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## APPENDIKS 2:

# FUNCTIONAL ANALYSIS OF LITHIC IMPLEMENTS

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### **Introduction**

The objective of the present study was to assess the possibilities of a wear trace and residue study of the lithic assemblage from site R39 at Rødsmø, Hedmark County, Norway. As the organic preservation at especially the lower levels was excellent, it was expected that the same would pertain for the lithic component. The research was designed as a pilot study, so, although the find circumstances provide an excellent opportunity to determine for instance activity areas (intra site analysis), such was not possible with the presently studied sample, because of its small size and the fact that it derived for the most part from the midden to the south of the excavated house pit.

### **Sampling and methods**

Until the mid seventies the function of stone implements could only be inferred from the shape, often on the basis of ethnographic and ethnohistoric analogies. Now we know that using an implement causes wear traces on its surface: these include edge removals (frequently called use retouch), edge rounding, polish and striations, all of which can be examined microscopically. Experimental research has demonstrated that the configuration and appearance of these traces varies according to contact material and motion (see Keeley 1980, Van Gijn 1990 and Odell 1977

for an outline of the method of studying these traces). Not only wear traces are present on a used tool but frequently residue of the contact material is present as well. The residues can be identified through the presence of structural features such as plant cell walls or individual blood cells (see Fullagar et al. 1992).

The sample studied for wear traces and residue (N=40) was taken with no specific research question in mind and is obviously too small to be representative of the activities carried out at the site. It is deemed sufficient however, for the objective of this study, namely to obtain an indication of the feasibility of a functional study of the lithic material from R39, both from a perspective of residue and wear traces.

The implements were first examined for traces of residue. In order to avoid contamination, all tools were handled with starch free gloves. An overview was obtained by stereomicroscope with oblique light, under magnifications ranging from 10-50 x. Subsequently, the implements were studied by an incident light microscope, fitted with Nomarski DIC interference light and polarizing options, magnifications ranging from 100x for scanning to 1500x for detailed observation. If possible residue was thought to be present, extractions were made, in order to examine

the residues for their structural properties. This was done by applying 20 ml. of distilled water onto the supposed residue, gently rubbing the spot with the pipette tip to loosen the residue, and 'sucking' it up by pipette to apply it to a glass slide. This way residues could be preserved for re-examination later and studied for structural properties by transmitted light microscopy. Five implements displayed possible traces of blood (R39/17, 31, 32, 36 and 45). The extractions of these residues were subjected to a Hemastix test, which identifies the protein Haem found in hemoglobin and myoglobin and to a dot-blot test which assays for the presence of immunoglobulin G. All tests proved negative, although they were done both in Leiden and in the laboratory of the University of Sydney.

The wear traces, edge removals, edge rounding, polish and striations, were located during the course of the residue analysis, using the same sequence of microscopic techniques, with the exception of the transmitted light option. Edge removals were mainly studied by stereomicroscope with oblique light, polish and striations by incident light microscope with bright field illumination. Photos were taken of representative or unusual traces.

One implement (R39/32) displaying a very resistant film was examined by electron microscopy to examine its structure and by EDAX to determine its elemental composition.

### **Preservation**

Most tools were made of a medium-coarse grained chert, the points of a medium-coarse grained slate. Macro- and microwear (edge removals, edge rounding, polish and striations) were well-preserved. There seemed to be no evidence for extensive trampling affecting the patterning of edge removals, or for abrasion or patination, inhibiting the visibility of polish and striations.

Unfortunately, residues were not preserved so well. The first collection examined (N=20) largely derived from the upper fill of the midden and displayed a substantial amount of fungi-growth on the surface, of a brownish-red color. The second collection of 20 implements were excavated from a lower level and proved to be largely free of fungi-remnants. In these lower levels of the fill, wood and bone was preserved and theoretically one would expect residues to be present on the tool surfaces as well. As mentioned, such was not the case and this may be due to the acidity of the surrounding soil matrix. From experiments it is known that most organic residues do not survive pH conditions less than five. It may be that due to the peat matrix, the pH of the soil surrounding the implements was lower than 5. The only residue left were traces of resin, probably related to hafting.

### **Inferred activities**

Most of the tools selected for the functional analysis were modified. The largest category constituted the scrapers (N=19), all of which displayed traces of use; four even had two used edges, or were used along their entire circumference. Certainly most of the scrapers were quite intensively used, considering the extent of the wear and the fact that several displayed use along more than one edge. The fact three implements showed both hide- and antler working traces (in the case of nr. 101 it is clear that the tool first served for hide scraping and only secondarily for antler) further supports the idea that the material is used in a conservatory manner. Moreover, sometimes evidence for resharpening was present on the tools (R39/35 and 39). Not only the scrapers but also the remaining retouched implements invariably displayed traces of use (see table 1). Only one blade and two flakes lacked any traces of use.

|               | Scraper   | Borer    | Point    | Blade    | Flake   | Total |
|---------------|-----------|----------|----------|----------|---------|-------|
| Hide          | 7 (36.8%) |          |          |          |         | 7     |
| Antler        | 7 (36.8%) | 2 (100%) |          | 10 (84%) |         | 19    |
| Bone          | 1 (5.1%)  |          |          |          |         | 1     |
| Hide & Antler | 3 (15.8%) |          |          |          |         | 3     |
| Bone/Antler   | 1 (5.3%)  |          |          |          |         | 1     |
| Plant/Wood    |           |          |          |          | 1 (25%) | 1     |
| Projectile    |           |          | 3 (100%) |          |         | 3     |
| Not Interp.   |           |          |          | 1 (8%)   | 1 (25%) | 2     |
| No Traces     |           |          |          | 1 (8%)   | 2 (50%) | 3     |
| Total         | 19        | 2        | 3        | 12       | 4       | 40    |

Table 1: Overview of inferred contact materials by tool category.

Antler seemed to have been the most frequently worked contact material. It should be stressed, however, that in experimental context antler and wood working polish sometimes resemble in their smooth texture and domed topography. However, ten out of the eleven blades examined, displayed what is, in traceologist's jargon, called a 'melting snowfield' appearance, a feature which is almost solely related to antler polish. Of the ten blades showing antler working traces, six were used in a perpendicular fashion, one in longitudinal motion and in three cases the motion could not be determined. Antler working traces were also inferred on seven of the 19 scrapers examined, all of them used in a perpendicular, scraping motion. Both borers displayed traces from contact with antler, and were used in a motion conform their typological category. In addition, three scrapers showed wear from both contact with hide and antler, with a perpendicular directionality. These scrapers were clearly multipurpose implements. Last, with respect to one scraper it could not be determined whether the traces resulted from bone- or antler working. To conclude, it seems that fashioning objects from antler constituted an important activity within the site, as more than half the

implements studied, displayed traces resulting from this activity.

Hide working traces, characterized by a heavily rounded edge and a narrow band of rough, sometimes cratered polish, formed the second-largest category. All of the hide-working wear was seen on scrapers, seven of which were solely used on hide, three were also used on antler. Invariably, the scrapers were used in a perpendicular motion. The preparation of hides is thus a well-represented activity.

The three slate projectile points examined all displayed traces of impact or so-called MLITS, indicative of their use as projectile. MLITS are streaks of flat polish directed parallel to the direction of impact; they result from scraping along bone or other hard particles as they penetrate the animal. Experimental studies have shown them to be present in about two-third of the points used for shooting (Fisher et al 1984; Van Gijn 1990; Odell & Cowan 1986). One of the inferences is certain, two are less certain.

All other contact materials are represented in very small numbers. Noteworthy is the virtual absence of plant or wood working traces. Two flakes are not used, two were not interpretable.

|             | Transverse | Longitud | Boring | Projectile | Unsure | Not Interp. | No Traces |
|-------------|------------|----------|--------|------------|--------|-------------|-----------|
| Hide        | 7          |          |        |            |        |             |           |
| Antler      | 13         | 1        | 2      |            | 3      |             |           |
| Bone        | 1          |          |        |            |        |             |           |
| Hide&Antler | 3          |          |        |            |        |             |           |
| Bone/Antler | 1          |          |        |            |        |             |           |
| Plant/Wood  |            | 1        |        |            |        |             |           |
| Unsure      |            |          |        | 3          |        |             |           |
| Not Interp. |            |          |        |            |        | 2           |           |
| No Traces   |            |          |        |            |        |             | 3         |
| Total       | 25         | 2        | 2      | 3          | 3      | 2           | 3         |

Table 2: Inferred motion versus contact material.

### Hafting

Traces of resin are known to preserve quite well in most archaeological deposits. They are insoluble in water, and stick firmly to the surface. It turns out that, upon closer scrutiny, they are frequently present on archaeological implements, even where they have not been noticed before (Folkersma 1996). The material from R39 also displayed fragments of resin. The problem, however, was differentiating between the resin and some of the fungal growth, as they were both black or brown in color. It took some time to define the characteristics to distinguish resin and fungi remnants and the counts cannot be taken as absolute until every implement has been chemically tested for resin. Twelve of the nineteen scrapers and one slate point displayed traces of hafting, one blade and two flakes possibly.

One implement, nr.32, displayed a very resistant film of a reddish color. In some ways it resembled blood, so a sample was taken to check for the presence of blood; this turned out to be negative (see above). Next, a sample was taken with an adhesive on a stub to fit in the chamber of a scanning electron microscope, removing small particles of the film for SEM and EDAX

analysis. The residue lacked structure so it does not concern some organic material but most likely a resin. This is also supported by the results of the EDAX analysis, but it can only be confirmed by massspectrometric analysis. If it does prove to be a resin, it is probably a hafted implement.

### Concluding remarks

With respect to the primary objective of this pilot study, the assessment of the quality of the R39 material for a functional analysis, the conclusion can be affirmative. The residue is not preserved, probably due to the acidic matrix from which the material derives, but the tools certainly display clear wear traces. Micro- and macrowear analysis is therefore possible. This means a lower level of inference, because it is impossible to distinguish the polish from one type of wood from the other, whereas with residue preserved it may be possible to make a further distinction. However, a wear trace analysis already offers quite a bit of information concerning the relationship between tool form and function, about the activities carried out at a site and so forth.

Sites such as R39 are frequently interpreted as winter camps in which all sorts of mainte-

nance activities, such as the preparation of hides and the upkeep of various tools, took place (a.o. Rydstrom 1984). In the literature scrapers are usually related to hide or wood working (Lundberg 1985; Rydstrom 1984), activities which are believed to have taken place in a base camp. The results of the present pilot study suggest however, that many scrapers were involved in the manufacture of antler objects or tools. Still, in terms of site function, such an observation does not negate the interpretation of R39 as winter camp. On the other hand, maintenance activities also take place in transitory settlements. In the case of R39, the site is located close to a migratory route for elk (Boaz 1994). It is quite possible that people spend their time manufacturing objects while watching for game (see also Binford 1978 who observed a similar phenomenon for the Alaskan Nunamiut). Producing antler objects requires a relatively small toolkit, it is not strenuous work and it is easy to look up to watch for game while working (contrary to hide working which requires a more active body attitude). The present data do not suggest a particular site function therefore; conclusions about site function probably can only be made on the basis of the complete configuration of site features and distribution of various find categories.

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