

Neanderthal children and their flints

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Abstract

As pioneer studies at the Magdalenian sites of Pincevent and Etiolles have shown, refitting analyses can reveal the presence of those learning the craft of flint knapping, *i.e.* children. This approach was successful especially at Upper Palaeolithic sites. Learners can be recognized by their incompetent flaking, and also by typical beginners' errors such as 'face battering' and 'stacked steps,' as shown in experiments by Shelley (1990). For reasons unknown to me, and in contrast to the Upper Palaeolithic, it is quite unusual to come across children in the literature about the Lower and Middle Palaeolithic. In most cases, 'flint failures' from these periods are attributed to poor-quality raw material. In this paper it is argued, by means of several examples, that in many cases children may be responsible.

In his monograph about the main Saalian find level in the Maastricht-Belvédère quarry, De Loecker (2006) mentions that at Site K relatively many cores show phenomena such as stacked steps and face battering. It is suggested that this reflects the presence of children practising their flint knapping skills, rather than the poor quality of the local raw material. The absence of the classic Levallois technology, and the use of the simpler discoidal cores instead, may also be seen in this light.

This article describes a series of implements from several sites of the Rhenen Industry in The Netherlands, dating from the Early Middle Palaeolithic. A '*pic*' and a handaxe-like core reveal incompetent flaking, and the *pic*-like object also shows 'face battering' on both faces. These artefacts, as well as several small cores and a 'micro-Levallois-flake,' are interpreted as specimens made by learners in the art of flint working. A miniature handaxe, only 4.4 cm long, is tentatively interpreted as an instructive toy made by an adult for a child. Finally, a few enigmatic objects from the Late Middle Palaeolithic in the northern parts of The Netherlands are also interpreted as pieces worked by children.

In the discussion chapter, the literature is searched for further possible examples of this phenomenon. It is concluded that the activities of children are overlooked in studies of the older phases of the Palaeolithic.

Key-words: Middle Palaeolithic, Upper Palaeolithic, children, flint knapping

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1. Introduction

Skeletal remains of more than 500 Neanderthal individuals are known. About half of these were children. The finding of skeletal remains of a Neanderthal male in the Kleine Feldhofer Grotte in 1856 was commemorated in 2006. It is appropriate, however, to mention that the first time that Neanderthal remains were found was late 1829 or early 1830, when the physician J.-P. Schmerling excavated a child's skull in Engis Cave in Belgium (he also excavated a second human skull at Engis, of an adult, which proved to be of the modern human type). In his publication of 1833-1834, Schmerling recognized the importance of the observed association of these human remains with stone tools and bones of extinct animals such as mammoth and woolly rhinoceros (Toussaint, 1992). The child's skull had soon crumbled into many fragments, however, and its full importance was only realized a century later, thanks to the work of J. Fraipont, who in his publication of 1936 described it as a Neanderthal skull. It is thought that the child of Engis was four to six years old at the time of death. Fraipont suggested that its skull showed some deformations possibly caused by rickets.

It has been suggested that Neanderthals may have had a shorter childhood than modern humans (see *e.g.* the discussion in Stringer & Gamble, 1993: 84-86), but there is no consensus about this. What seems clear enough, however, is that life was in many cases not very easy for Neanderthal youngsters. As mentioned above, about half of the individuals of whom we have skeletal remains were children, and they often died quite young. This is a high proportion, considering that the bones of young children stand a much poorer chance of preservation than those of adults. Therefore, child mortality must have been considerably higher than 50 %. In this connection it may be noted that sites with skeletal remains of more than one individual mostly show a predominance of children. A famous example is La Ferrassie (Delporte, 1984): six of the eight individuals were children, most of them very young (and at least one still fetal). More recent research is that in the Dederiyah Cave in Syria. In 1993, a fairly complete skeleton of a two-year-old child was found here, the find of which was followed in 1997 by a less complete skeleton of a second child of about the same age and after that by an isolated arm bone of a child maybe six months old (Fortin, 1999).

There may have been several reasons for the high child mortality among Neanderthals (*e.g.* Trinkaus 1992): periodical food shortage, unbalanced diet, disease and also violence. Evidence of episodic food shortage has been found through tooth analysis, and it has been shown in several cases that children went through one or several temporary growth stops. Violence was most probably also a factor; for example, several Neanderthal skulls show scars of severe blows to the head, like the skull of Saint-Césaire (Zollikofer *et al.*, 2002). The practice of cannibalism among Neanderthals has been assumed by many authors, ever since the finds at Krapina, and vehemently rejected by others. However, there seem to be convincing indications for this practice, not only among Neanderthals but also among modern humans during the Palaeolithic (and later periods). It has to be assumed that also children were consumed. In this connection, the recently excavated site of Moula-Guercy (100-120 kyr) is often mentioned. Skeletal remains of at least two adults, two youngsters of 15 or 16 and two children aged six or seven were found. Just like the animal bones at the site, the human bones show cut marks, which according to the excavator indicate that the humans were killed, butchered and eaten, after which their bones were smashed to release the marrow (Defleur *et al.*, 1999). The human bones occurred in the same dump situation as the animal bones, mixed among the latter. Similar evidence for cannibalism is known from other sites.

So, it seems that Neanderthals often did not survive early childhood, and that the children who did, mostly had a tough life. Many adult Neanderthals suffered from a multitude of diseases and afflictions (on the male individual found in 1856 in Neanderthal: see Schultz, 2006). In this paper, I am focusing on the children who survived to become active members of the small groups of Neanderthals that produced the many thousands of Middle Palaeolithic sites in Europe. What do we know about their activities?

2. Apprenticeship in flint working as shown by refitting analysis

Archaeologists have given relatively little attention to Stone Age children and their activities (but see: Derevenski, 2000), and this is true especially for the older stages of the Palaeolithic. The few colleagues who have explicitly discussed Stone Age children have generally followed one or several of the following three maxims in their interpretations: 1) children are small; 2) they want to play all the time; 3) they have to learn a lot. In other words: 1) children may have left behind especially small things, for example miniature versions of everyday tools; 2) they may also have left behind toys, made either by themselves or by their parents; 3) they may have left traces of the learning processes that they went through. Of course, several combinations of these categories can be envisaged.

Refitting analyses have been very successful in revealing learning processes in flintknapping. Such studies have made it possible to observe (and almost to re-experience) Stone Age children's efforts in learning to knap flint. This has been achieved especially for sites dating from the Upper Palaeolithic: the Magdalenian sites

at Pincevent and Etiolles in France are famous examples. This success is based on the fact that, to a certain extent, refitted cores make it possible to recognize individual knappers, especially on the basis of differences in their level of skill. Most researchers feel able to distinguish three levels: unproductive beginners, advanced learners with a modest productivity, and expert knappers. Pioneering research was done at Etiolles, where up to six or seven levels were distinguished (see for detailed discussions, on Etiolles P15: Olive, 1988; on Etiolles U5: Pigeot, 1987; 1990; on Etiolles Q31: Pigeot, 2004). The first stage in learning to knap is the realization that you need an edge with an angle of less than 90 degrees; the last step is to know when to stop.

It is obvious that the learners who have been identified in this way at Stone Age sites were all, or at least mostly, children. Probably they were mostly boys. This interpretation is based on ethnographical observations. In their cross-cultural study, Murdock & Provost (1973) presented data for 73 non-industrialized peoples, both hunter-gatherers and others. Among 67 of these peoples (ca. 92 %) stone-working was an exclusively male task, and among just six (ca. 8 %) males and females participated about equally in this work. It has to be noted that 'stone-working' includes more activities than just flint knapping. In fact, only very few cases have been observed of women knapping flint or equivalent types of stone. Nevertheless, some feminist archaeologists (e.g. Gero, 1991; Owen, 2005) do not agree with using this evidence to model the division of labour during the Upper Palaeolithic. To my mind, however, it is quite likely that the kind of gender division of labour as described by Murdock & Provost (and many other authors) existed also during the Upper Palaeolithic. A different question is whether the same was true during the Lower and Middle Palaeolithic, when we are dealing with different species of humans. However, the same 'logic' underlying this behaviour would have applied during all these periods, and it may therefore be assumed that also Neanderthals and other 'ancients' had a similar division of labour. Hence it seems probable that handaxes were made and used predominantly or exclusively by men (a similar opinion is expressed by Keeley, 1993: 137). The fact that hand axes are often found isolated, presumably left at kill sites where they had been used for butchering work, supports this interpretation, as hunting large animals is also known ethnographically to be a predominantly male task.

In small-scale societies most learning and teaching takes place in families, where children are often taught tasks by parents of the same gender (e.g. Baxter, 2005). It may therefore be assumed that flint knapping was mostly taught by fathers to their sons. On the basis of experiments with modern children, it may furthermore be concluded that beginners, lacking even the basic skills of this craft, probably were children younger than nine or ten years (Sørensen *et al.*, 2002; Sternke & Sørensen, in press). Up to this age, children seem to have trouble correctly creating three-dimensional shapes (see also Hawcroft & Dennell, 2000). It is known that it takes years to become a decent flint knapper (Pelegrin, 1990). It may therefore be expected that advanced Stone Age learners of the art of flint knapping were aged over nine or ten, probably up to 14 or 15 years old.

Of course, there are other possibilities for explaining the presence of flint artefacts that reveal inadequate knapping. For example, Kamp (1998: 13) writes: "It is not even unlikely that, if old age brings with it maladies such as poor eyesight or crippling arthritis, the craft products of the elderly may sometimes appear low in quality." This may be so, but in my opinion this cannot be a plausible explanation for the majority of the observed traces of learning processes in Palaeolithic sites.

The work of learners has been observed at quite a few sites, and in fact their identification has become a regular outcome of refitting studies of Upper and Late Palaeolithic material (see e.g. Perlès, 1991). At some sites, such as Etiolles P15 (Olive, 1988), the conclusion may even be that *most* of the flint knapping was done by children! Apart from the famous examples of Etiolles referred to above, I would like to mention several other publications that are of great interest in this respect, and contain a wealth of ideas. On the Magdalenian site of Pincevent, see Bodu (1993), Bodu *et al.* (1990), Ploux (1989); on the Brommian site of Trollesgave, see Fischer (1990); on the Federmesser site of Rekem, see De Bie & Caspar (2000); and on the Perigordian level at the site of Solvieux, see Grimm (2000).

It is to be expected that such traces of children are left at many more sites. I would like to mention just a few examples, but many more may be found when one would specifically search for this phenomenon. At the Aurignacian site of Geissenklösterle, several levels of skill in flint knapping could be observed (Hahn, 1987: 19), which implies the presence of at least one child. It is probable that some knapping by children was done at the Creswellian site of Gough's Cave (Jacobi, 2004: 22). One or several children were probably knapping flint at Marsangy (Schmider, 1993: 111, 115).

In the Netherlands, L. Johansen has performed refitting analyses with the flint material of a Hamburgian site, Oldeholtwolde, and of two Late Ahrensburgian sites, Gramsbergen and Oudehaske (for an overview, see Johansen & Stapert, in press). At Oldeholtwolde, three levels of skill could be observed, and these were interpreted as associated with a young boy (novice), a somewhat older boy (advanced learner), and an adult man (expert knapper) (Johansen & Stapert, 2004). Figures 1-3 show a few examples of refitted cores that had been worked by these three flint knappers. The refitted core in figure 1 is the largest of the site, containing a little over 100 artefacts. It was worked in a very competent way. The core was prepared carefully by bifacial cresting over the full length of the production face, and a whole series of slender and regular blades were produced, many of

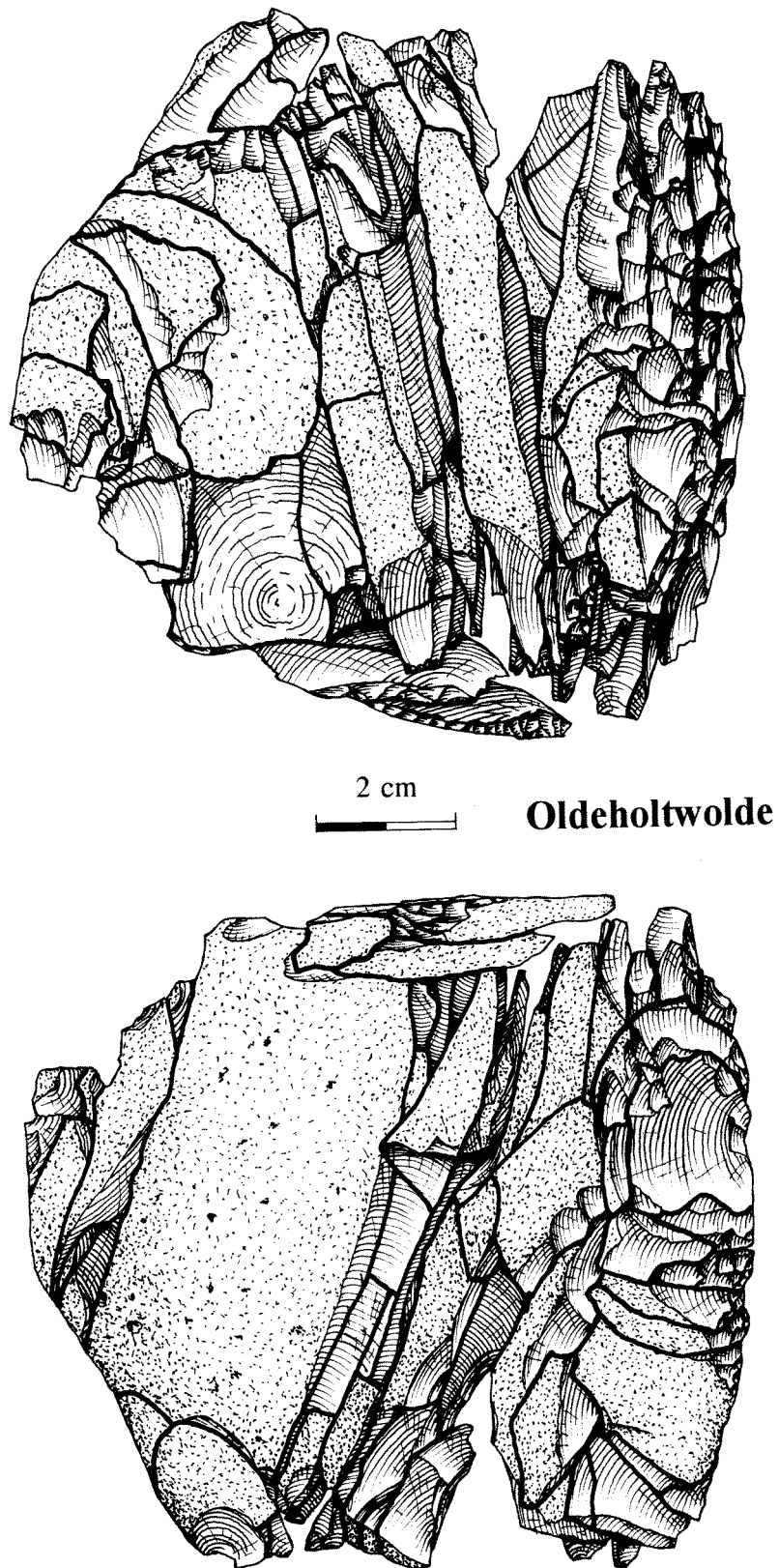


Figure 1. The largest refitted core from the Hamburgian site at Oldeholtwolde (The Netherlands). This core was worked by an experienced flint knapper; a series of good and slender blades were produced. Note the bifacial preparation over the full length of the production face. Drawing by L. Johansen.

which were transformed into tools. The refitted core illustrated in figure 2 is an example of what is considered to be the work of an advanced learner. There is a modest production, though most of the produced blanks are rather short blades, quite a lot of which ended in hinges or steps. Nevertheless, most of the blades were turned into tools of various types. Several cores were worked totally unsystematically, and must have been knapped by a beginner (figure 3 shows an example).

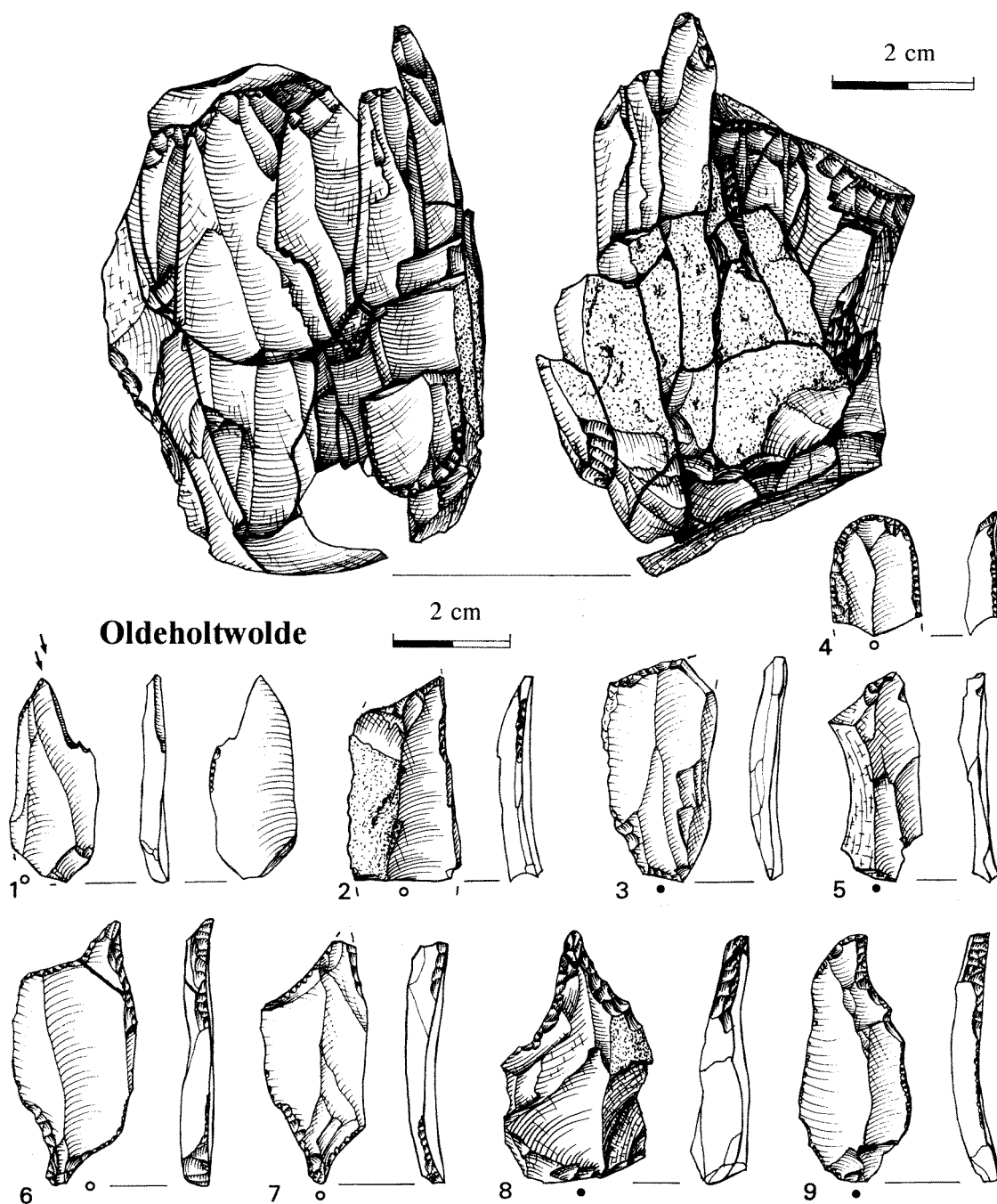


Figure 2. Refitted core from Oldeholtwolde, worked by an advanced learner in the art of flint knapping. A modest series of relatively short blades were produced, some of which ended in hinges or steps. Nevertheless, almost all of them were transformed into tools of various types. Drawing by L. Johansen.

At the site of Gramsbergen, two levels were observed, connected to an advanced learner (older boy) and an expert knapper (adult man); at Oudehaske, a small site occupied only briefly, no flint knapping work by children could be identified (Johansen & Stapert, 2000).

Oldeholtwolde

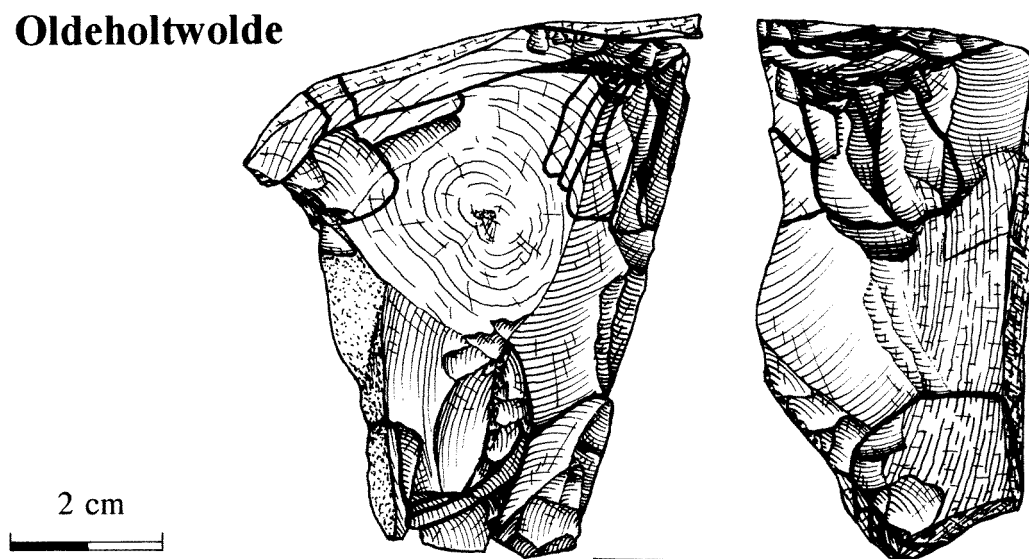


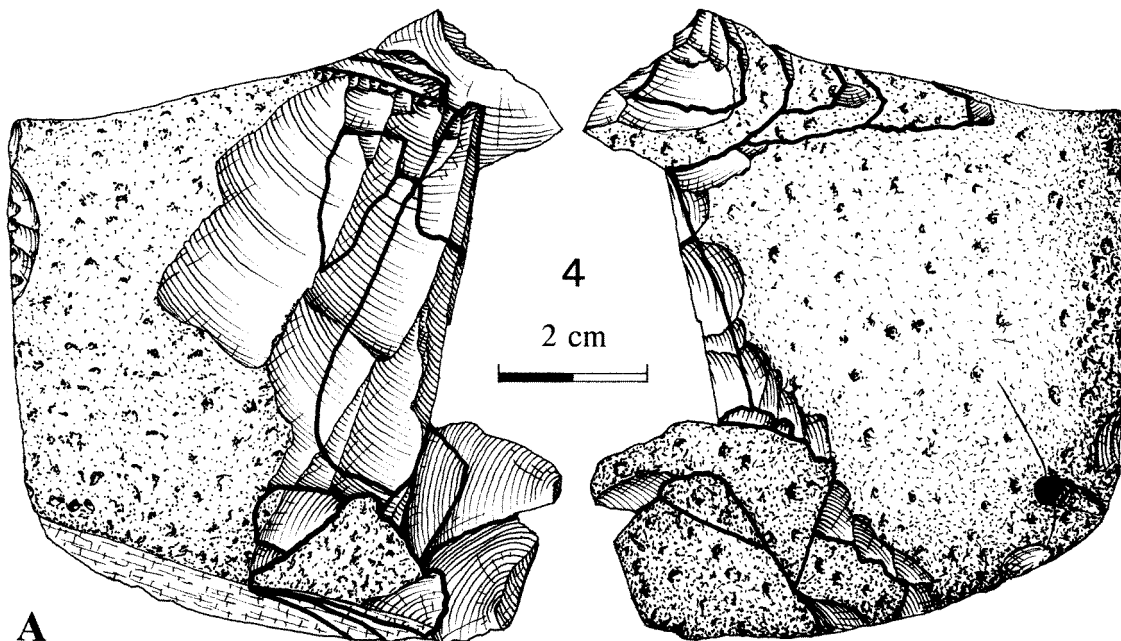
Figure 3. Refitted core from Oldeholtwolde. This core was knapped by a beginner, who was sitting close to the hearth. Not one usable blade was produced. A small 'blade'-fragment was nevertheless transported on the site over a distance of 6.5 m. Drawing by L. Johansen).

One interesting aspect of this work is the phenomenon of re-use of cores. In many instances, children have practised on used-up cores abandoned by expert knappers. Most of the cores at Etiolles P15, for example, were re-used cores abandoned by the expert knappers (Olive, 1988). The same phenomenon is known from Etiolles U5 (Pigeot, 1987), and from Oldeholtwolde (Johansen & Stapert, 2004) where several cores were first knapped by the experienced knapper, and later by one of the learners (two examples are illustrated in figure 4). In general one might say that such re-use of abandoned cores may be expected especially in situations where good-quality flint nodules are relatively scarce; in such cases the best nodules were for the best knappers. In places where plenty of flint was available, for example at Pincevent, this phenomenon was much less common (Bodu, 1993: 94).

Another aspect worth noting is the presence of 'academic' cores: cores worked by an expert knapper in what seems to be a demonstration for the benefit of young pupils. One example is an isolated flint knapping location in the periphery of unit M89 (Bodu *et al.*, 1990; Ploux, 1989). In such cases every step in the *chaîne opératoire* is carried out with utmost precision, but almost all of the products are left on the spot: the purpose was not to make good blades for practical use, but to instruct. We may conclude that 'teaching' was a Palaeolithic invention (at least an Upper Palaeolithic one). According to its excavator, Trollesgave may also present an example of such a teaching session (Fischer, 1990), and the same is true for Solvieux (Grimm, 2000). Both at Oldeholtwolde (Johansen & Stapert, 2004) and Gramsbergen (Johansen & Stapert, 2000) it was observed that residues of the expert knapper and an advanced pupil were located 1 or 1.5 m apart, suggesting some kind of educational interaction during the work (figure 5).

Finally, it has been noted at several sites that learners often, or even exclusively, applied hard percussion, as if they were not permitted to use the precious hammers of organic material (*e.g.* Pigeot, 2004: 100).

Up until now, I have referred to studies about the Upper Palaeolithic in order to introduce this kind of research. Refitting analyses of Middle Palaeolithic material, which have produced hints of the presence of children are rare. One of the very few was done by Bodu (1990); he performed a refitting analysis of the flint artefacts from the Chatelperronian levels in the Grotte du Renne at Arcy-sur-Cure. At least three levels of flint knapping skill could be observed. Apart from experienced knappers there must have been one or several advanced learners, practising 'simplified' knapping, and one or several beginners, displaying incompetent work ('*maladresse*'). Several levels of skill were represented in all Chatelperronian levels at the site, and it may therefore be concluded that the Neanderthal groups camping out here included children in each case.



Oldeholtwolde

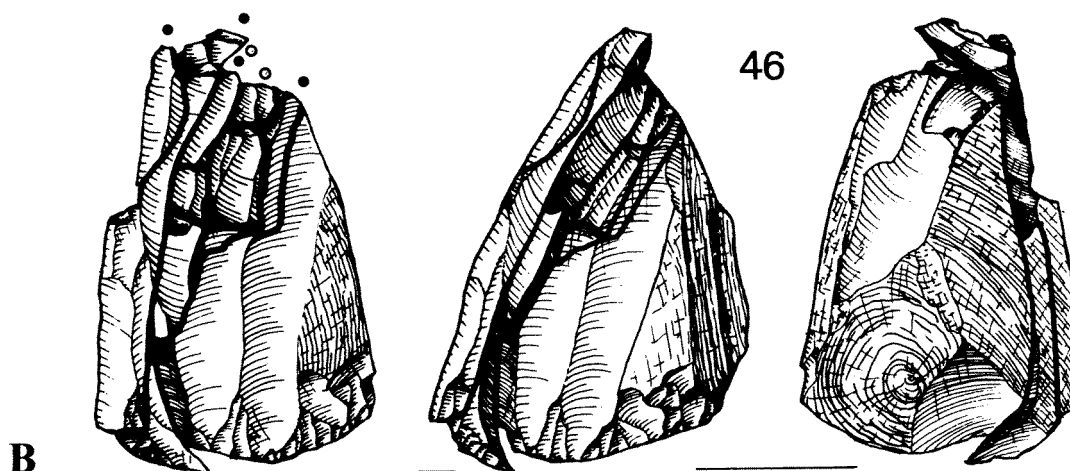


Figure 4 (above). Two refitted cores from Oldeholtwolde. These were first knapped by an experienced knapper, as is evident from the negatives of a series of good blades (which were not found on the site because they were used elsewhere). The discarded cores were then taken up by a beginner to practise his flint knapping skills; no usable blades were produced, however. Drawings by L. Johansen.

Figure 5 (left). Sketch of how one might envisage a flint knapping learning session by a proficient knapper and a learner. Drawing by L. Johansen.

3. 'Failed flints': Shelley's experiments

Refitting is a time-consuming task which cannot always be carried out successfully. Fortunately, it is not the only approach in the recognition of children. In many cases, children's products can be recognized directly by traces of incompetent flaking, such as hinges and steps. Of course, hinges and steps may result from imperfections in the flint, and every knapper will produce them from time to time. But they can also result from incompetent flaking: for example, hammering with too much force, using a wrong flaking angle, or hitting too far from the edge of the striking platform. It is known that novices in the art of flint knapping produce significantly more steps and hinges than accomplished knappers. Shelley (1990) compared the products of a group of 31 novices (his students) with those of a group of 11 experienced knappers: both groups exploited blade cores and made bifaces. It is important to note that the products of the very first learning phase, by absolute beginners, were excluded from his analysis. Among the blade cores of the learners, steps and/or hinges occurred in about 53 %; among the cores of the experienced knappers, only in 20 %. With the bifaces, these percentages are 47 % and 18 % respectively (figure 6). In other words: hinges/steps are produced roughly 2.5 times as often by beginners as by experienced knappers.

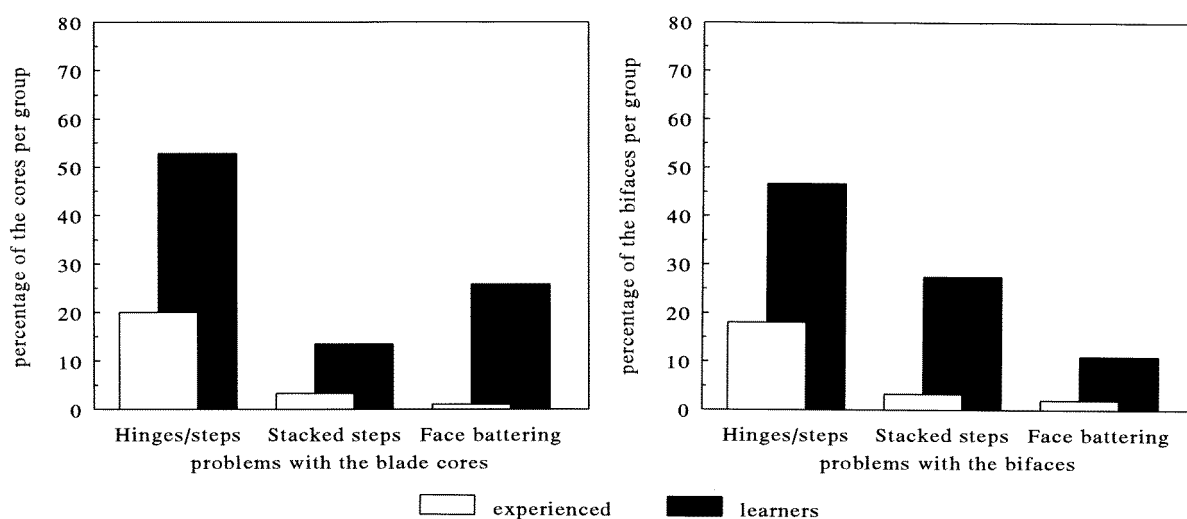


Figure 6. Diagrams illustrating some differences between learners and experienced flint knappers. Based on experimental data gathered by Shelley (1990). Figure by the author.

Two other features, 'face battering' and 'stacked steps', indicate incompetence in almost all cases. They are mostly the result of pointless exercises: bashing the middle of a face (in attempts to remove protruding parts), and repeatedly hitting a spot where successful flaking cannot be achieved (so that an accumulation of steps is produced). These tactics are not rational, and apart from incompetence also reveal frustration. Of the cores worked by Shelley's students, about 14 % show stacked steps, while among the cores of the experienced knappers only some 3 % show this phenomenon. Among the bifaces, these percentages are about 27 % and 3 %, respectively. The difference between the two groups of knappers is even more marked when it comes to face battering. The blade cores of the learners show traces of this tactic in about 26 %, those of the experienced knappers in only about 1 %. The proportions among the bifaces are 11 % and 2 % respectively. In other words: experienced knappers rarely display this behavior, but it is quite common among learners (these percentages are based on Table 1 & 2 in Shelley, 1990; the tables contain some inconsistencies, but these cannot have had a significant impact on the percentages given above).

4. Some examples of flint artefacts probably produced by Neanderthal children

For reasons yet to be explored, it is very uncommon to come across children in the literature concerning the older phases of the Palaeolithic (see also Shea, 2006). But of course Neanderthal or *Homo heidelbergensis* children also had to learn to knap flint. Being able to make good flint tools was important for survival, and probably for other reasons as well, such as social standing (Kohn & Mithen, 1999).

One possible approach to the presence of children in these periods is to look for failed flint tools, 'wasters' resulting from incompetent knapping. Authors in archaeology are more often inclined to describe and illustrate the 'regular' or 'typical' tools than the 'wasters,' especially if they have to make a selection for lack of

space. As a result, 'failed flints' have been described and illustrated only rarely in the literature concerning the older Palaeolithic. Moreover, in almost all cases their presence is attributed to the poor quality of locally available raw material. Maybe one reason for this situation was a subconscious belief by some authors that a certain 'primitiveness' was only to be expected of older Palaeolithic cultures. This idea is certainly wrong. In fact, several examples of flint work by *Homo heidelbergensis* (for example the magnificent handaxes at Boxgrove) or by Neanderthals (for example the splendid leaf points from Ranis and Mauern) are quite stunning and sophisticated, and may almost be regarded as these people's equivalent of 'art.'

Below, several specimens of 'failed flints' are described, and it is suggested that they are pieces worked by children. Many of these are quite small. Miniature forms may also be instructive toys, made by a parent for a child; these will generally be well-made (in contrast to children's products) and one possible example is illustrated.

4.1. Maastricht-Belvédère, Site K

De Loecker (2006), in his monograph about the Maastricht-Belvédère quarry, offers a detailed description of the flint artefacts from Site K and eight other sites, all excavated earlier by Roebroeks (1988) in the main find level, Unit IV. The Unit IV sites date to an intra-Saalian interglacial, which is now known in The Netherlands as the Belvédère Interglacial. This can probably be correlated with the Hoogeveen Interstadial as defined by Zagwijn (1973; see Van Kolfschoten *et al.*, 1993). Some ten TL dates for burnt flints are available for Unit IV (they come from several sites), averaging 250 ± 20 ka; the dates range from 218,000 to 307,000 BP (Huxtable, 1993).

The artefacts in Unit IV were embedded in loams deposited by the river Meuse. At the artefact-rich Site K, 10,912 flint artefacts were excavated (see also De Loecker, 1992). According to De Loecker, the flints at Site K were barely if at all moved by water, even the smaller ones. This is the only Unit IV site with a substantial number of 'tools': 111 formal tools and 26 artefacts with macroscopic traces of use. Among the tools, scrapers predominate (ca. 75 %), including pointed double scrapers ('Mousterian points'). About one third of all flints ≥ 2 cm could be refitted. The results seem to point to the presence of several flint knappers who used different locations within the site. Enormous refit-compositions were created; for example, Composition I from Site K comprises 160 elements, weighs about 9.3 kilos and has a maximum diameter of about 40 cm. There are no tools in Composition I. This large nodule was split on the site into nine pieces, which were then exploited separately at different spots. The second-largest composition (II, 35 cm, 0.8 kg) comprises 146 elements, one of which is a simple scraper; this nodule was split into eight pieces, which were then reduced separately. In total, 321 refit-groups were created from the flint material of Site K, 17 of which are described in detail by De Loecker (2006).

At Site K, the Levallois method was not used at all. Most cores were of a simpler kind: disc or discoidal cores (see De Loecker, 1992: 452). Moreover, core preparation and faceting of striking platforms were rarely practised. De Loecker mentions that instances of knapping accidents are common at Site K. These may partly be the result of imperfections in the flint, such as hidden fissures and fossil inclusions. But the frequency of knapping accidents seems too high to be explained only by the poor quality of the local flint, as is suggested by De Loecker. De Loecker (2006: 29) observed that 85.7 % of the cores at Site K show one or several of the following phenomena: hinges, steps, 'face battering' and 'stacked steps.' This is a very high percentage, even when we take into account that in many cases cores will have been abandoned for the very reason that hinges and steps occurred during the last episode of exploitation. In the appendices of De Loecker's monograph, it is stated that 68.1 % of the cores from Site K show hinges, and 57.1 % steps. Stacked steps were observed on no less than 59.3 % of the cores, and face battering on 17.6 % (figure 7).

These are extremely high percentages, even when compared with the work of Shelley's students. Though De Loecker (2006) does refer to the study by Shelley, he does not explain the frequent knapping accidents at Site K as the work of learners. He writes (p. 28): "Therefore the assumption can be made that a large part of the nuclei was discarded due to the 'poor' quality of the raw material." In my opinion, however, one should assume that at Site K one or (more probably) several learners in the art of flint knapping were active (Stapert, 2007). Of course, the relatively poor quality of the local flint will have played a part, resulting in quite some steps and hinges. But this would not adequately explain the high frequency of stacked steps and, especially, of face battering. These phenomena are hardly seen at all with experienced knappers, as was noted by Shelley.

Yet another aspect is worth considering. As De Loecker demonstrated, the Levallois method was not used at Site K, though the occupants did practise it elsewhere (there are good Levallois flakes, mostly transformed into tools, but these were imported). Since the Levallois technique has a complicated *chaîne opératoire*, it will have been difficult for youngsters to master; the learning process will have taken quite some time. At Site K, instead of the Levallois method, use was made of more simple disc or discoidal cores (see *e.g.* Boëda, 1993), which allow continuous flake production without complicated preparations. De Loecker (2006: 113) believes that the relatively poor quality of the local flint was responsible for this choice too: "... it can be suggested that at

Site K a discoidal approach was applied in response to inferior quality raw material.” However, we might consider the alternative possibility that this was an adaptation to youngsters still learning to knap flint, who were insufficiently advanced to apply the Levallois method. Several other phenomena observed by De Loecker, such as the fact that flint nodules were rarely tested before transportation to the site, and the almost total absence of faceted striking platforms, seem to support this hypothesis.

At Site K, quite a lot of flint artefacts are burnt: about 5.7 %. It can be shown that the burnt flints occurred in two clusters; it is probable that two hearths were tended here (Stapert, 2007). Much of the flint working was done in the vicinity of the hearths.

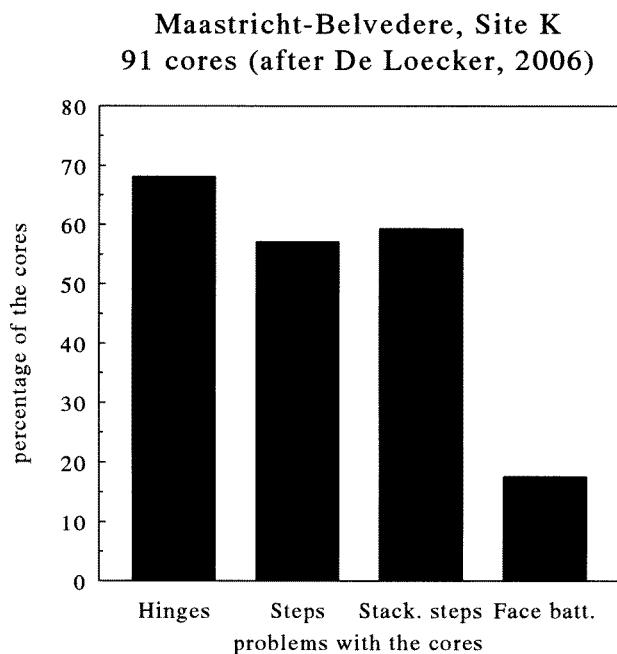


Figure 7. Maastricht-Belvédère, Site K. Percentages of cores revealing several types of technological accident (n = 91). Relatively many cores show 'stacked steps' and/or 'face battering,' indicating work by learners (children). Based on data in De Loecker (2006: appendix 9). Figure by the author.

4.2. The Rhenen Industry

Thousands of Middle Palaeolithic flint artefacts are known from a series of sand quarries in the ice-pushed hills in the central Netherlands. Especially the Kwintelooijen pit near Rhenen produced large quantities of artefacts. Excavations have shown that these artefacts derive from river gravels of the Urk Formation (Stapert, 1981, 1983, 1987, 1991). The sediments containing the artefacts were pushed up by the ice during the last phase of the Saalian, between circa 160,000 and 130,000 years ago (during OIS 6). Therefore these finds must be older than ca. 160,000 years. In fact, the find-bearing gravels at the Leusderheide site have been dated by OSL to about 168,000 years ago (this being considered the most reliable of three dates: 168±19, 199±15 and 208±20 kyr: Van Balen *et al.*, 2007). Since the artefacts are in a secondary position, given their occurrence in river gravels, they must be older than ca. 170 kyr. Van Balen *et al.* (2007) believe a dating of the artefacts in the Bantega Interstadial to be more probable than in the Hooogeveen Interstadial. However, given especially the stratigraphical results at the Wageningen site, I consider the latter possibility more plausible, which implies a dating around 250 kyr - as at Maastricht-Belvédère (Stapert, 1987). The find-bearing gravels also produced quite a number of animal remains, which were studied by Van Kolfschoten (1981). These represent both cold and warm faunas, so it is clear that part of the faunal remains were reworked from older deposits.

Because of the presence of handaxes, be it in relatively small numbers, the Rhenen Industry can be placed in the Acheulian. The Levallois technique was regularly used, so the industry can be described as Early Middle Palaeolithic. The relatively large numbers of sometimes very regular Levallois blades are particularly striking (see illustrations in Stapert 1981, 1983, 1987).

Several implements from Rhenen may be interpreted as having been worked by children. A few of these were discussed by Stapert *et al.* (2006), and several more were identified later in the collection of J. Offerman. I shall briefly discuss some examples.

The first is a bifacial tool from the Kwintelooijen Pit (figure 8). Typologically it belongs in the category of '*pics*' (Bordes, 1961), having a pointed part and a triangular cross-section. Its length is 9.9 cm, its width 4.8 cm, its thickness 2.9 cm and its weight 129 g. The tool is hardly rolled; it has a low gloss and a light brown

patina. Both faces have protruding parts (see the side view) as a result of incompetent flaking. The flint knapper tried to remove these protrusions by the tactic known as 'face battering' (Shelley, 1990), but this predictably only resulted in splintering. Therefore we are here dealing most probably with a product of a learner, *i.e.* a child. In this connection it is of interest to note that Shelley's students, when attempting to create bifaces, often ended up with pieces having the morphology of *pics* (Shelley, 1990: 192). Of the students' bifaces, 71 % had a high-triangular (instead of a plano-convex or bi-convex) cross-section, as with *pics*; this was never the case with the bifaces of the experienced knappers. In other words, *pics* may often not have been the intended tool form at all; in many cases they could in fact result from failed attempts by learners to create a handaxe.

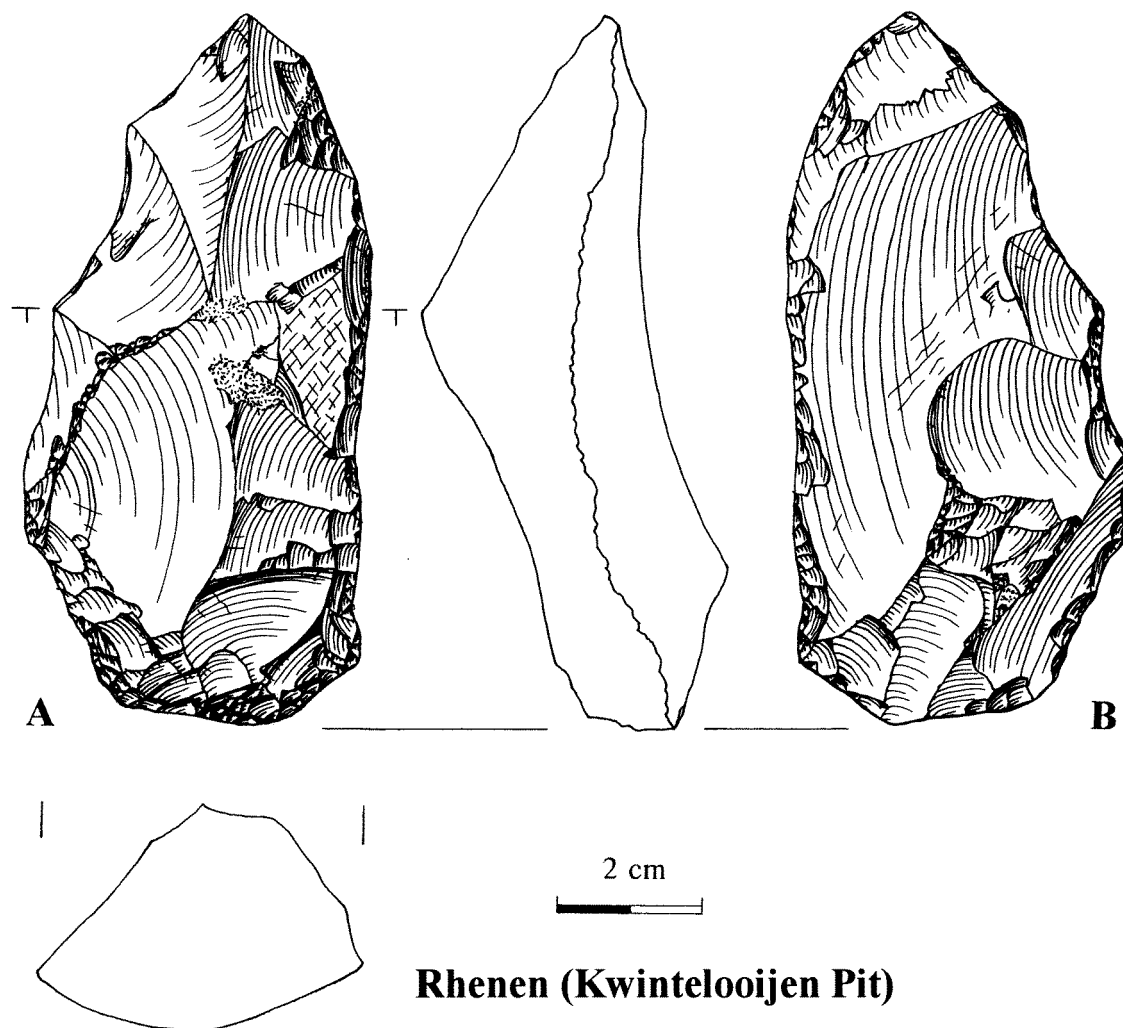


Figure 8. A bifacial tool ('pic') of the Rhenen Industry (Kwintelooijen sandpit, Rhenen, The Netherlands), dated to the Early Middle Palaeolithic. The tool was knapped in an incompetent way, and shows traces of 'face battering' on both faces: probably the work of a child. Drawing by L. Johansen.

The second example is a handaxe-like object (figure 9). Its length is 6.4 cm, its width 5.2 cm, its thickness 1.9 cm and its weight 54 g. Most negatives on face A do not start at the edges, but are truncated. Face A was thus worked first, and only later face B, where most negatives start at the right-hand edge. The 'tool' cannot be classified satisfactorily. Though bifacially worked, it is not a typical handaxe; it may more plausibly be called a core. Yet, if so, its exploitation did not proceed systematically. It is also strange that face A was worked more or less completely before face B; an experienced knapper would have turned the piece over repeatedly. He would also have used a more controlled knapping technique: especially face B displays negatives of several flakes that went awry or quite obliquely. Because of the unclear typology, and the unsystematic and poor knapping technology, we suggest this may be a product of a learner in the art of flint knapping.

Several small cores are known from the sites of the Rhenen Industry which show characteristics of incompetent flaking; in most cases these are on 'Levallois-like' cores. One example comes from the Tamme sandpit at Soesterberg (figure 10). Its length is 4.2 cm, its width 3.4 cm, its thickness 1.4 cm and its weight ca. 25

g. The artefact is made of good fine-grained flint; it is lightly rolled, glossy and patinated brown. It is a small irregular core, à la Levallois. Both faces show negatives from several directions, but the knapping was not successful. On both faces protruding parts occurred which the knapper could not remove, especially on face B. The knapper tried time and again, but this only resulted in a whole series of steps: 'stacked steps.' In fact, this only aggravated the situation and an experienced knapper would not have done this. The knapper went on even when it had become very clear that his approach did not work. It should also be noted that the core is very small. If the preparation had been successful, a Levallois flake with a length of ca. 3 cm would have been just possible, but a smaller flake would have been more probable. It is an unsuccessful core, showing stacked steps. Several negatives are irregular and show that the knapping technique was not optimal. The knapper had a general knowledge of the Levallois technique and its *chaîne opératoire* but was not able to put it into practice. I believe this core to be a learning piece, not meant to produce useful flakes but for practising. The knapper must have been an advanced learner, but still a child.

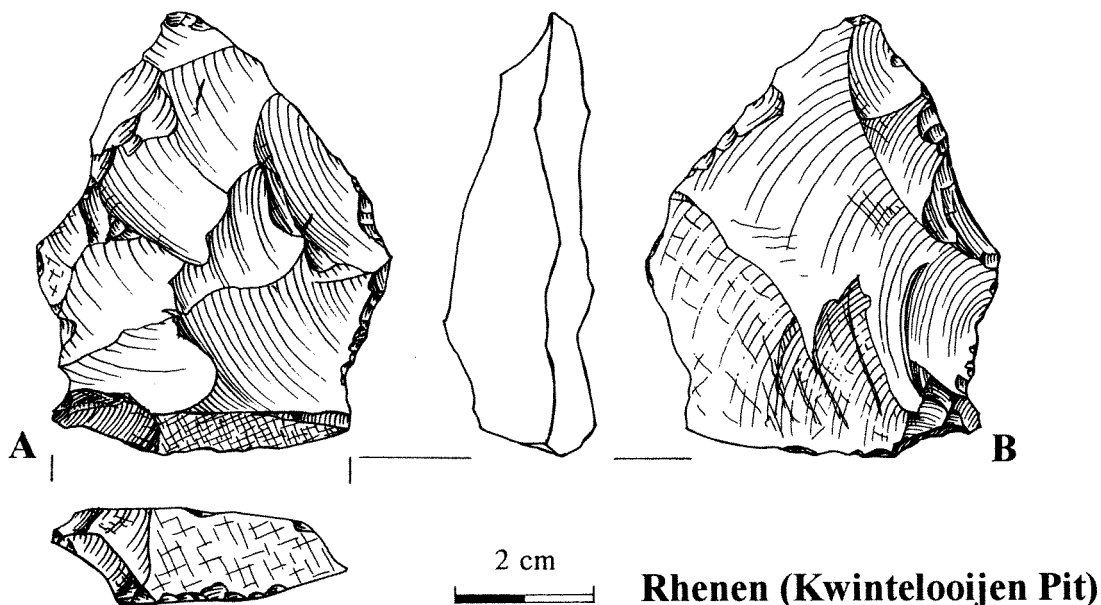


Figure 9. A bifacial core-like artefact of the Rhenen Industry (Kwintelooijen sandpit, Rhenen), knapped in an inadequate way, probably by an advanced pupil. Drawing by L. Johansen.

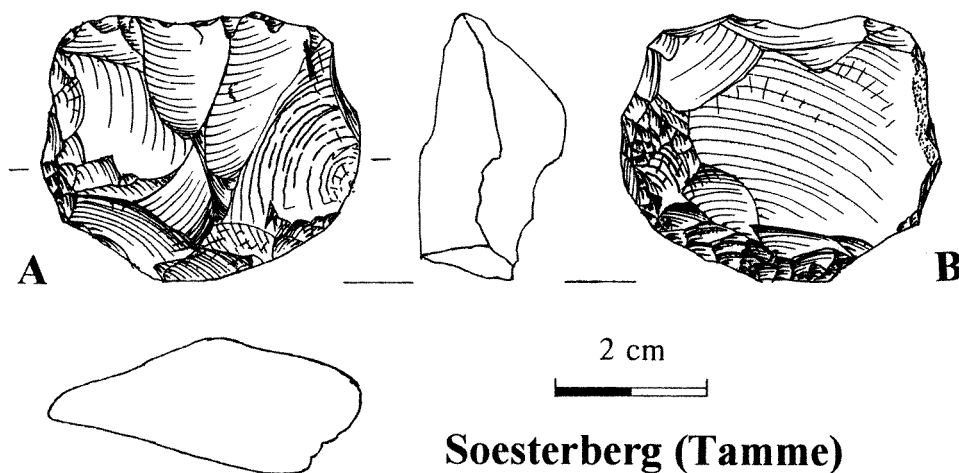


Figure 10. A small 'Levallois-like' core of the Rhenen Industry (Tamme sandpit, Soesterberg), knapped in an inadequate way and showing stacked steps. Drawing by L. Johansen.

Another example from the same site is shown in figure 11. Its length is 3.7 cm, its width 3.3 cm, its thickness 1.3 cm and its weight ca. 18 g. Face B preserves remains of cortex, with concave parts. Several small negatives on this face were meant to create striking platforms for working the upper surface, but this was done incompletely. On the upper surface (A), several negatives are visible, the largest of which has a length of about 3.5 cm; two others, of subsequent flakes, are only ca. 1.5 cm. It is difficult to understand why anybody decided to knap this small nodule, which at several places is only ca. 0.5 cm thick in its current state. Moreover, the nodule also has a frost crack which should have troubled the knapper. This is probably a practising core of an advanced learner.

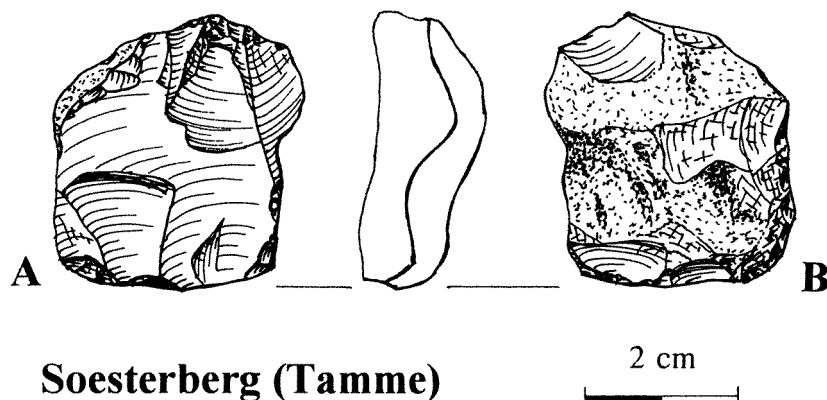


Figure 11. A small 'Levallois-like' core of the Rhenen Industry (Tamme sandpit, Soesterberg), knapped in an incompetent way. Drawing by L. Johansen.

A third 'Levallois-like' small core comes from a pit for suction-dredging at Warandeborgen near Huizen (figure 12). Its length is 4.5 cm, its width 3.7 cm, its thickness 2.9 cm and its weight ca. 50 g. This core too went wrong as a result of inadequate knapping and insufficient preparation. Both faces preserved remnants of old faces, which show that the nodule was a small rounded pebble, not much larger than it is now (five to six cm). Striking platforms were created on face B, but not all around. The upper surface (A) was then prepared from several directions. The striking platform for the Levallois flake was not prepared, and the flake itself, only one cm long, ended in a deep step fracture. Though not perfectly, the core was worked for the most part in a reasonable way, and shows all the elements of the Levallois *chaîne opératoire*. It is very small, however, and could hardly have produced usable flakes. It was probably knapped by an advanced learner practising his skills.

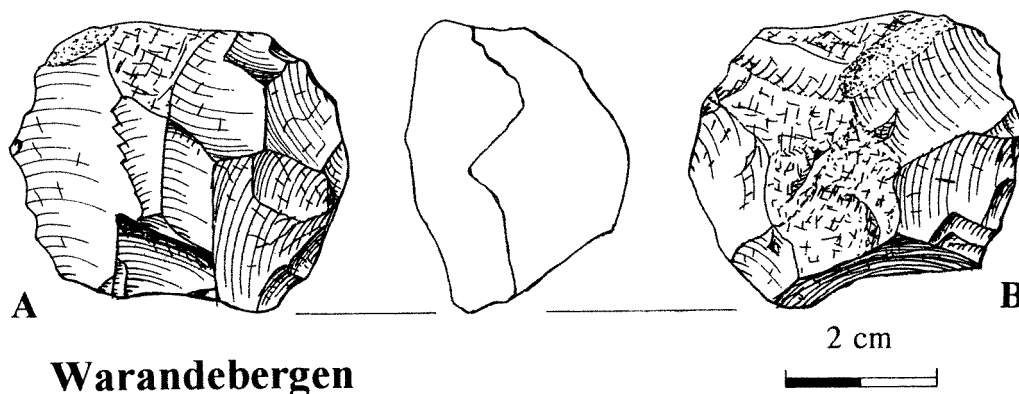
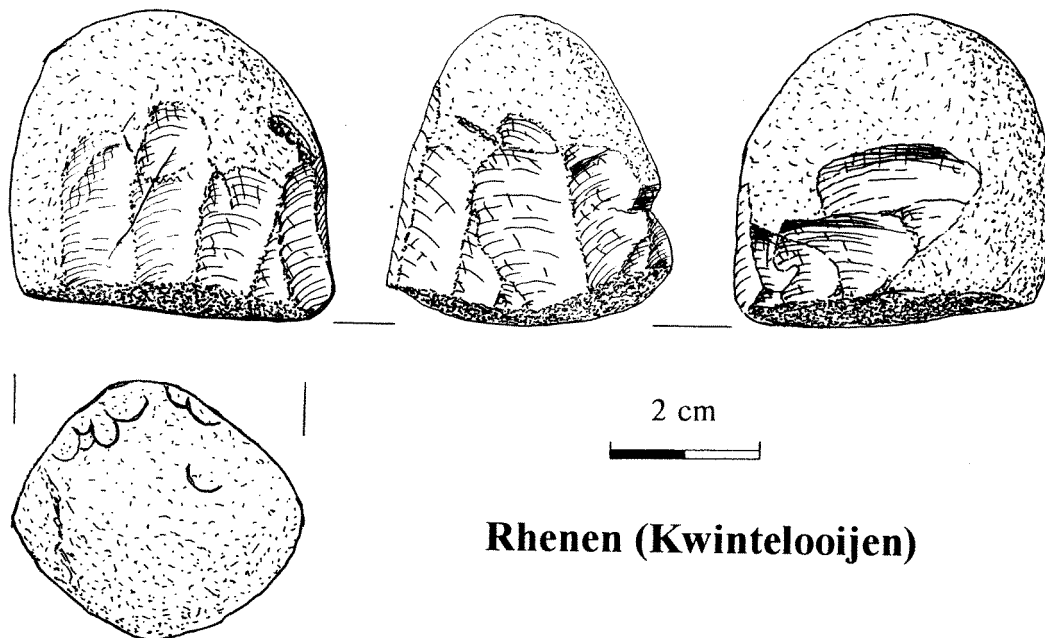


Figure 12. A small 'Levallois-like' core of the Rhenen Industry (Warandeborgen, Huizen), knapped inadequately: the intended Levallois flake ended with a step fracture. Drawing by L. Johansen.

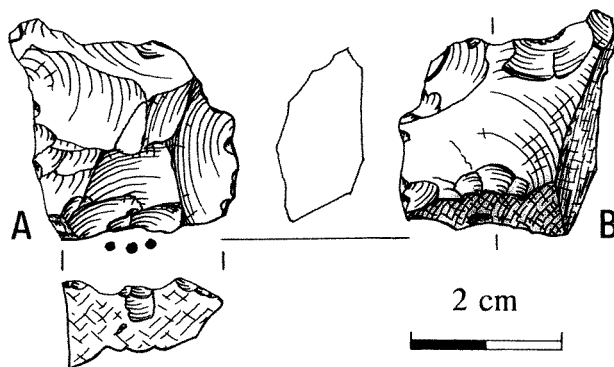
A small quartzite core comes from the Kwinteloijen quarry near Rhenen (figure 13). It is half of a rounded pebble, 4.1 cm x 3.4 cm, its weight is ca. 80 g. The flat face was used as a striking platform for the removal of five or six small flakes, with lengths of 2.0 to 2.7 cm. Much larger flakes could not have been obtained from this piece, and it is hard to imagine an experienced knapper selecting this nodule. One negative is irregular, oblique, and ends with a deep step. The knapping was not meant to produce a tool of any kind. The

knapper went on striking the platform for some time after it had become difficult or impossible to remove any more flakes (because the core angle had come to exceed 90 degrees). At several spots the knapper hit the core at a distance of one cm or more from the edge of the striking platform, at a place where the core-angle was ca. 100 degrees (several impact cones are indicated in the drawing). This seems to have been a core of a not yet very advanced recruit to the art of flint knapping.



Rhenen (Kwinteloijen)

Figure 13. A small core on a rounded quartzite pebble of the Rhenen Industry (Kwinteloijen sandpit, Rhenen). The core was knapped in an incompetent way. Drawing by L. Johansen.

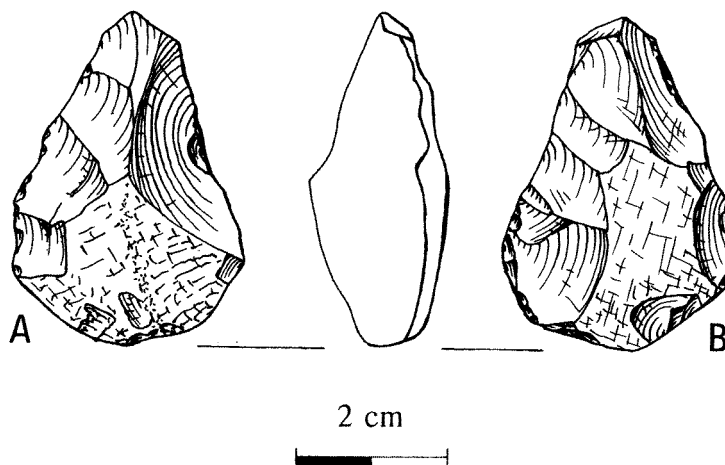


Rhenen (Kwinteloijen Pit)

Figure 14. A 'micro-Levallois-flake' of the Rhenen Industry (Kwinteloijen pit, Rhenen). It shows three percussion cones next to each other. The striking platform was not prepared (it is an old frost-split face). It is suggested that this flake was produced by an advanced learner in the context of learning to knap flint. Drawing by L. Johansen.

In the above, several small cores were interpreted as probable learning cores worked by advanced learners training their Levallois skills. A possible example of what Levallois flakes produced in such sessions may look like, is shown in figure 14. It is a 'micro-Levallois flake', excavated in the Kwinteloijen pit (Stapert, 1981). It measures only 2.5 x 3 cm, but nevertheless displays a whole series of centripetal negatives. The striking platform was not prepared, however: it consists of an old frost-split face, just like one of the sides, which therefore is no cutting edge. There are three cones of percussion next to each other, indicating that it took at least three blows to detach the flake. Remarkably, the ventral face shows several small negatives too, as if the knapper wanted to

retouch the flake ventrally - an uncommon feature in the Acheulian. It is unlikely that this flake was produced by an experienced knapper: what use would it be? Therefore, I am convinced that this flake is a product of an advanced learner (but still a child).



Rhenen (Kwinteloijen Pit)

Figure 15. A 'miniature handaxe' of the Rhenen Industry (Kwinteloijen sandpit, Rhenen). The tool is only 4.4 cm long and weighs 17 g. It may have been an instructive toy for a child, made by a parent. Drawing by L. Johansen.

4.3. Two enigmatic objects from the northern Netherlands

From the northern Netherlands, quite a few artefacts (around a hundred) are known that, given their surface modifications, must be dated to the Middle Palaeolithic (Niekus & Stapert, 2005; Stapert, 1976a, 1976b). These finds belong in the Eemian and the first half of the Weichselian and can therefore be placed in the Late Middle Palaeolithic. In cultural terms, these artefacts may be attributed to the Final Acheulian, Mousterian and the Leafpoint Group. Many of these are isolated finds found near valleys (a map of the finds in part of the northern Netherlands is presented in Beuker *et al.*, 2006). In the case of most of the handaxes, there are indications that their isolated occurrence is original. These tools could have been used as butchering knives at kill sites and therefore do not necessarily indicate encampments. The same may be true for several other finds, for example the large Levallois flake from Eeserveld, where repeated searching of the field failed to produce any other Middle Palaeolithic artefacts (Stapert, 2002). In other cases, however, the isolated nature of the finds may be accidental, not reflecting an original situation.

Most of the finds known to us at present can be understood as having been made by experienced knappers; any flaws such as steps and the like may be explained by the nature of the available raw material. In this area, Middle Palaeolithic people used flint nodules from the Saalian moraines (till or boulderclay), and these often had hidden frost cracks hampering adequate knapping. We can observe adaptations to the nature of the source material. For example, several *Halbkeile* were found in this region; these were not intended as such, but are a 'natural' result of using flat, frost-split nodules. Several objects, however, remain enigmatic, as their failure and/or smallness cannot be satisfactorily explained by the poor quality of the raw material alone. Such pieces may have been produced by inexperienced flint knappers: children. Two of these are discussed below.

The first is a bifacially worked object from Zuidlaren (Prins Bernhardhoeve) (figure 16). No other finds are known from the site. The flint tool has windgloss and white patina. Its length is 5.0 cm, its width 3.8 cm and its thickness 1.6 cm. The object is not made of a flake, since both faces have remnants of old frost-split faces or cortex; one of these is an almost transverse face along one of the edges. Face A was worked all around, mostly with quite superficial flakes of which many ended in steps. Face B has a protruding part, which the knapper could not get rid of; quite a lot of flakes were knapped from several sides, many of which again ended in steps. Smaller and larger negatives occur side by side. Though an internal frost crack did affect the knapping, it can still be seen that the knapping was done quite incompetently. Moreover, the aim of the knapping is unclear and the typology of the object obscure. Maybe the idea was to create a small handaxe-like tool (a leaf point?). Knapping continued after it had become clear that there could be no satisfying result. This object was certainly not worked by an experienced knapper, but most probably by a youngster still learning to knap.

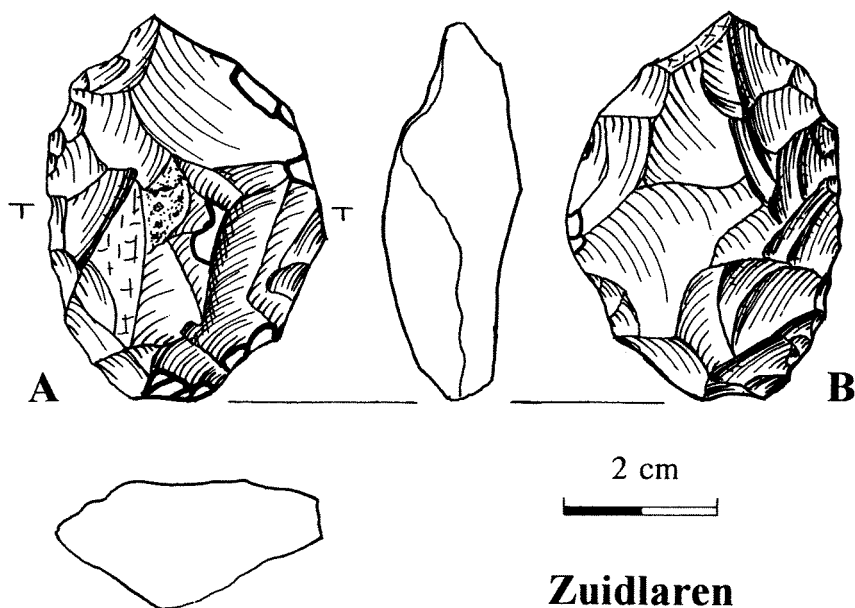
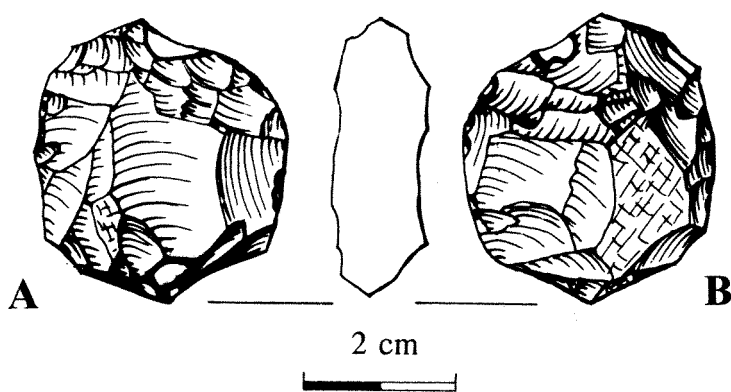


Figure 16. A bifacial object from Zuidlaren (northern Netherlands), dating from the Late Middle Palaeolithic. The tool was knapped in an incompetent way, showing many steps. It was probably produced by a learner of the craft of flint knapping, and intended maybe as a small handaxe or leaf point. Drawing by L. Johansen.

The second object may be described as a 'micro-Levallois core' (figure 17). It comes from a potato-starch factory ('Oranje' near Beilen), so its precise provenance is unknown. However, it most probably originates from western Drenthe. Its maximum length is 3.5 cm, its thickness 1.3 cm and its weight 17 g. The flint artefact has windgloss and white patina. Apart from a small remnant of an old frost-split face, face A shows many small negatives from all sides, as seen on Levallois cores. Several of these negatives end in steps. Still, there is also a negative of the end product, a Levallois flake, though with a length of only ca. 2.5 cm. The other face of the core shows several remnants of old frost-split faces and a remnant of cortex, in addition to negatives of flakes that were meant to create striking platforms for working face A. This piece has also been described as a 'disque,' but the negative of a 'Levallois flake' on face A seems to indicate that it may best be described as a 'micro-core.' The resulting flake was too small for any practical use, however, and it may therefore be suggested that this core was worked by an advanced trainee in the art of flint working.



Northern Netherlands

Figure 17. A 'micro-Levallois-core', dating from the Late Middle Palaeolithic. It was found in a secondary position at Beilen (northern Netherlands). Though the core is very small, a Levallois flake was nevertheless knapped from it; this was only about 2.5 cm long. Since this is too small to be of any use, the core was presumably knapped by an advanced learner. Drawing by L. Johansen.

5. Discussion

Refitting analysis has been very successful in revealing flint work by children, especially at Upper Palaeolithic sites. The Magdalenian sites in the Paris Basin stand out in this respect. In most cases, three levels of skill can be fairly confidently recognized, which can be associated with expert knappers (adults), advanced learners with a modest productivity and beginners without productivity. The last two categories will have consisted of children.

At sites where good-quality raw material is relatively scarce, we often see that learners used cores abandoned by experienced knappers when these had become too small. This phenomenon is known from for example Etiolles, and was also observed at the Hamburgian site of Oldeholtwolde in The Netherlands. The same probably happened at many Middle Palaeolithic sites, which may explain why small or 'exhausted' cores often show beginner's marks. Boëda (1993: 401) seems to hint at this phenomenon: "En effet, on peut toujours observer un désinvestissement technique dans les phases finales de débitage. Un talon trop épais, un point d'impact mal défini, une mauvaise orientation du nucléus, plusieurs impacts pour détacher un seul enlèvement, voilà quelques-uns des problèmes que l'on peut rencontrer."

There are sites which seem to have been used mainly by youngsters for practising their flint knapping skills. Etiolles P15 is the clearest example of this, but there may be more such sites, also in the Lower or Middle Palaeolithic. For example, in the above it was suggested that children might have been doing a lot of flint knapping at the Early Middle Palaeolithic Site K at Maastricht-Belvédère in The Netherlands.

At Pincevent, refitting has produced evidence of active flint knapping instruction by adults. There may be examples of this behaviour at other sites too, for example at Solvieux, Trollesgave and Oldeholtwolde. Hence it may be concluded that teaching probably was a Palaeolithic invention, at least an Upper Palaeolithic one. So far, such behaviour has not been described for older phases of the Palaeolithic, but it may be expected to have existed at least in the Middle Palaeolithic.

Refitting is a time-consuming and labour-intensive activity. Fortunately there is also the possibility of examining the flint tools and cores themselves for beginners' markers, as identified in the study by Shelley (1990). Tactics such as 'face battering' and 'stacked steps' especially are typical of learners, and are almost never used by experienced knappers. This has made it possible to identify several objects from the Middle Palaeolithic as pieces likely to have been made by children.

Above, the refitting work by P. Bodu (1990) was mentioned, and his conclusion that several learners in the art of flint knapping, children, were active at the Grotte du Renne. It is of interest to note that Pierre Bodu is an experienced flint knapper himself. Of course, to achieve this he had to go through the necessary learning process, which may have contributed to his insights. The same is true for J. Pelegrin. Pelegrin (1995) studied the flint material from several Chatelperronian sites, and has explicitly identified flint objects, which were most probably knapped by Neanderthal children. About one third of the cores (some 40 out of a total of 122) from the Chatelperronian assemblage of Roc-de-Combe (Layer 8) were probably worked by beginners in flintworking (Pelegrin, 1995: 109-110, 134). No fewer than 33 of these cores are described as "*nucléus-débris*," made of inferior material and very small, which were worked unsystematically. Most of these nodules would have been immediately rejected by an experienced knapper, and only inexperienced individuals would have transported them to the site: children. A number of atypical and ill-defined 'tools' can also be attributed to children (*ibidem*: 161). Another Chatelperronian site, Niveau III of La Côte, also produced several cores that were worked inadequately, probably by children (*ibidem*: 228). We can only endorse the following remark by Pelegrin (*ibidem*: 110; freely translated by me): "This testimony to the presence of children should not surprise us, but is only rarely acknowledged by archaeologists. It is indeed their absence that would have posed a problem."

Above, in section 4, several 'flint failures' dating from the Middle Palaeolithic in The Netherlands are described that may be specimens worked by children. One of the most convincing examples is the '*pic*'-like implement from Rhenen, showing traces of 'face battering' on both faces. It is of interest to note that this type (*pic*) actually may not be more than a category of failed bifaces, partly made up of childrens' efforts at making handaxes! As noted above, however, children are not often cited as possible creators of peculiar flint implements. If, in site reports concerning the Lower or Middle Palaeolithic periods, examples of poor-quality knapping are mentioned at all, such failures are mostly attributed to the quality of the local raw material, not to children learning the craft of flint knapping. De Loecker's monograph (2006) on Site K is just one example of this tendency.

Grahmann & Movius (1955) studied material from Markkleeberg. A few handaxes of mediocre shape due to poor flaking are mentioned, but these deviations are explained by assuming that the 'men' of Markkleeberg were more used to striking blades (from Levallois cores) than to making handaxes (*ibidem*: 560) - as though producing blades from Levallois cores were any easier than making a handaxe (in my limited experience it is rather the opposite). Also Baumann & Mania (1983: 74) mention several failed implements, including handaxes, from Markkleeberg ('*Fehlbearbeitung*'), but do not attach any particular conclusion to this observation.

Even at Boxgrove, known for its superb handaxes with tranchet blow, there are a few examples of poor-quality pieces, for example at Quarry 1/B, where several handaxes are described as 'thick,' 'heavy' or 'irregular.' About one small specimen (no. 754) it is noted by Austen *et al.* (1999: 348) that "... the preferred shape was not produced. This may have been related to the raw material or the skill of the knapper." M. Pope (pers. comm. to my colleague M. Niekus, May 4th 2006, in the context of discussions we had about the topic of this article) confirms that at Boxgrove there are "... some, poorly made pieces with hard hammer reduction that may well be the product of children. They occur directly alongside the more finely made pieces but there is a broad gradation of knapping abilities represented at the site."

The same is true for the site at Mauern, where splendid leaf points were produced (Bohmers, 1951). However, at least two failed preforms of leaf points were also present. One of these is illustrated (figure 18); the artefact has a length of 6.4 cm, and in the finished state would not have been much longer than about 5 cm. Bohmers (1951: 56) writes that the specimen was worked in a crude ('*grob*') way; there are hardly any negatives reaching the middle of the faces, and many steps occur. As in other cases of beginner's pieces described in this paper, knapping went on for some time after it had become clear that the tool was a failure.

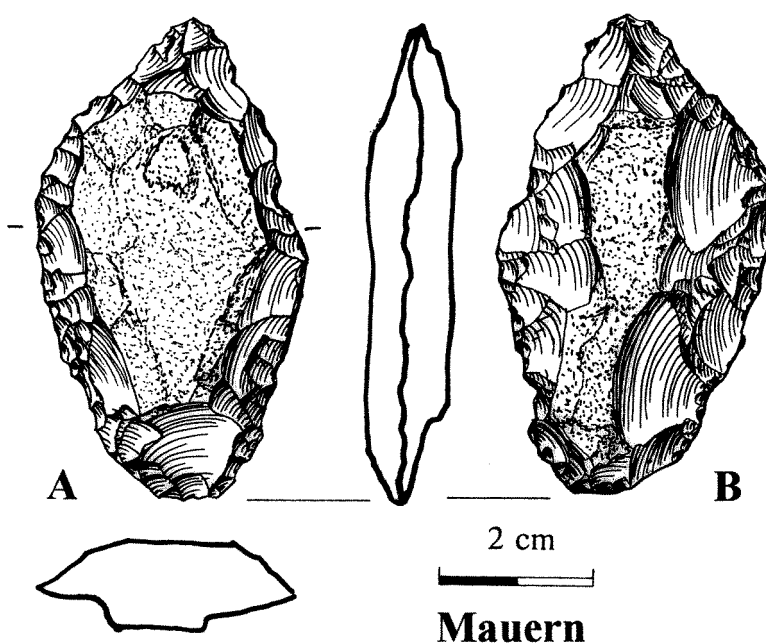


Figure 18. A failed preform of a leaf point from Mauern (after Bohmers, 1951: Tafel 28, no. 2). Drawing by L. Johansen.

Very small artefacts - too small to be of use - may be products of learners, especially if they show beginner's marks. The small size would have been an adaptation to the small hands of children. Above, a series of small cores of the Rhenen Industry are described. These pieces reveal various traces of incompetent flaking. It is not by necessity that these cores are so small: in this area one could easily have picked up larger flint nodules. We therefore get the impression that small cores, often 'Levallois-like,' in many cases were cores of kids practising their skills. The Levallois technique is not easy to master, so in my opinion it is only to be expected that many failed cores produced during learning processes found their way into the archaeological record. Learning cores will mostly have been small, and therefore easier to handle. They were smaller than the cores worked by experienced, adult knappers, and this will have been the case especially in contexts where large good-quality flint nodules were scarce. From Rhenen, there is also a 'micro-Levallois flake', 2.5-3 cm, with three cones of percussion, which gives an impression of what the products obtained from such exercise cores will have looked like.

A 'micro-Levallois core' was also found in the northern Netherlands. Moreover, a small bifacial tool (from Zuidlaren), showing many steps, is known from this area: a failed preform of possibly a leaf point. These pieces, described above, date from a late phase of the Middle Palaeolithic, and, as at Rhenen, can be interpreted as products of learners.

Small cores are also known from many other sites. Researchers have often wondered about the meaning of very small and therefore seemingly useless artefacts or tools at sites of the Lower or Middle Palaeolithic. However, the possibility of children's involvement has been rarely raised - again in contrast to later phases of the Stone Age. For example, Bosinski (1966: 328) writes the following about the refitted *Knolle 2* of Rheindahlen-

Westwand: "Hier fragt man sich, aus welchem Grunde so kleine Absplisse, die nicht zu Werkzeugen verarbeitet werden können, noch abgetrennt wurden." It is amusing to read that Thieme (1983: 85) does not wish to share this amazement, because he rejects the (implied) idea of a certain 'Unfähigkeit' or 'Hilflosigkeit' of Middle Palaeolithic people! Children did not pop up in this discussion.

Hahn (1988: 139) wondered why Aurignacian people at Geissenklösterle sometimes went on to strike off small flakes even after the occurrence of steps or hinges made it clear that the core could not possibly produce usable flakes any longer: "Welche Funktion die kleinen Abschläge hatten, ist ungewiss. Es ist auch denkbar, dass man einen Kern bis zum letzten Ende "mechanisch" weiterzerlegte, ohne gewollte Abschläge zu erzeugen." In other words, Hahn supposed that some kind of 'habit' was responsible, a hypothesis which I believe is not very plausible; children's work is a more likely explanation.

Small cores are a regular phenomenon at Mousterian sites in the Near East (Crew, 1976; Goren-Imbar, 1988). Crew described the lithic material of Rosh Ein Mor, and wrote about the many cores from which no end-products were obtained (1976: 89): "More Levallois cores were unstruck than were struck. As they tend to be quite small, many undoubtedly proved to be too small for successful flake removal. Some exhibit considerable crushing and battering on their platforms, suggesting that unsuccessful attempts were made to remove the Levallois flake." At Rosh Ein Mor there are also very small cores-on-flakes - apparently too small to be usable. Similar pieces are known from other sites, for example from the Mousterian site of Quneitra (Goren-Imbar, 1988). Of the 225 cores, 33 are on flakes, and these are very small (Goren-Imbar, 1988: 40): "... usually so small that it is difficult to see any use for them..." Some of the flakes had previously been tools such as scrapers, so here again we see re-use of abandoned pieces. Goren-Imbar noted that the removals from these cores often seem to be (*ibidem*: 38) "... of lesser craftsmanship, or without the emphasized control manifested in the previous stage. They are short, very frequently deep, resulting in hinge flakes, which are present in some numbers at Quneitra..." The possibility of youngsters practising their flint knapping skills is not mentioned, but seems probable to me, because at several sites where such material was excavated was no shortage of larger nodules in the vicinity (*ibidem*: 43). Though smallness may be a function of scarcity of suitable raw material at some sites, this would still not explain the high proportion of steps and hinges. Goren-Imbar (*ibidem*) mentions that small cores, mostly only three to four cm in length, are also known from Kebara.

Above, it was suggested that at Site K at Maastricht-Belvédère, discoidal cores may have been used especially by youngsters who were not yet skilled enough to use the more difficult Levallois technique. Another possible example of this phenomenon is seen at Oldbury in England, where also discoidal cores were knapped (Cook & Jacobi, 1998). The relatively high proportion of step terminations and the sometimes crude, hard-hammer technique, seem to point to the presence of child knappers here. The possible use of the 'bipolar technique,' *i.e.* hard percussion using an anvil, was also noted at Oldbury (*ibidem*: 131), which is of interest because it seems that this technique was especially popular among inexperienced knappers, for example during the Mesolithic (see also Sterneke & Sørensen, in press).

I have suggested that the presence of very small and apparently unusable 'tools' may in some cases be understood in the context of children's play. One possible example is the 'micro-handaxe' from one of the sites of the Rhenen Industry (Kwintelooijen pit). In this area plenty of large flint nodules could be collected, so there was no obvious need for making small tools. Because the implement is well-knapped, it is suggested that it was an instructive toy, made by a father for a child.

It is of interest to mention here the curious 'Groszaki' found at the (Micoquian) site in the Neander Valley; these are 'small, circular edge-retouched tools' (Hillgruber, 2006). Most *Groszaki* are only 1 to 1.5 cm in diameter (range: 6.5 - 21 mm). No fewer than 67 specimens were found in Neanderthal (ca. 38 % of all the 'tools'). Since these implements seem to be too small to be of any practical use, one wonders whether these remarkable pieces might have been toys or pieces which played a role in some children's game. In this connection it may be remarked that recent investigations have uncovered bones of at least one subadult individual in Neanderthal, in addition to skeletal remains of a second adult (Smith *et al.*, 2006). Similar small, round and thin flint tools are known from the Neolithic of Denmark; these are called 'Spillebrik' (game piece; Petersen 1993: 68-69).

At Neanderthal, there are also several other very small tools and cores, apart from the *Groszaki*. Moreover, there is a 'pic' (Hillgruber, 2006: Plate 5 no. 3), described as "... an elongated, relatively coarsely worked piece..." (length ca. 6.5 cm.). One 'leaf point' or 'Fäustel,' made of a flake, is only 3.2 cm in length (*ibidem*: Plate 7 no. 2). Furthermore, a small discoid core (*ibidem*: Plate 10 no. 1), ca. 2.8 cm in length, and a small 'Levallois core,' ca. 3.1 cm in length (*ibidem*: Plate 10 no. 2), are mentioned by Hillgruber, in addition to several small 'Meuse-egg' pebbles with irregular working as 'cores' (*ibidem*: Plate 11 no. 3; ca. 3.3 cm long). In my opinion, here is evidence of playing, as well as flint working, by one or more children at the classic Neanderthal site.

Of course, such interpretations will remain somewhat speculative, and in many cases cannot be substantiated. However, it is of interest that similar interpretations are often offered in the case of micro-forms

from much later periods (Lillehammer, 1989). From the Neolithic in Sweden, miniature axes are known (Johansen, 1986; Malmer, 1962); one interpretation is that they were instructive toys. From a child's grave at the Mesolithic site of Skateholm, there are miniature arrowheads, which were less well made than normal-sized specimens (Larsson, 1986). At the Hamburgian site of Søbjerg in Denmark, Lykke Johansen (pers. comm.) noted a set of miniature tools: a borer, a scraper and a burin, lying quite close together. These may have been instructive toys, made by a parent for a child.

It is of interest to note that miniature tools, as educational toys, are ethnographically well documented. From the Eskimos, miniature sledges, kayaks, bows, arrows, harpoons, lamps, cooking pots etc. are known (Matthiassen, 1927; 1928). Park (1998) discussed this 'miniature archaeology of childhood' in Eskimo societies. Examples of miniature objects as educational/instructive toys for children are also known from many other societies (see e.g. McDonald, 2007: 120-121).

Miniature objects can also play a role in other contexts, however, for example as grave offerings, or "as the paraphernalia of shamans" (Park, 1998: 275). Small implements were not always children's toys, so one has to be cautious with this kind of interpretation. For example, 'miniature daggers' from the Bronze Age were definitely not toys. They were symbolic tools, used for making fire in a ritual context. Similarly, miniature cups in Bronze Age graves in Ireland were not specifically associated with children (Donnabháin & Brindley, 1989).

It is my conclusion that one should take into account the fact that during the Lower and Middle Palaeolithic quite a lot of flint artefacts must have been left behind by children in the context of learning (knapping) and/or playing. Learning to knap takes years, and we should note that among hunter/gatherers, children younger than 15 years make up more than 40 % of the population (Roveland, 2000). In site reports for these periods, however, the possibility of significant contributions by children to the assemblages seems so far to have been largely disregarded, in contrast to publications on the Upper Palaeolithic. It would be interesting to find out what has caused this difference: is it harder to imagine children and their activities when one is dealing with species other than modern humans? The realization that children must be responsible for quite a few flint artefacts may help to understand not only some typological aberrations (e.g. *pic*-like tools), but also the reason why some sites make a 'primitive' impression. Taking into account the activities of children will make our reconstructions of the past not only more plausible and complete, but also more lively and interesting.

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The author of the article 'Neanderthal children and their flints' (nweur-2007-1-2), Dick Stapert, recently (October 1st, 2008) noted that the following section is missing from the text. The section should follow onto the paragraph on p. 30, after the sentence: "Therefore, I am convinced that this flake is a product of an advanced learner (but still a child)."

"In some cases, small objects may be interpreted as toys. Another find from the Kwintelooijen pit may serve as an example: a 'micro-handaxe' (figure 15). Its length is 4.4 cm, its width 3.2 cm, its thickness 1.8 cm and its weight 17 g. The tool is lightly rolled, and displays brown patina and gloss. On the basis of use-wear studies (*e.g.* Keeley, 1980), it is often assumed that Acheulian handaxes were mainly used for heavy butchering work, although other functions have also been suggested. Butchering is of course impossible with this small implement. Typologically, it is nevertheless a handaxe. In the Rhenen area, plenty of large flint nodules could be collected, and there would therefore have been no practical reason for producing very small tools. It is difficult to interpret this tool as anything other than a toy. The tool has been worked in a minimal but competent way. Hence it does not seem to be a product of a learner. Maybe it was made by a father, as an instructive toy for his child."

Amsterdam, 23 January 2009



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