9 The Belvédère 'data': implications for the interpretation of hominid behaviour in the Middle Palaeolithic

9.1 Introduction

In this chapter some implications of the results of the Belvédère studies will be discussed in terms of their inferred relevance for the study of Middle Palaeolithic hominid behaviour. In the first section (9.2) we will focus on a discussion of the informative value of the Unit IV-C sites, treating such topics as inter-site variation and the degree in which the Belvédère sites are representative of Middle Palaeolithic sites in general.

This short discussion will be followed by a more general topic, the role of the transport of stone artefacts in the formation of inter-assemblage variability. The specific find circumstances in the Belvédère pit and their interpretative possibilities led to the formulation of this research question, which has been touched upon in earlier parts of this volume. In section 9.3 the role of the transport of lithics will be discussed in the broader context of the European Lower and Middle Palaeolithic.

Section 9.4 deals with the problem of discriminating between 'normal' background fauna and faunal elements introduced by hominids, a problem especially relevant to Site-G-like constellations which has already been discussed in some detail in that context.

In section 9.5 a limited number of northern European key sites of 'more or less' the same age as the Unit IV-C sites will be reviewed in the context of the topics discussed earlier in this chapter (9.2-9.4) and in chapter 8. The choice of the sites and the sequence in which they are discussed is rather subjective, and the author did certainly not try to provide an exhaustive survey.

The final paragraph of this chapter (9.6) focusses on the pseudo-artefact problem, a subject that lies somewhat outside of the scope of this volume, but with which we are confronted when talking about the colonization of northern Europe by Middle Pleistocene hominids.

Figure 138, finally, provides a map of the archaeological sites mentioned in this chapter.

9.2 The Unit IV-C sites: an evaluation

The basic idea behind the Belvédère project and the justification for the time and energy put into it is the hypothesis that the area surveyed in the course of the past eight years and the sites discovered in that area are in one way or another representative of a far larger area than South Limburg, and, perhaps, of a (much) longer time period.

What new information -one might ask- have the Belvédère sites given us about human behaviour in the Middle Palaeolithic and how representative are these inferred forms of behaviour?

For an evaluation of the sites it must be stressed that, in all probability, they can be interpreted as the remains of one and the same cultural system, which were created under more or less the same environmental conditions, over a relatively short period of time. The sites are *contemporaneous* in Pleistocene terms, having been formed in the same warm-temperate period. The Unit IV-C-I sites are very

Table 23: A comparison of the main Unit IV-C primary-context sites.

Site	Area dug (m^2)	Artefacts found: Tools[a]	Cores	Flakes & chips	Total	Ratio: Tools: waste	Cores: waste	Density: Artefacts per m^2	Tools per m^2
B[b]	20	-	-	5	5	-	-	0.25	-
C	264	3	4	3060	3067	1:1020	1:765	11.6	0.001
F	42	1	1	1213	1215	1:1213	1:1213	28.9	0.02
G	50	3	-	48[c]	51[c]	1:16	-	1.0	0.06
K[d]	370	150	80	10220	10450	1:68	1:128	28.2	0.40

[a] = 'essential' tools count; [b] = lower level only; [c] = after refitting; [d] = preliminary figures.

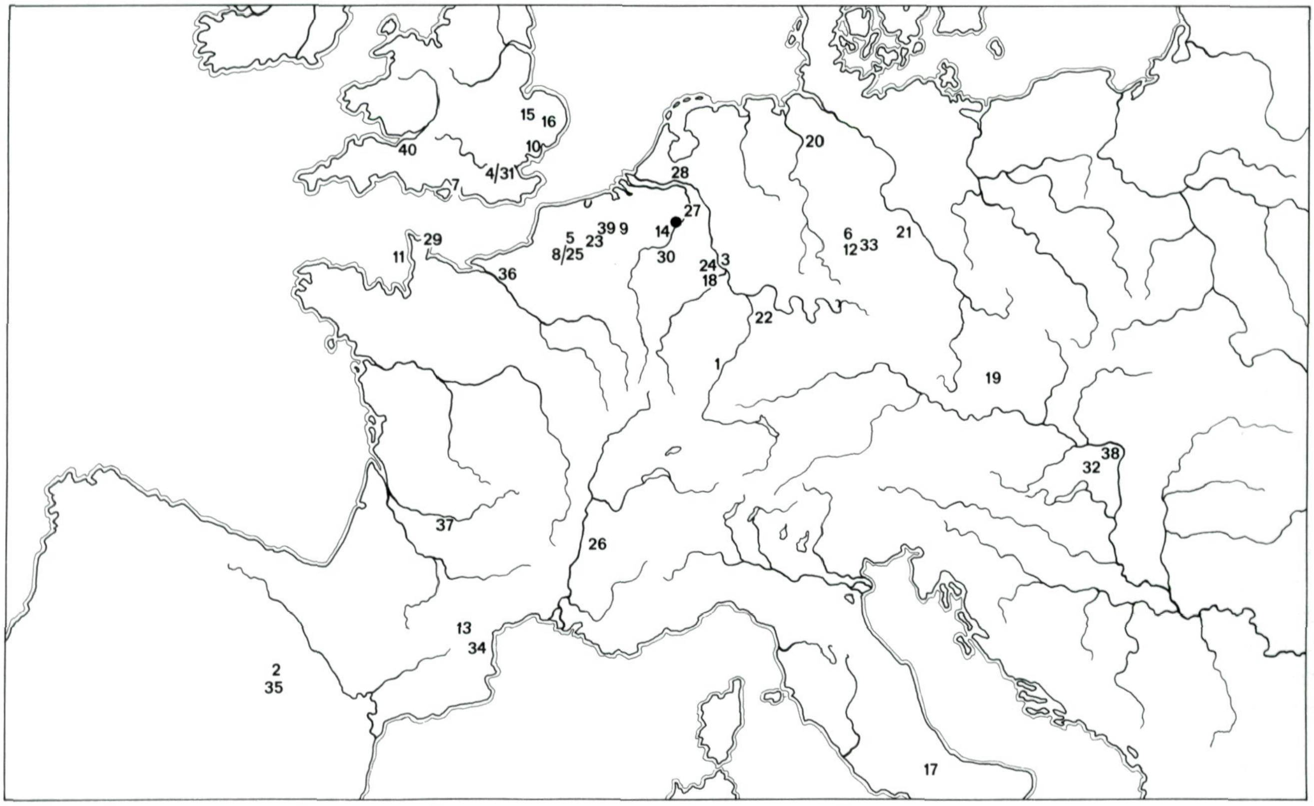

Fig. 138. Map of the sites mentioned in the text of chapter 9. The situation of Maastricht-Belvédère is indicated by a black dot.
1. Achenheim, 2. Ambrona, 3. Ariendorf, 4. Baker's Hole, 5. Biache-St.-Vaast, 6. Bilzingsleben, 7. Boxgrove, 8. Cagny, 9. Céroux-Mousty/Ottigny, 10.Clacton, 11. La Cotte de St. Brelade, 12. Ehringsdorf, 13. Ermitage, 14. Halembaye, 15. High Lodge, 16. Hoxne, 17. Isernia, 18. Kärlich, 19. Kulna, 20. Lehringen, 21. Markkleeberg, 22. Mauer, 23. Mesvin, 24. Miesenheim, 25. Montières, 26. Prélétang, 27. Rheindahlen, 28. Rhenen, 29. St.Vaast-la-Hougue, 30. Sprimont, 31. Swanscombe, 32. Tata, 33. Taubach, 34. Tautavel, 35. Torralba, 36. Tourville-la-Rivière, 37. Grotte Vaufrey, 38. Vértésszöllös, 39. Vollezele, 40. Westbury-sub-Mendip.

probably contemporaneous in terms of age differences of several hundreds of years. The age difference between the lower-(IV-C-I) and upper-level (IV-C-III) sites is more difficult to estimate, as already discussed in previous chapters. There are, however, no geological arguments for assuming large time differences, i.e. thousands of years.

In addition to contemporaneity, we may assume that no significant changes in raw material availability took place during the relatively short period of the formation of the archaeological assemblages. Finally, the sites were all discovered within a small area, of approximately five hectares.

It is therefore interesting to note, for instance, the differences in core reduction strategies observable between the assemblages from Site C, Site F and Site K, ranging from the very sophisticated *Levallois recurrent* core reduction at Site C to the wasteful reduction of non-prepared cores at Site K. Table 23, after Gamble (1986: Appendix V), gives a survey of the assemblage quantities and the relative 'richness' of the Unit IV-C sites, which provides further evidence of inter-site variation.

The comparison of these individual sites, however, presents certain limitations, which are especially connected with differences in excavation techniques, in the degree to which empty squares were incorporated in the excavated area, etc. These limitations are easy to overcome though if they are explicitly taken in consideration in comparing specific aspects of the different sites.

Table 23 shows that the majority of the Unit IV-C sites are very 'poor' sites in terms of the numbers of tools and cores and the amount of flaked stone material. They are, however, 'rich' in that the differences noted above cannot be explained away by referring to factors commonly used in these discussions, such as differences in time and the availability of raw material. We are here looking at differences caused by differences in behaviour of the participants of one and the same cultural system, who frequently visited the area of the present Belvédère pit in the context of, for example, meat procurement strategies, which were focussed on the 'collecting' of very young animals.

The inter-site variation in terms of technological differences, relative frequency of 'tools' and cores and in terms of refit observations, *can* be explained by referring to the position of what we call a site in a geographically larger flint-logistical system, in which cores, flakes and tools were manufactured, transported, used and discarded at rates dictated by the anticipation of activities on the one hand and the needs of the moment on the other (see 9.3).

The Belvédère Unit IV-C 'sites', varying from low-density 'off-site' scatters (Site G) to high-density sites (Site K), are very probably representative of debris scatters produced by Middle Pleistocene hominids in sediment-receiving riverside areas but we cannot say anything meaningful about their relation to sites formed on higher terrains.

At Belvédère we are dealing mainly with sites which, in the past (?), many archaeologists might have considered not worthy of excavation, as the absolute numbers of artefacts, and especially tools, are generally very low. Even then, the sites excavated are on the whole flint-rich sites, like Sites C, F and K, which have a much greater archaeological visibility than low-density artefact scatters like Site G, especially if no bone material is preserved. The few 'low-density sites' known from the European Lower and Middle Palaeolithic were, not surprisingly, indeed excavated thanks to the great archaeological visibility of the associated bone material. The spectacular faunal remains at Torralba and Ambrona (Howell 1966; Freeman 1975) were accompanied by a relatively small number of stone artefacts, some of which (handaxes) had been imported to the sites from sources lying several dozens of kilometres away (Howell 1988). Likewise, the Eemian site at Lehringen (Adam 1951; Thieme/Veil 1985) was discovered thanks to elephant remains, which turned out to be associated with a small number of flint artefacts. Saalian low-density sites, all discovered because of the presence of faunal remains, are known from Ariendorf in the German Neuwied basin (find level I, Turner 1986), and from the sites Tourville-la-Rivière (Vallin 1984) and Achenheim in northern France. At Achenheim, Sol 74, first considered to be of Early Weichselian age (Thevenin/Sainty 1974) but now interpreted as dating from the last cold phase of the Saalian complex (Heim *et al.* 1982), yielded remains of horse, woolly rhino, giant deer, bison and mammoth over an area of 200 m^2, in a density distribution comparable to that of Site G, which was associated with only a small number of artefacts.

Low-density scatters of the Site G type are undoubtedly underrepresented in the Unit IV-C site sample -and probably even more so in the overall Palaeolithic sites sample- while these may in fact be the most common types of 'scatters' produced by Middle Pleistocene hominids.

From ethnoarchaeological studies we have data on the densities of cultural debris scatters indicating the generally poor visibility of activities of hunter-gatherers (e.g. Hayden 1979), which stresses the importance of studying regional variations in artefact densities. Are 'rich' sites just a consequence of a palimpsest deposition of many 'poor' assemblages, or are we looking at the signatures of other processes, for instance the continuous and uninterrupted use of sites? One way of establishing this could be studying the differences in the *contents* of the assemblages.

Nevertheless, it is very probable, and in any case an interesting working hypothesis, that a large number of the 'rich' assemblages, such as Biache-Saint-Vaast in northern France, are the results of the repeated deposition of 'poor' assemblages at a rate high enough to surpass sedimentation, which could have stratigraphically isolated these 'poor' assemblages when the rate of sedimentation was higher. 'Poor' assemblages give us the opportunity to isolate the individual depositional processes behind the formation of larger lithic assemblages.

What can these isolated depositional events tell us about the behaviour of Middle Pleistocene hominids in terms of the functional character of a site with respect to the context of the subsistence-settlement system in which the site was formed? In trying to answer this question we are faced with two major problems, both dealing essentially with the character of the Pleistocene archaeological record. The first problem is that already discussed *in extenso* above, namely the problem of the organised versus compound entity discussion. For instance, how do we expect to archaeologically recognize 'base camps' in the context of this discussion? Binford and Binford (1966) suggested that archaeological evidence of maintenance activities, the preparation and consumption of food and the manufacture of tools for use at other sites could provide sound evidence of 'base camps'. Usually, however, the nature of the archaeological record is such that it is virtually impossible to distinguish between a 'base camp' assemblage and a palimpsest assemblage formed in several independent depositional events spaced in time. We are dealing with assemblages defined by three spatial coordinates, without having enough knowledge of the factor *time* involved in the formation of the spatial aggregate.

Theoretically, only a very strict spatially organised use of a site could possibly be a candidate for an interpretation in terms of one of the many site types distinguished by different authors. Further elaboration of this problem is necessary if Palaeolithic archaeology wishes to meaningfully assign a 'function' to sites painstakingly excavated and analysed.

A related problem is the spatial organisation of depositional events in a larger geographical area, involving the broader settlement system in which the sites were formed. Here our problem is that sites formed in sediment-receiving, unstable areas are greatly overrepresented in our sample of Palaeolithic sites. The overall majority of well-preserved sites, from the Early Pleistocene ones in East Africa to the Middle and Late Pleistocene ones in Europe, owe their state of preservation to *fluvial* and *lacustrine* sedimentation, which encased the archaeological remains in finely-grained matrices. To mention only a few northern European examples we can cite Swanscombe, Hoxne, Clacton, High Lodge and Boxgrove in England, Bilzingsleben, Ehringsdorf and Taubach in the German Democratic Republic, Lehringen in West Germany and Biache-Saint-Vaast and Cagny in northern France.

We get the distinct impression that we tend to focus too much on the 'wet feet' part of the settlement system, and that we have only a very limited -cave and rock shelter biased!- knowledge of what went on in higher areas, more suited to the establishment of semi-permanent settlements (cf. Gifford 1980).

The only way out of this problem is concentrating on 'lower quality data' from surface scatters and *cailloutis* sites in regional studies instead of constantly focussing on well-preserved sites in sedimentary environments (cf. Appendix IV).

9.3 Transport of lithic materials and Palaeolithic interassemblage variability

An important research aim developed in the course of the Belvédère studies is, in the author's opinion, the study of the role of the transportation of lithic artefacts in the formation of Palaeolithic assemblages.

We were first confronted with the possible implications of transport in our attempts at conjoining artefacts from the Belvédère Site C in 1983-1985. These refitting studies have been described in section 4.2, where we concluded on the basis of evidence from other sites that the data obtained had to be interpreted in terms of transport of cores and finished flakes to and from sites. We subsequently started screening the literature for data from other Middle Palaeolithic sites, at first focussing on the sites themselves and later on larger, regional patterns. This study showed that the sites were 'points' in a dynamic system of transportation of artefacts, which could be an important factor in discussing the possible explanations for 'inter-assemblage variability'. The results of this study were published in a more general paper on transport in the Palaeolithic (Roebroeks *et al.* 1988). In this paragraph we will focus on some possible implications of these studies, basing ourselves mainly on the Roebroeks *et al.* 1988 paper mentioned above, to which the reader is referred for more detailed information on this topic.

The literature study essentially demonstrated that there are many Middle Palaeolithic sites for which petrological, conjoining and other technological studies have yielded results which can be interpreted along the same 'transport lines' as those obtained for Maastricht-Belvédère. Transport strategies include the transportation of cores, finished flakes and tools. What follows here is a short description of these transport strategies, which have been divided into the transport of cores and flakes and the transport of tools.

Transport of cores is known from several Middle Palaeolithic sites, for instance Rheindahlen-Westwand/B1 (Bosinski 1966; Thieme 1983a) and Lehringen (Thieme/Veil 1985) in West Germany, Vollezele-Congoberg (Vynckier *et al.* 1986) in Belgium, Saint-Vaast La Hougue (Fosse *et al.* 1986) in northern France and several sites in the Périgord area, e.g. the 'Rissian' layers at Grotte Vaufrey (Geneste 1985; 1986a). All these sites also yielded evidence of the transport of finished flakes. The transport strategies discussed here can be associated archaeologically with several economical forms of core reduction, discussed as contrasting with the 'classical' Levallois technique by Callow:

> 'The classic Levallois technique for producing flakes by centripetal preparation (i.e. using tortoise-cores) is extravagant compared to the disc-core technique. The latter, and that directed at the production of blades, are methods for the continuous manufacture of blanks and incur very little waste (the term 'Levallois blade' is a misnomer when applied to parallel longitudinal preparation, as the underlying concept is entirely 'non-Levallois' compared to that employed at, say, Baker's Hole or Montières).' (in: Callow and Cornford 1986: 386)

Besides the examples given in the paper by Roebroeks *et al.* (1988) two other regions must be mentioned here which provided important data on this subject, namely the Languedoc in France (Tavoso 1984) and the French Alps (Malenfant 1976).

A very good example of the transport strategy referred to above is provided by the Ermitage site (Aude, France), where 72 cores and 418 flakes were found which all came from a source lying 7 km from the site (Tavoso 1984). Only seven cortical flakes were found at the site, while the technological Levalllois Index is 29%.

Also worth mentioning here are the assemblages from the Mousterian sites in the French Alps, characterized by a preponderance of 'Levallois' artefacts, which distinguishes them from the Mousterian industries in lower areas in southeastern France:

> '*Les industries du Paléolithique moyen recueillies dans les grottes des massifs subalpins francais* ont une caractéristique commune qu'elles partagent avec celles de plusieurs gisements suisses:*le débitage levallois y occupe une place préponderante et la proportion d'éclats levallois non retouchés est remarquablement élevée*. Le débitage Levallois fut pratiqué même quand paraissait s'y opposer la médiocre qualité de la 'silexite' à Onion et de l'oelquartzit au Wildkirchli et au Wildenmannlisloch.' (Malenfant 1976: 1035, in italics in the original)

One of the most conspicuous sites in this area is the 'grotte de Prélétang', at an altitude of 1200 m, which yielded a small artefact assemblage consisting of 110 Levallois flakes, 27 non-Levallois flakes and 27 tools manufactured from flakes. The facetting index of this industry is 82.2%. The artefacts were manufactured from flint from diverse sources, which must have been imported to the site (Lequatre 1966; Malenfant 1976; Tavoso 1984). The absence of cores and debris indicates that the assemblage was imported to the site as such. Malenfant interprets Prélétang -and other sites in the Alps- as:

'... *habitats* ou *des haltes dans un environnement montagnard forestières*, d'abord et de pratique difficiles, même pour *des séjours saisonnières* et relativement *brefs* ...' (Malenfant 1976: 1036, in italics in the original).

In his opinion we are here dealing with

'... d'outillages dotés d'une extraordinaire plasticité, témoins d'une adaptation saissonnière profonde d'industries définies, hors des Alpes, comme moustériennes ...' (Malenfant 1976: 1036).

Cores and flakes were occasionally transported over large distances from their geological sources in the Middle Palaeolithic (see: Roebroeks *et al.* 1988), but 'tools' were generally discarded at greater distances from the source than flakes and cores. Figure 139 (after: Roebroeks *et al.*, 1988 figure 1) shows the relation between the distance from the raw material source near Ottigny and Céroux-Mousty (Belgium, Caspar 1984) and the form in which phtanite artefacts were discarded in Belgian Middle Palaeolithic sites. Retouched items ('tools') were generally discarded at much greater distances from the source than non-retouched items, a phenomenon also observable in the 'Rissian' Mousterian layers in the grotte Vaufrey (Geneste 1985; 1986a), and one that did not change significantly in the later stages of the Palaeolithic in these regions.

In the Roebroeks *et al.* 1988 paper we suggested, following Hayden (1976), that bifaces were very probably *curated* items which were periodically resharpened. This interpretation has found independent support in Keeley's study of microwear traces on handaxes, from which it can be inferred that there was an overlap in function between handaxes and flake tools (Keeley 1980). Hayden states that the use of soft-hammer techniques and the biface form only make technological sense if we assume that handaxes were fashioned to be resharpened and were curated. Virtually the only way of maintaining relatively sharp edge angles through many instances of resharpening by percussion is via the soft-hammer, bifacial technique. This also minimizes wastage of raw material during rejuvenation since the flakes tend to be thin, making the tool last longer. Handaxes may therefore be regarded as objects that were recycled in the system and were taken from one site to another in anticipation of future use. The 'raw material' data provided by Roebroeks *et al.* (1988) corroborate Hayden's interpretation with archaeological data, by showing that handaxes were

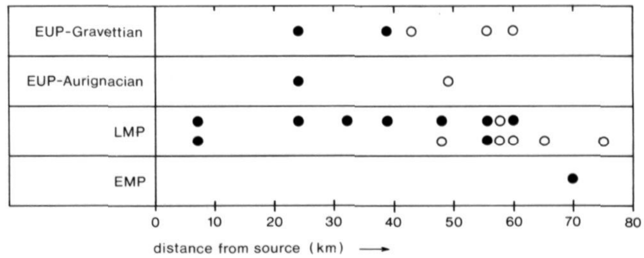

Fig. 139. The relation between the distance from the phtanite source at Ottigny/Céroux Mousty (Belgium) and the form in which phtanite artefacts were discarded.
– the black circles indicate sites that yielded blanks and retouched tools
– the open symbols are sites that yielded only retouched tools (from Roebroeks *et al.* 1988, figure 1).

transported over considerable distances.

Another very conspicuous aspect of Middle Palaeolithic technologies besides the transport strategy is the expedient manufacture of stone tools from local materials. This 'ad hoc' versus 'transported' dichotomy has been described in detail by Geneste for the Middle Palaeolithic of the Aquitaine area. Geneste defined three zones of raw material exploitation for the sites studied.

1. A zone consisting of an area of about 5 km around the sites provided 65-98% of the raw materials used. All of the flint knapping seems to have taken place at the sites. The 'utilisation index' of these raw material products is low: 5%.
2. Outside the first territory an area from 5 to 20 km around the sites provided 2-20% of the material, with a utilisation index of 10-20%. The materials entered the site in the form of prepared blocks.
3. Occasionally materials were brought in from much larger areas,involving distances of 50-80 km from the sites. Only products of the last stages of reduction sequences have been found. The utilisation index of these 'exotic' material products is very high: 75-100%.

This pattern is already observable in the case of the 'Rissian' layer VIII at Grotte Vaufrey (Geneste 1986a), which contained flint artefacts from several sources, two from areas 80 km to the west and the northeast of the site. A TL date of 120 ± 10 ka for the younger layer IV at this site (Aitken *et al.* 1986) is a *terminus ante quem* for these Grotte Vaufrey data.

Geneste has, furthermore, found evidence of a relation between technological, typological and raw material characteristics of assemblages: 'Levallois' assemblages are generally made from non-local raw materials and often contain Mousterian points, scrapers and handaxes (typical Mousterian, rich in scrapers and MTA). The 'Levallois' assemblage types contrast with assemblages which were made out of locally available raw materials using non-'Levallois' core-reduction strategies. Assemblages of this second type contain high percentages of denticulates and abrupt and irregularly retouched pieces, and can be classified as denticulate Mousterian or typical Mousterian rich in denticulates (Geneste 1985; Binford 1986).

Of course the choice between *ad hoc* and transport strategies has important consequences for the form in which lithic artefacts were discarded, as we have seen above in the case of the Belgian phtanite evidence. Transportation may be one of the key factors in Dibble's reduction model, which suggests that many aspects of scraper morphology reflect a continuum of reduction of one or more edges of flake blanks. According to this view (Dibble 1987a, 1987b), the typological variability of the scrapers is a measure of the intensity of reduction.

What if we try to interpret the much discussed 'Clactonian' along these lines? The definition of the Clactonian *excludes* the possibility of assemblages containing handaxes or 'Levallois' products ever being called Clactonian, so that, basically, the definition only refers to products of a flint-working technique in which little energy was invested:

> 'One must beware of some authors' use of the term 'Clactonian technique', which may merely denote the production of large heavy flakes with broad plain striking platforms, pronounced bulbs or cones of percussion and a high figure (say 110 to 140 degrees) for the angle between the general plane of the striking platform and the general plane of the bulbar surface. But these are all common features of the production of large flakes by use of a hard hammer-stone, and can clearly occur at any stage of the Palaeolithic or even of Prehistory in general; more specifically, flakes showing these characteristics are certainly not outside the range of Acheulian industries, where they may occur for example as the initial hard-hammer removals from a large nodule as a first stage of shaping it into a handaxe, or even as blanks for handaxes themselves ... If one must seek a single hallmark, as it were, of the Clactonian, it might be better to regard the Clactonian 'chopper-cores' as providing it ... since they are in fact very uncommon in other Palaeolithic industries, though not totally absent in every case, while in the Clactonian they are relatively frequent. However, it is far better not to rely on a single characteristic feature at all, but to reserve the name Clactonian for *unmixed industries which consist wholly of the cores, flake implements and flakes of the kinds described, lack all signs of handaxe manufacture or Levalloisian technique, and, where dated, belong to the earlier stages of the Lower Palaeolithic* ...' (Roe 1981: 137, the author's italics)

Roe's definition of the Clactonian as given above has a built-in guarantee against the 'mixed' character of assemblages, which may, however, tell us much about the depositional processes behind these assemblages. Singer *et al.* (1973), reporting on the excavations at the Golf Course at Clacton-on-Sea, mention the presence of some flakes in the Clactonian industry which, if not found in a 'Clactonian context',

> '... would be accepted as the normal waste of hand-axe manufacture. This does not mean they are accepted here as such artefacts, for such an identification is critical in view of the problem in Britain of determining the sequence of the Clactonian and Acheulian industries.' (Singer *et al.* 1973: 40)

The interpretation of the Clactonian as essentially an 'ad hoc' industry is not a very original one (see Ohel 1979 for a survey of interpretations of the Clactonian), but one that should be critically evaluated now that the British site Boxgrove (Roberts 1986; Bergman *et al.*, in press) seems to be a serious candidate for a primary-context Acheulean site with a 'pre-Hoxnian' age. The author's 'ad hoc' interpretation of the Clactonian indeed sees it as an 'integral part of the Acheulean' (Ohel 1979), but not in Ohel's terms, who considered Clactonian sites to be areas for the preparatory production of handaxe roughouts, i.e. just a link in the manufacturing chain from raw material to finished tool. In this interpretation an occasional find of something that looks like a handaxe-sharpening flake or any 'Acheulean' find might indicate the presence of 'transported' tools in the toolkit of the producers of the Clactonian, who did not use (or more correctly: did not discard) the transported tools for any reason we can think of.

The 'transported versus ad hoc' dichotomy can also be used to challenge the 'cultural group' of the Taubachian, a term created by Collins (1969; see also: Valoch 1984, 1986). In general, the term Taubachian refers to assemblages containing artefacts of small dimensions including denticulates and notches. 'Taubachian' assemblages are known from several sites of a presumably last interglacial age, e.g. Taubach itself (Schäfer 1981; Brunnacker *et al.* 1983), Kulna (Layer 11, Valoch 1984, 1986) and Tata (Vértes 1964). Bilzingsleben, Vértesszöllös and Isernia La Pineta are Middle Pleistocene sites that have also been termed 'Taubachian' by Valoch (1984).

The microlithic form of Taubachian assemblages is in many cases clearly partly determined by the character of the locally available raw materials used to make the desired implements. At Kulna, however, the microlithic form of the Taubachian tools may have been determined by the reduction of larger blanks during the transportation of these objects. Valoch states that the Layer 11 (Taubachian) industry was made from heterogeneous material imported from several raw material sources, some at distances of more than 60 km from the site. The hominids who discarded the overlying Micoquian assemblage, however, used mainly flint from the immediate surroundings of the cave '... *pour la production d'outils de dimensions normales* ...' (Valoch 1984: 204, the author's italics).

Schäfer (1981) has discussed the Taubach artefact assemblage along a comparable line, opposing the notion that the small dimensions of the artefacts have to be related to factors like raw material availibility and environmental circumstances, and stressing the efficiency of these 'primitive' artefacts as the primary criterion of the producers.

Of course, the arguments developed in this paragraph are rather impressionistic and they should be worked out systematically in a more detailed study. The author is of the opinion that they could be developed into a good conceptual framework with which the Lower, Middle and also the Upper Palaeolithic could be tackled. The ideas presented here are, of course, not all new and the main topic has already been summarized in a much neglected paper by Tavoso (1984):

'Le fractionnement dans l'espace des étappes de la fabrication et de l'utilisation des outils apparait comme un modulateur puissant des caractères que nous utilisons pour décrire les outillages. Un même groupe humaine pouvait fort bien se contenter d'un grand nombre d'éclats bruts peu Levallois sur un gisement de silex, abandonner à une dizaine de kilomètres un outillage nettement Levallois et riche en éclats retouchés et n'emporter plus loin que quelques racloirs et éclats bruts.' (Tavoso 1984: 81).

This approach throws a totally new light on the Mousterian problem. The correlation between the importation of flint and the intensity of reduction (and thus the shape of the tool), the use of local flint and the predominance of denticulated and notched tools (Geneste 1985) clearly shows the way toward a tentative solution. It would be very interesting to study the patterning of the earlier Upper Palaeolithic industries (Aurignacian, Perigordian) along these lines too, in order to see whether there are any relations between specific industries and the predominant use of local or non-local materials.

The long distances over which implements were transported -and during which journeys they were repeatedly resharpened- have led us to assign a considerable *planning depth* (*sensu* Binford 1986) to Middle Palaeolithic technologies (Roebroeks *et al.* 1988). This is in marked contrast to especially Binford's assessment of the Middle/Upper Palaeolithic transition (Binford 1986, Binford in: Renfrew 1987). He stresses that Middle Palaeolithic adaptations '...appear to me to be based on tactics which do not require much planning ahead (that is, beyond one or two days); in addition to the absence of storage...there is an absence of curated technologies...' (Binford 1982b: 178). It is stated in Roebroeks *et al.* (1988) that the differences in technological organization between Middle and Upper Palaeolithic hunter-gatherer societies were less pronounced than commonly acknowledged, and that there are no convincing arguments to be derived from flint technology and flint use for great differences in fundamental forms of behaviour, such as in the capacity for anticipation and advance planning of activities. The authors tried to trace these differences on a wider chronological scale by comparing the size of raw material procurement networks in the different phases of the Palaeolithic. Figure 140 shows that the distances over which stone artefacts were transported increased considerably from the earliest Palaeolithic onwards. The observed increase in the transport distances over the Pleistocene time span could primarily be a function of expanding social networks, incorporating more people, on the assumption that the size of the procurement networks is a more or less reliable measure of the size of action radii of ancient hunter-gatherer communities.

The rise in the curve from 200 ka onwards is based exclusively on European data, which are relatively abundant from the Weichselian Middle Palaeolithic onwards. Roebroeks *et al.* (1988) have tentatively correlated this rise with the colonization of environments with dispersed food resources, relatively low 'Effective Temperature' and thus short growing seasons (cf. Rogers 1969; Gamble 1986; Kelly 1983). Fundamental forms of behaviour such as anticipation over larger time intervals and the exchange of information must be considered prerequisites for the colonization and exploitation of such regions.

9.4 Hunters, scavengers and background faunas

In the preceding chapters we have already touched upon the subject indicated in the title of this paragraph: can we discriminate between a 'normal' background fauna and faunal elements introduced by man, and if so, are the 'faunal elements' attributable to hominid activities in the form of hunting or scavenging?

It is important to try to discriminate between these two types of meat procurement on the basis of the archaeological material. As Blumenschine (1986) points out, scavenging or the foraging for and consumption of animals found dead implies that meat eating was a rather opportunistic form of behaviour, occurring irregularly and with a minimum of social cooperation. Indications of hunting activities, however, would imply that meat was more regularly consumed by these early hominids. The success of hunting practices was, to a large extent, possibly determined by social adaptations, for example group cooperation during the stalking and capturing of the game, and possibly also during its consumption. Getting a grip on the primary meat procurement strategies of Pleistocene hominids could give us a more solid base for hypothesizing on especially the social aspects of early hominid behaviour in this line of reasoning.

Until the end of the seventies, archaeologists all agreed that 'hunting' had been the primary meat-procurement strategy from the beginning of mankind onwards. One of the reasons for this *communis opinio* was that field studies of non-human primates had indicated that the eating of meat of smaller mammals by chimpansees and baboons was almost exclusively based on hunting activities (Blumenschine 1986). Early man was a hunter! Binford (1985) has

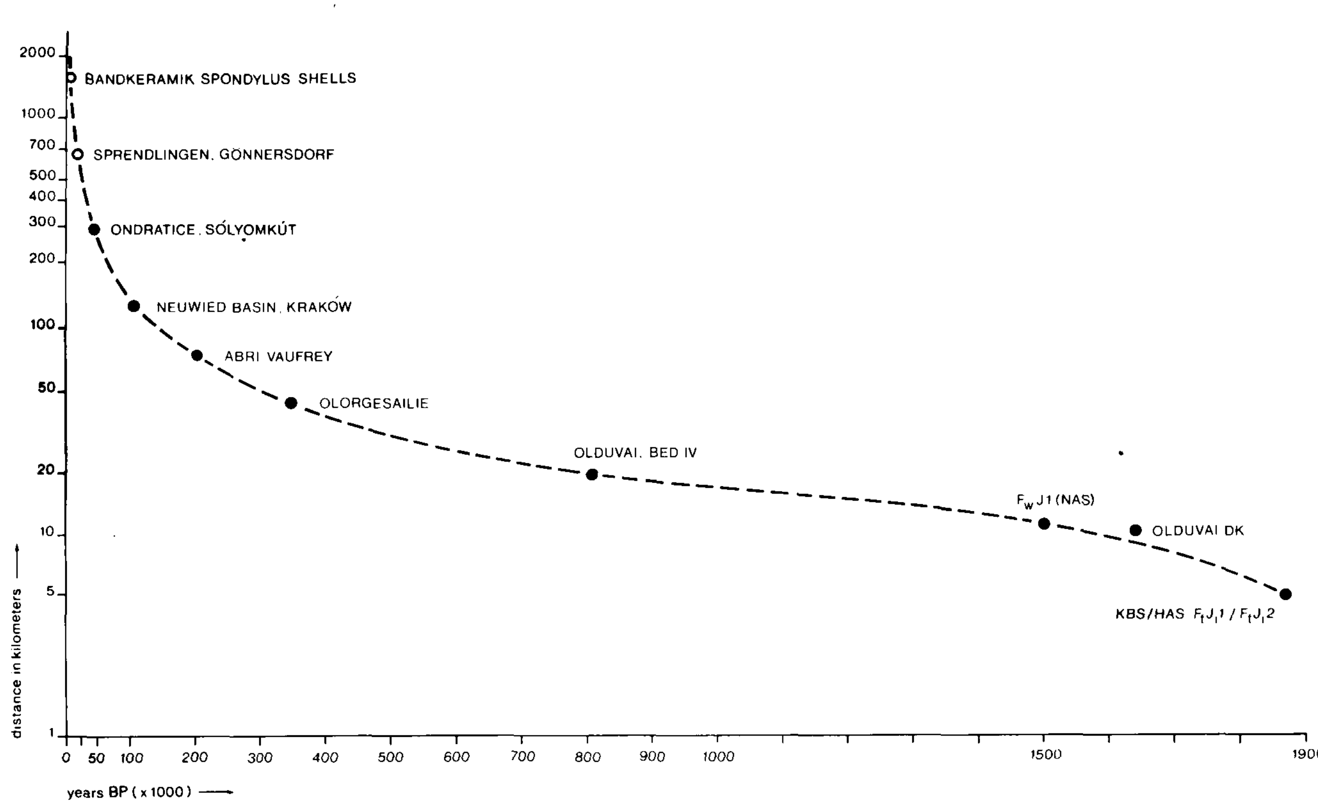

Fig. 140. Maximum distances over which raw materials were exported from their sources, from 'Oldowan' to Neolithic times.
– the black circles indicate stone artefacts
– the open circles indicate molluscs
(based on data presented in Roebroeks *et al.* 1988, with additional data from Leakey 1979).

given a survey of the way in which different authors described the social organisation of these 'hunters': tool-using hominids, hunting and living in social groups characterized by a male-female division of labour. Food sharing took place after the products of the hunt had been transported to the 'base camp', and this food sharing was seen by Isaac (1978) as one of the most important facets of the behaviour of the Plio/Pleistocene hominids and the basis for later sociocultural evolution. This interpretation of early hominid behaviour, however, has been the target of severe criticism for several years now (see: Binford 1985 for a survey), and several authors have stressed the potential role of scavenging in the meat-procurement strategies of Pleistocene hominids (Gamble 1986, 1987).

Now that scavenging is generally regarded as a meat-procurement strategy which may have been of considerable importance to early hominids, the question is, of course, how to discriminate between hunting and scavenging strategies on the basis of the archaeological material? The criteria that have been proposed in this context (see: Blumenschine 1986) are mostly based on size, age or body-part profiles characteristic of faunal assemblages obtained by specific procurement strategies, i.e. hunting or scavenging, and on the distribution of cutting and chopping marks, breakage and evidence of carnivore chewing.

The first attempts at a strict analysis of the archaeological material along these lines have not yielded unambiguous results and Blumenschine (1986) holds two factors responsible for this: one in the field of the premisses of the author in question, and a second of a methodical nature.

The first one is, in Blumenschine's opinion, related to the question to what extent indications of hunting or scavenging are seen as indications of the 'humanness' of early hominids. The best pleader of the 'hardly human' school is Lewis Binford, who continuously stresses the vital role of scavenging in the meat-procurement strategies of Lower, Middle and even Upper Pleistocene hominids, prior to the appearance of *Homo sapiens sapiens* on the archaeological scene. Binford has reassessed faunal assemblages from several pre-*sapiens* sites in the context of this discussion (Binford 1985; Binford/Stone 1986). One of the best known controversies generated in the course of his studies concerns the faunal assemblages excavated in the 1960s at Klasies River Mouth on the southern coast of Africa. In Binford's opinion, the 'Middle Stone Age' Klasies people were to a large extent dependent on the scavenging of what remained after other predators had eaten (see: Singer/Wymer 1986; Scott 1986).

With a view to the following discussion a brief outline will be given of Binford's (1985) 'look at the northern temperate zone' in terms of the hunting-scavenging discussion, for which he selected a few 'classic' sites in western Europe.

Swanscombe (Lower Gravels/Lower Loam):
In Binford's opinion, the faunal composition at Swanscombe shows all the characteristics of a natural background fauna. In his interpretation the hominids responsible for the presence of artefacts among the faunal remains were scavengers of carcasses and the hominid involvement in the accumulation of much of the faunal remains at Swanscombe was very small. The absence of tool marks on the bone material indicates that the hominids were mainly interested in meat, not in marrow.

Hoxne:
Binford mentions the predominance of heads and lower limbs of horses and evidence of systematic breakage of bones for marrow, particularly of horse bones. Fallow deer was represented by primarily meat-yielding bones. In his opinion the Hoxne fauna

'... has the characteristics of a transported and accumulated assemblage scavenged from medium to large mammals, in which heads and marrow-yielding bone were the parts most commonly transported for processing ...' (Binford 1985: 317)

Grotte Vaufrey:
The faunal assemblage from the 'Rissian' level VIII at this site points to the transport of parts of red deer, horse and occasionally aurochs to the cave. The bones are mostly upper limb bones or the meat-yielding bones. Tool-inflicted marks are virtually absent, as are indications of marrow exploitation. The presence of gnawing marks on the bones led Binford to assume that the hominids transported meat-yielding bones from previously ravaged carcasses, not from hunted animals.

Combe Grenal:
In the several Würm I and II levels at Combe Grenal larger mammals like aurochs and horses were mainly represented by essentially meat-yielding upper limb bones, while the marrow-yielding bones that had been introduced to the site showed evidence of cracking. Medium-sized animals, like red deer and reindeer, were brought onto the site in the form of a representative anatomical inventory.

'Particularly striking is the general absence of non-hominid gnawing of the bones from moderate sized animals. This contrasts markedly with Klasies River Mouth and all the earlier sites discussed here. This is taken as good evidence that the majority of the moderate body sized animals at Combe Grenal were *hunted for meat*.' (Binford 1985: 319)

Binford's conclusion of his 'look at the northern temperate zone' is that:

'At present, the inevitable conclusion seems to be that regular, moderate to large mammal hunting appears simultaneously with the foreshadowing of changes occurring just prior to the appearance of fully modern man.' (Binford 1985: 321, in italics in the original)

In the first interpretation of the Unit IV sites in terms of the research problems discussed in the preceding section the author was strongly guided by the dominance of remains of very young animals at these sites, which palaeontologists interpreted as indicative of human activities (Van Kolfschoten 1985: 72; Roebroeks *et al.* 1986). This assessment was interpreted in terms of hunting activities of Middle Pleistocene hominids, who were thought to be (partly) responsible for the formation of the Unit IV-C faunal assemblages.

A crucial factor in this interpretation was without any doubt the fact that palaeontologists working on faunas which are not associated with remains of human activities rarely find a dominance of young animals (Van Kolfschoten, pers.comm., 1985-1986). This is, implicitly, the reason why the combination of young animals and artefacts is often interpreted in terms of hunting activities. Vrba (1980), for instance, used the percentage of juvenile antilopes in faunal assemblages of South African *Australopithecus* sites to determine whether the bone collector in question was a primary predator or a scavenger.

The author presented his 'hunting' interpretation of the Unit IV-C data at several lectures and in discussions with colleagues, and was not confronted with criticism. Moreover, this interpretation seemed to be corroborated by the results of the investigation of the Early Pleistocene Tegelen faunal remains, discussed in section 4.3.4, and by the results of a recent study of deer from Tegelen, which again stressed the rarity of young individuals in the faunal remains (Van Kolfschoten, pers.comm., 1986).

In this earlier interpretation, however, one particular point was overlooked. Although the Tegelen fauna seemed to justify the inferences made regarding the Unit IV data, the point is that high percentages of the newborn individuals of all mammal species die in their first year. So we

Fig. 141. On the left, the numbers of individuals in successive age classes in an idealized schematic *catastrophic* age profile and, on the right, an idealized schematic *attritional* age profile, consisting of the numbers of individuals that died between the successive age classes in the figure on the left (after: Klein and Cruz-Uribe 1984, fig. 5.4).

should be concentrating on the problem why this is not reflected in the Tegelen (and many other!) faunas, rather than wondering about the juvenile-dominated Belvédère fauna.

In order to try to answer this question, we must first consider the formation of a faunal assemblage in some detail. A faunal collection like that of Unit IV-C can be seen as representing the (preliminary) last phase of a sequence of transformation processes, in which part of a community of living animals finally ends up on the table of a palaeontologist. Klein and Cruz-Uribe (1984) have distinguished the following phases in this process:

1. *the life assemblage*: the community of live animals in 'natural' proportions (biocoenose)
2. *the death assemblage*: the carcasses that are available for collection by people, carnivores or other agents of bone accumulation (thanatocoenose)
3. *the deposited assemblage*: the carcasses or portions of carcasses that come to rest at the site (taphocoenose)
4. *the fossil assemblage*: the animal parts that survive at a site until collection
5. *the sample assemblage*: the part of the fossil assemblage that is collected

Klein and Cruz-Uribe (1984) have discussed the processes that play a role in the different phases of this series in detail. In this context only a few facets are of importance to us, namely the transformation of the life into the death assemblage, the transformation of the death into the deposited assemblage, and the transformation of the deposited into the fossil assemblage.

Figure 141 is important with respect to the transformation of a life assemblage into a death assemblage. The figures show hypothetical age profiles of mammal species of which the females give birth to at most one young a year. The 'fossil' age profiles of these species are interpreted in terms of two theoretically expectable models (Voorhies 1969; Klein/Cruz-Uribe 1984).

In the first model the successive age classes contain progressively fewer individuals. Such an age profile reflects a living population fossilized by a catastrophe. This type of profile is therefore known as a 'catastrophic' age profile (fig. 141).

In the second model prime age (reproductive, active) adults are underrepresented in comparison with their number in the living community, while young and old individuals are overrepresented. Such a profile comprises individuals dying of malnutrition, of accidents, predation and other attritional factors which had most impact on the youngest and the oldest individuals. The resulting age profile is called an attritional age profile.

One of the main factors involved in the transformation of a death assemblage into a deposited assemblage is the behaviour of the collector (see: Klein/Cruz-Uribe 1984). Different predators treat the various parts of a carcass differently, and selectively destroy bones when consuming a carcass. Furthermore, collectors tend to transport specific parts of a carcass to other sites, for instance because of their preference for those parts or because those parts are easily transported. Other parts of the carcass are left behind at the death site. Perkins and Daly (1968) have stressed the importance of this *Schlepp-effect* at archaeological sites, where bones of larger mammals may be represented by a smaller range than those of smaller mammals, which can be transported as whole carcasses. Klein and Cruz-Uribe (1984) point to the role of the portability of the skeletal elements in the interpretation of hyena sites: at two sites containing faunal assemblages generated by the activities of hyenas small ungulates were proportionally better represented by cranial material, while larger ungulates were proportionally better represented by post-cranial elements. These data clearly suggest that the percentage of young individuals in a faunal assemblage may say more about the collector's capability of transporting or destroying bones than about the collector's role as a scavenger or a primary predator. It is furthermore worth mentioning that carnivores often consume very young animals so completely that almost no skeletal parts are left for deposition. As for the transformation of the deposited into the fossil assemblage, the skeletal elements of young individuals suffer most from post-depositional processes and therefore young individuals are underrepresented in the fossil assemblage.

Systematical study of faunal assemblages in which man cannot have been a formative agent -for instance because of the great antiquity of the assemblage- could in due time provide us with very relevant reference information for the interpretation of archaeological sites. We have already touched upon this topic above, in the discussion of the Early Pleistocene fauna of Tegelen. Such studies could give us detailed data on the character and variability of the kind of *natural background faunas* to be expected in specific environments. This kind of research was started only recently, as a way of studying problems encountered in the analysis of East African Plio/Pleistocene archaeological sites. Toth and Schick (1986) report that the preliminary results of these studies indicate a large variability in natural bone accumulations in terms of assemblage composition and bone modification. Furthermore,

'... a number of criteria which have sometimes been used to infer effects of hominid diversity, fracture patterns, degree of fragmentation, and some types of surface modification, can be mimicked by some natural phenomena ...' (Toth/Schick 1986: 44; see also: Haynes 1988)

The question we started with was to what extent may we use a predominance of young individuals in a fauna associated with primary-context archaeological remains to make inferences on hunting activities of Middle Pleistocene hominids? It seems legitimate to state that the age-profile of a faunal assemblage as such may only with severe restrictions be used to make positive statements on this topic (in contrast with: Roebroeks *et al.* 1986). The relatively large number of juveniles that died in their first year were a potentially important prey for scavengers, while they formed a common prey for hunting carnivores, because of their inexperience. Vrba (1980), discussing this problem, states:

'... I have found very little in the literature to test my hypothesis that scavenged assemblages should generally contain lower percentages of juveniles than primary predated ones. Kruuk presents hyena scavenging and killing totals of adult and juvenile wildebeest, zebra and gazelle in Serengeti and Ngorongoro (Kruuk 1972: table 22). Most of these data (excepting zebras at Serengeti) indicate that fewer juveniles than adults are scavenged by hyenas, while the reverse is apparent in the killing totals ...' (Vbra 1980: 268)

The often almost complete consumption of young animal skeletons by non-hominid carnivores may be one of the factors responsible for the virtual absence of young individuals in 'natural' faunal assemblages. Hominid bone collectors on the contrary, may leave behind more remains of these juvenile animals for deposition and incorporation in the fossil record.

At Belvédère we are looking at very small 'cuttings' in a riverine landscape, where hominid activities are attested by the presence of stone artefacts, spatially (horizontally and vertically) associated with bone fragments of predominantly very young animals. At Site G at least part of this spatial association could be translated in terms of hominid activities, thanks to the microwear analysis by A. van Gijn (see: Van Gijn, this volume, appendix I). Because of the relatively small number of animals involved and the generally poor state of preservation of the bone material all that can be said is that the point of departure for any inference concerning these problems has to be the proven interrelationship of the 'stones and bones'. All we can say here is that, on the assumption that they were hunters, the 'Belvédère' hominids hunted mainly very young individuals of larger mammals (here). But we have *absolutely* no base for the hunting assertion, and in fact this kind of reasoning eventually leads to treating Plio/Pleistocene hominids and their archaeological 'sites' as counterparts of present-day hunter-gatherers, thus bringing the archaeologist into a vicious circle, in which there is only a limited amount of room for evolution of hominid behaviour in the Pleistocene time span.

Another approach, advocated by Binford (1985, 1986), assumes the existence of basic differences in organizational capabilities between present-day hunter-gatherers and Middle and Early Pleistocene hominids as long as the contrary cannot be demonstrated. Instead of using the !Kung, Nunamiut, or other hunter-gatherer groups as ambulant Stones of Rosetta, advocates of this approach try to analyse what indications of specific forms of 'modern' behaviour can be found in the archaeological material. Of course, this approach also involves the risk of vicious circles. The difficulties encountered in the analysis of Early and Middle Pleistocene archaeological sites (hunting, scavenging or background faunas?) are -to the author's knowledge-only very rarely discussed when archaeologists are dealing with sites in which *Homo sapiens sapiens* played a formative role. When discussing sites from this time range, practically every archaeologist speaks of hunting activities, but what, one might ask, are the explicit arguments for this assumption?

9.5 The Unit IV-C sites in the northern European context

In recent years several northern European sites have been published which date roughly from the same time range as the Maastricht-Belvédère Unit IV-C sites.

In the Netherlands, for example, the rich quarry-sites in the neighbourhood of *Rhenen* (central Netherlands), discovered in the 1970s by Franssen and Wouters (Franssen/Wouters 1978, 1981; Stapert 1981b), were formed before the maximum extension of the Saalian ice-sheet. Most of the flint artefacts found at these sites were discovered in secondary contexts, in coarsely-grained fluviatile deposits, pushed up by the Saalian ice-cover. The assemblages collected at these sites show a striking resemblance to the Markkleeberg material (German Democratic Republic: Grahmann 1955; Baumann/Mania 1983).

The Belgian site *Mesvin* IV has yielded a rich Middle Palaeolithic flint assemblage in a secondary context, found in coarsely-grained sediments and in geological association with macro-faunal remains indicative of cold climatic conditions (Cahen/Haesaerts 1984; Cahen/Michel 1986). U/Th dating of faunal remains from the site yielded an age roughly in the middle of the 200-300 ka time range. The formation of the Mesvin IV archaeological assemblage may therefore be approximately contemporaneous with the deposition of the Unit III gravels at Maastricht-Belvédère, in a cold phase preceding the Unit IV-C warm-temperate phase. However, in the virtual absence of biostratigraphically diagnostic elements in the Mesvin IV faunal assemblage this correlation is based solely on the U/Th dates (Cahen/Haesaerts 1984).

The micro- and macro-faunal assemblages from the archaeological find layer 1 at *Ariendorf* (Neuwieder Becken, West Germany) indicate that these assemblages were formed in a cold stage either just before or just after the Maastricht-Belvédère Unit IV-C warm-temperate phase (Van Kolfschoten 1985; Turner 1986). The morphology of the stone artefact assemblage from this find layer, which is composed mainly of simple flakes, may have been dictated by the quality of the locally available raw material, being quartz, quartzite, and silicious slate (Kieselschiefer). Bosinski (1983b), however, has suggested another explanation for the morphology of this assemblage, namely that it was largely determined by the activities to be performed rather than by the raw material.

None of the sites discussed above was discovered in a primary archaeological context. The refitting evidence of the Mesvin IV and the Ariendorf sites suggests that the archaeological material may have been displaced over a limited distance only. There are a few better preserved sites in northern Europe which date from approximately the same period as the Unit IV sites at Maastricht-Belvédère.

The *Arvicolas* in the faunal assemblage from the Lower Travertines at *Ehringsdorf* (German Democratic Republic) enabled Van Kolfschoten (1985) to relate the formation of these travertines to the Belvédère Unit IV-C warm-temperate phase. U-series dating of the Lower Travertines, adjacent to the famous *Brandschichten* 'occupation layers', by Schwarcz *et al.* gave an average age of 225 ± 26 ka (Cook *et al.* 1982; see also: Brunnacker *et al.* 1983; Blackwell and Schwarcz 1986; Schwarcz *et al.* 1988). The Lower Travertines contained the products of an indisputably Middle Palaeolithic flint industry (Behm-Blancke 1960). The flints included a large number of simple, double and convergent scrapers, limaces and some bifacial points. The retouching was often scalariform, 'almost Quina-like', according to Bordes (1984), and was probably the product of several stages of reduction (cf. Dibble 1987a, 1987b). Steiner (1979) classified the Upper Travertine finds as a 'waste industry' (*Abfall-Industrie*), consisting of amorphous artefacts, comparable to the (Eemian) industries of Taubach (Steiner/Steiner 1975).

In 1922, Soergel published age divisions of fossil remains of rhinoceros (*Dicerorhinus kirchbergensis* [= *D.mercki*]) and elephant (*Elephas antiquus*) found at the travertine sites Ehringsdorf (Lower Travertines) and Taubach. Figures 142 and 143 give the age distributions of the species mentioned above, based on the identification of large numbers of individuals. Soergel used the age distributions of the larger mammal fossils to make inferences on the hunting methods of Palaeolithic groups whose flint artefacts were also found in the travertines. His approach, followed by later investigators of the Ehringsdorf site, provides a clear example of the approach in Palaeolithic archaeology that implicitly regards man as the principal or one and only agent responsible for the presence of faunal remains in deposits containing artefacts (cf. Binford 1981). In a recent review of the Ehringsdorf sites, Steiner (1979) discussed the hunting methods of the Palaeolithic groups at Ehringsdorf. His implicit approach, which is based largely on that of Soergel, can be summarized as follows:

1. human activities during the formation of the travertines are clearly attested by flint artefacts, charcoal and remains of the hominids themselves.
2. all larger mammal remains recovered from the travertines were deposited as 'Jagdbeute' (hunted game)
3. classify the elephant and rhino remains according to age, and you get information on the hunting methods of Palaeolithic man.

The age classifications made by Soergel (1922) are represented in table 24 and figures 142 and 143. According to Soergel (1922) and Kahlke (1957), rhinoceros and elephant were the most important game. The differences in the age compositions of the faunas of the two neighbouring sites Taubach and Ehringsdorf led Steiner to the conclusion that different hunting methods were applied at the two sites (cf.

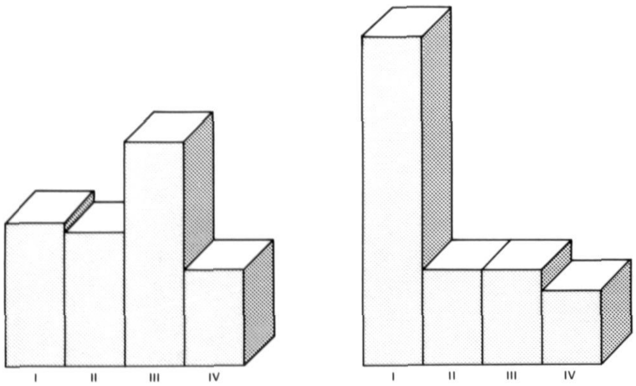

Fig. 142. Distribution of *Dicerorhinus kirchbergensis* remains according to age at (left) Ehringsdorf and (right) Taubach. I. very young individuals, II. young adult individuals, III. adult individuals, IV. old individuals. Based on data in Soergel 1922 (see this volume, Table 24).

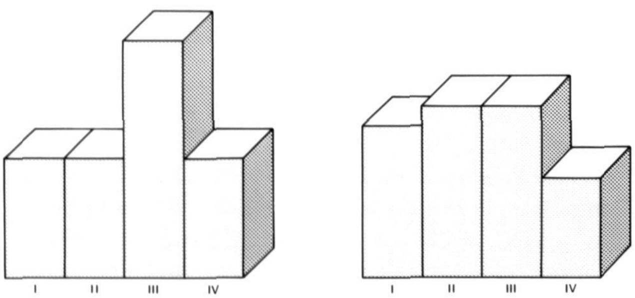

Fig. 143. Distribution of *Elephas antiquus* remains according to age at (left) Ehringsdorf and (right) Taubach. I. individuals of 0-6 years, II. 6-20 years, III. 20-50 years, IV. more than 50 years. Based on data in Soergel 1922 (see this volume, Table 24).

Soergel 1922; Behm-Blancke 1960): at Taubach very young to young animals formed the major part of the fauna, whereas at Ehringsdorf these age categories are less well represented. Therefore, Palaeolithic groups at Taubach must have used a more primitive hunting technique focussed on younger animals. The 'more evolved' (an interpretation based on the morphology of the stone artefacts; cf. 9.3) Ehringsdorf hominids, however, succeeded in killing large numbers of the experienced adult animals that were probably more difficult to catch. Details of the hunting techniques applied (pitfalls, etc.) are also given by Steiner (1979).

These interpretations speak for themselves. The Ehringsdorf and Taubach sites certainly deserve a reevaluation in the light of the current debate on our 'human ancestors' and the 'changing views of their behavior' (Binford 1985). Behm-Blancke (1960) has published pictures of what seem

Table 24: Distribution of faunal remains from Taubach and Ehringsdorf according to age, as discussed in the text; based on data in Soergel 1922; Behm-Blancke 1960; Guenther 1975. See also figures 142 and 143.

	n	very young/ young indiv.	adult/ old indiv.
Taubach rhinoceros	100	71.4 %	28.6 %
Taubach elephant	60	54.3 %	45.5 %
Ehringsdorf rhinoceros	?	46.2 %	53.7 %
Ehringsdorf elephant	?	40.0 %	60.0 %

to be cutting marks on rhinoceros bones from Ehringsdorf, which show that these sites have a wealth of potential information on Middle Pleistocene human behaviour hardly matched by any other site in Europe.

One of the major problems encountered in the interpretation of these -and other- travertine sites is of course that we are dealing with faunal assemblages formed in sedimentary environments which favour the preservation of faunal elements 'produced' by a wide range of accumulating agents: natural deaths, various non-human predators, hominids, and geological processes. The 'sites' excavated in such sedimentary environments are the products of a complex series of depositional events of which hominid activities form only a part, but one that is usually given most of the credit for the 'statics' encountered, as we have seen above.

The biostratigraphical evidence from the sites of *Bilzingsleben* (German Democratic Republic) and *Miesenheim* (West Germany, Boscheinen *et al.* 1984), which includes the presence of *Arvicola terrestris cantiana* (*sensu* Van Kolfschoten, in press) in the faunal assemblages, shows that they are older than Maastricht-Belvédère (Van Kolfschoten, in press).

So far, few archaeological remains have been recovered from the Miesenheim site (Boscheinen *et al.* 1984). The fauna, however, may date from before the warm-temperate phase attested at the Bilzingsleben site, from which a large number of stone artefacts have been recovered (Van Kolfschoten, pers.comm, 1988).

Several absolute dates have been published for the Bilzingsleben travertine site and Harmon *et al.* (1980) proposed a correlation of the Bilzingsleben deposits with Stage 7 of the marine Oxygen Isotope record on the basis of a U/Th age of 228 +17/-12 ka. In view of the Belvédère Unit IV-C dating evidence discussed above, this age may be considered too young. Moreover, Cook *et al.* (1982) have reported the results of work on the dating of the site, which refer to ages of over 350 ka. Schwarcz *et al.* (1988) have recently published the results of an extensive ESR and U-series dating programme of the Bilzingsleben site. They conclude that the most likely date of the formation of the deposits bearing artifacts and hominid remains is 414 ± 45 ka at the earliest, and no later than 280 ka. Mania (1986) places Bilzingsleben explicitly above the 'typical' Holsteinian, namely in the Dömnitz-interglacial, which he considers to be the youngest of the two interglacials which form the 'Holsteinian complex'. The typical Holsteinian and the Dömnitz-interglacial are separated by the *Fuhne glacial.* Between the Dömnitz- and the Eemian-interglacial there was another interglacial, the *Rügen-interglacial.* Bilzingsleben has yielded very rich floral and faunal remains including remains of *Homo erectus* (see for the discussion on the classification of the hominid remains: Stringer 1981). Large numbers of artefacts have been found, most of which are small (10-80 mm). The retouched edges, often denticulated or notched, are straight, convex or concave. Thick scrapers were found, and points fashioned into borers. According to Mania, the material also included typical 'Levallois' cores, which means that the hominids responsible for the formation of the archaeological assemblage at least knew how to apply more complex forms of flint working. Mania (1986) presumes that the small dimensions and the poor structure of the raw material allowed only very simple forms of stone working.

Table 25 (from: Mania 1983, table 2) shows the frequency of identified mammals from a 200 m² section of the excavated area at Bilzingsleben. Mania (1983) explicitly treats these faunal remains as remains of *Jagdtiere*, hunted animals, and the large number of species is interpreted as indicating generalized hunting strategies, with a preference for rhinoceros (*Dicerorhinus kirchbergensis* [= *D.mercki*], *Dicerorhinus hemitoechus*), which accounted for a quarter of the total number of individuals in the 200 m² area. The 38 rhinoceros are mainly represented by lower jaws and individual teeth from 'smashed' upper and lower jaws. Young and adult individuals are present in equal numbers.

The predators present in the Bilzingsleben assemblage (amongst others: *Panthera [Leo] spelaea*, *Felis sylvestris*, *Lupus* sp.) are interpreted as also belonging to the group of *hunted* animals (Mania 1983: 330). In the author's opinion, analysis of the enormously rich and important Bilzingsleben site has to consider the possible *active* role of carnivores, not in the first place because their bones have been found, but because they may have participated in the taphonomic processes. As discussed above (9.4), we urgently need detailed data on the character and the variability of the kind of natural background faunas to be expected in northern temperate waterside regions. What do the 'natural faunas' of travertine or other open-air sites -i.e. faunas associated with no archaeological remains whatsoever- look like? What carnivores became fossilized there, and what do the body-part profiles look like? Such data might be useful in decoding the complex information provided by important sites like Bilzingsleben.

Table 25: Bilzingsleben, 'Steinrinne' frequency of animal species from a 200 m² section of the excavated area (data from: Mania 1983, table 2).

Species	Number of individuals	Relative frequency (%)
rhinoceros	38	26.02
deer	21	14.38
beaver	17	11.64
bear	17	11.64
elephant	16	10.95
bovid	8	5.48
extinct beaver	6	4.10
horse	4	2.74
boar	4	2.74
roe deer	3	2.05
lion	2	1.37
wild cat	1	0.68
fox	1	0.68
badger	1	0.68
wolf	1	0.68
other	6	4.10
Total	146	99.93

The Pleistocene sediments exposed in the *Kärlich* clay pit (Neuwied Basin, Middle Rhine area, West Germany) have provided important data on the Pleistocene stratigraphy of central Europe. The exposures, consisting of Rhine and Mosel gravels, loess and volcanic ashes, have yielded archaeological finds in several stratigraphical positions (see: Bosinski *et al.* 1980; Bosinski 1983c; Kulemeyer 1986). Of special importance here is the presence of an archaeological site in limnic sediments, which, according to palaeobotanical investigations, were deposited during a Middle Pleistocene interglacial (Urban 1983). Of special biostratigraphical importance is the occurrence of the taxa *Azolla filiculoides*, *Pterocaria* and *Celtis australis.* Although these three 'marker species' suggest a correlation with the Dutch Holsteinian (Zagwijn 1973), Urban suggests an intra-Saalian age for the 'Kärlich'-interglacial', on the basis of the composition of the flora of its terminal phase: this is dominated by deciduous trees, whereas pollen diagrams of other Holsteinian deposits in northwestern and western Europe are usually characterized by long phases of conifer preponderance (Urban 1983: 88). The archaeological finds are placed in the *Carpinus-Betula* zone of the interglacial.

The archaeological finds of the aforementioned site were found over an area of 53 m² and consist of the products of a very simple flint industry, mainly flakes with cortex. There are a few retouched artefacts: chopping tools, a cleaver and three handaxes. It was, however, not always easy to distinguish the artefacts from the broken stones ('tephrofacts') naturally occurring in large numbers in the find-bearing matrix: '... par exemple, dans le m² 24 de la fouille on a compté environ 55000 pierres cassées parmi lesquels seulement 14 sont des outils ...' (Kulemeyer 1986: 46-47).

Oxford TL age determinations of burnt flints from layers C and D at *La Cotte de Saint-Brelade* (Jersey, United Kingdom) place the Middle Palaeolithic assemblages from these layers in the 238 ± 35 ka time range (Aitken *et al.* 1986; Callow 1986a). K. Scott (1980) has published the age groups of the mammals found at La Cotte de Saint-Brelade (Jersey) and discussed the role of hominids in the formation of the faunal assemblages of layers 3 and 6. In these 'Saalian' loessic deposits considerable numbers of mammoth and rhinoceros remains were found in two 'bone heaps', whereas, in contrast to other levels, artefacts were found in only relatively small numbers. Scott attributed the arrival of the two groups of mammoths and rhinoceros at La Cotte to man, who may have driven several '...relatively young animals and prime adults -those which would have been most dangerous to hunt...' off the end of a headland. The layers containing the bone heaps produced very large bones, had a very limited species representation (essentially mammoth and rhino), and yielded small numbers of artefacts. The other Saalian deposits at La Cotte, on the other hand, show dense concentrations of small bone splinters but few large bones and a wide range of species, associated with numerous artefacts. In the light of our age classification discussion it is interesting that Scott has compared the ages of the layer 3 and 6 mammoths and rhinoceros with those from the other levels. In the latter, mammoth and rhinoceros were represented by individuals considerably younger than those in layers 3 and 6: some of these individuals were

'... undoubtedly new-born. This would imply that the hunting of these large, dangerous species depended upon finding isolated young, weak animals, until, on two separate occasions, a rare opportunity presented itself to kill a substantial group of mammoth and rhino at one time ...' (Scott 1980: 150)

La Cotte de Saint-Brelade therefore seems to be a site with an age class pattern identical to that of the Belvédère Unit IV sites.

Recently, a monograph was published on the La Cotte de Saint-Brelade site (Callow/Cornford 1986), in which these bone heaps are discussed in more detail and are compared with the other layers of the fill of the ravine system. Besides demonstrating hominid involvement in the formation of the bone heaps, Callow suggests that the formation of these bone heaps was no 'incident' but the result of a strategy combining wide-ranging hunting of many different species with occasional, and probably opportunistic, large game kills in the ravines. The two large bone heaps, both situated at the base of a Saalian loess deposit, must therefore be seen as dating from the time of the abandonment of the site, the bone-heaps having been preserved almost as left by the occupants. The absence of large bone concentrations in the other layers is interpreted in terms of occasional clearance of medium-to-large bones in the narrow space in the ravine system:

'Such a practice would result in a strong bias towards preservation of unidentifiable splinters, and bones or teeth (whole or broken) whose size and shape rendered them liable to be trodden into the ground surface.' (Callow, in: Callow/Cornford 1986: 372)

This interpretation implies that the La Cotte hominids employed a consistent and widely-based strategy troughout the period of occupation, and that the abandonment of the site and the subsequent loess deposition led to the preservation of evidence which would have been destroyed in the course of continued use of the site.

Evidence obtained in the recent analysis of the *Swanscombe* deposits has led Bridgland *et al.* (1984) to a new chronological interpretation of the Swanscombe Pleistocene sequence and its rate of formation (cf. Wymer 1974; Roe 1981; Hubbard 1982). The floodplain deposits of the Lower Loam were formed under interglacial conditions, as is demonstrated by the results of the analysis of the molluscan fauna, and are traditionally correlated with the Hoxnian interglacial (Kerney 1971). Bridgland *et al.* (1984) report a TL age for the Lower Loam of 228.8 ± 23.3 ka. The quoted TL age for the Upper Loam is 202 ± 15 ka. According to the TL age determinations, there can therefore have been no significantly long interval between the formation of the Lower Loam and that of the Upper Loam. These TL age determinations indicate that the Swanscombe skull fragments, stratigraphically situated between the two Loam complexes, have an age in the 200-250 ka range, which means that they date from approximately the same period as the Maastricht-Belvédère Unit IV-C assemblages. As shown above, the Unit IV-C assemblages at Belvédère, however, postdate the Holsteinian of the Netherlands, which is traditionally correlated with the British Hoxnian. Unfortunately, the mammal fauna of Swanscombe does not provide a sound basis for a biostratigraphical placing of the site's deposits (cf. Cook *et al.* 1982).

Both the biostratigraphical evidence (Chaline 1978; Van Kolfschoten 1985) and a TL age determination of burnt flints show that the Middle Palaeolithic site *Biache-Saint-Vaast* (northern France) is younger than the Maastricht-Belvédère Unit IV-C sites. The determination of the biostratigraphical position of the site was, however, based largely on the evolutionary stage of dentition of *Arvicola terrestris*, of which, according to the excavator (Tuffreau, pers.comm., 1984), only a few diagnostic elements were found. Aitken *et al.* (1985) report a TL age of 175 ± 13 ka for the site. The archaeological finds were situated in a complex of fluvial and colluvial deposits, formed under temperate and cold-temperate conditions prior to the formation of the typical loess deposits in which the Eemian

'Sol de Rocourt' was formed (Sommé *et al.* 1986). The sedimentary complex shows a succession of two temperate phases separated by a colder interval. The first temperate peak is the most pronounced one. Sommé *et al.* (1986) interpret the palaeoloecological data as indicating an environment comparable to that of the Early Weichselian interstadials, and reject an 'interglacial' status for this temperate phase (see also: Chaline 1978; Poplin 1978). The TL age determinations mentioned above date the first temperate period recorded at Biache-Saint-Vaast to 175 ± 13 ka, i.e. the beginning of Oxygen Isotope Stage 6. The rich Middle Palaeolithic flint industry of Biache has been reviewed by Tuffreau (1986) and Boëda (1986). The debitage of all the levels is Levallois. Boëda has shown that one and the same core was used to produce several 'Levallois' flakes. Many Levallois flakes had not been transformed into retouched tools. Tuffreau (1986) suggests that the fact that the tools from several levels consist of only moderately retouched flakes may be due to the short duration of the occupation. The majority of the simple or double scrapers that dominate the toolkit show only slight retouching. Handaxes are absent. The site has yielded a very rich mammal fauna: in the 1976 campaign an area of 300 m^2 was excavated, yielding approximately 3 tons of faunal remains, among which Poplin identified several bones with cut-marks (Poplin 1978). As at Bilzingsleben, the calcareous matrix of the finds, consisting of finely-grained fluvial deposits, had also preserved remains of lion (*Panthera* sp.) and other predators (*Felis* cf. *sylvestris*, *Canis lupus*; Auguste 1986).

Finally, the *Rheindahlen* loess-pit should be mentioned, the 'type site' of Bosinski's (1982) Rheindahlen group, named after the archaeological inventory of the Saalian level B3 at that site: in the middle of the 'Saalian' loess underlying the Grey Brown Podzol (*Parabraunerde*) dating from the last interglacial a rich flint industry was found in the 'mottled horizon' (*Fleckenlehm*), which presented little evidence of the Levallois technique and included many well-made side-scrapers and points (Thieme *et al.* 1981; Thieme 1983a). At first glance, the B_3 tool assemblage shows some similarity to the Belvédère Site K material. Recently, Zöller *et al.* (1987) published a TL sediment age of 167 ± 15 ka for the *Fleckenlehm* at Rheindahlen.

9.6 Early Middle Pleistocene sites and the pseudo-artefact problem

In the author's opinion, the Belvédère Unit IV-C sites represent the oldest well-dated material remains of Pleistocene human activities in the Netherlands. The flakes from Unit III, discussed in chapter 3, date from before the formation of the Unit IV sites, possibly from the cold phase preceding the warm-temperate 'Unit IV' phase.

In recent years, however, Dutch amateur archaeologists have published a large number of lithic objects that are interpreted as artefacts and are attributed to a 'Chopper-Chopping-tool Complex' (Franssen/Wouters 1983; Van Es/Franssen 1984). The dates ascribed to these lithic assemblages generally vary from Middle Pleistocene to the earlier phases of the Lower Pleistocene, although presumed Pliocene finds have also been published (Van Es/Franssen 1984). Thanks to the generous cooperation of Mr A.M. Wouters (Lent) and others, the author has been able to study several of these 'Chopper-Chopping-tool Complex' collections in recent years. In the author's opinion, which is totally divergent from that of Mr Wouters and his colleagues, the lithic objects presented to him as artefacts belonging to the 'Chopper-Chopping-tool Complex' tradition do not show any convincing signs of human workmanship and are, alternatively, to be interpreted as *pseudo-artefacts*.

In 1983, the author was able to study a flint object found by De Heinzelin at Halembaye (Belgium), 5 km south of Maastricht. This object had been found in a section in which gravel belonging to the Sint Pietersberg High Terrace deposits was exposed (De Heinzelin 1977). In a recent outline of the Belgian Palaeolithic (Cahen/Haesaerts 1984) this find is presented as evidence of human activities in the 'Cromerian'. In the author's opinion, the flint is clearly a pseudo-artefact of the same kind as can be collected in large numbers from the flint-rich Maas terrace gravels (Bartstra 1977). 'Pre-Acheulian artefacts' collected from High Terrace Maas gravels in South Limburg were published in 1950 (Thisse-Derouette 1950). Wouters (1952-1953) critically reviewed these finds and stressed that there were many pseudo-artefacts in these flint-rich deposits.

Therefore, sound evidence of the presence of man in the earlier Middle Pleistocene of the Netherlands is virtually lacking. In fact, if we try to gather evidence of human activities in northern Europe during the earlier parts of the Middle Pleistocene, i.e. prior to the Bilzingsleben occupation phase discussed above, we are regularly confronted with the pseudo-artefact problem. There seem to be only a few archaeological sites from this time range in northern Europe. Westbury-sub-Mendip in Great Britain was presented as a site with archaeological material dating from the 'Cromerian' period (Bishop 1974, 1975; Roe 1981). According to Cook (1983), however, the flint material from this site does not show clear traces of human working, and we may well be dealing with an assemblage of pseudo-artefacts.

The Belgian site La Belle Roche at Sprimont (province of Liège) has been published as a continental counterpart of Westbury-sub-Mendip but serious objections can be made against the presented artificial character of the 'stone industry' (cf. Roebroeks 1986b). The site at Sprimont is currently being investigated by a team from the University of Liège (Cordy 1980, 1981). The site is situated on the right bank of the river Amblève in the 'La Belle Roche' limestone quarry, where carboniferous chalk is being extracted. The finds come from a horizontal karst gallery, which is part of an extensive karstic system and is exposed in the upper part of the limestone, approx. 60 m above the Amblève. The entire karstic system is filled with detrital sediments and stalagmitic deposits. The horizontal karst gallery is 12 m long and 1.5 m high, and two vertical pipes ('chimneys') less than 10 m high extend to the land surface. The sediments filling the horizontal gallery consist of a basic gravel unit, overlain by a series of mudstone layers, about 70 cm thick, sealed by a calcite layer, which has been subjected to U-series dating analysis (Gascoyne/Schwarcz 1985). The upper half of the mudstone layer contained rounded limestone cobbles, stalagmite fragments, faunal remains, and about 40 small pieces of severely weathered flint. In addition to the flint objects, it contained some quartz and quartzite pebbles (Cordy 1980, 1981). Gascoyne and Schwarcz (1985) mention that the matrix of the faunal and lithic finds must have been deposited as a series of mud flows that descended through the vertical shafts from higher levels in the karstic system, which are now eroded. Because of the presence of remains of *Ursus deningeri* and *Panthera gombaszoegensis*, Cordy has placed the rich and well-preserved micro- and macro-faunal remains which were found in a secondary context in an earlier part of the Middle Pleistocene. The U-series dating of the calcite has provided a *terminus ante quem* of 350 ka for the deposition of the mudstone layer and the objects embedded in it (Gascoyne/Schwarcz 1985).

According to Ulrix-Closset (Cordy/Ulrix-Closset 1981), the flint assemblage includes some chopping tools, cores, polyhedrons, and flakes with archaic characteristics, and resembles the 'Budien' assemblage of the Middle Pleistocene site of Vértésszöllös in Hungary (Kretzoi/Vértes 1965; for illustrations of the Sprimont flint assemblage see: Cordy 1980, 1981).

The author has visited the Sprimont site several times with the excavator, J.M. Cordy, and has had the opportunity to study the stone assemblage. Cordy was of the opinion (pers.comm., 1983) that the combination of a very primitive flint-working technique and extreme weathering makes it difficult to identify the lithic objects as artefacts, but the author could not detect any characteristics in the assemblage that could be attributed to human activities and does therefore not regard the collection as an archaeological assemblage. As Cook *et al.* (1982: 56) have stressed, in these very problematical cases '... the burden of proof must fall on the shoulders of the excavator ...'.

One of the implicit arguments for human involvement in the case of the Sprimont stone assemblage is that currently there is no flint in the Sprimont region. This is incorrect, for the site lies in the vicinity of one of the places where the well-known *Eolith* problem was studied. The Belgian geologist Rutot's first and most important eolith-site, Boncelles (Rutot 1907), lies about 12 km to the west of Sprimont. Oligocene eoliths have been collected in the surroundings of Boncelles, to the west of Sprimont, and at Baraque Michel, 25 km to the east. According to Rutot and later generations of geologists, this region was originally covered by a *cailloutis* that enclosed the eoliths. Nowadays, the remnants of this *cailloutis* are known as the (Upper) Oligocene Basal Conglomerate (Calembert 1954; W.M. Felder, State Geological Survey, the Netherlands, pers.comm., 1983). The 'fresh' eoliths collected by Rutot from this *cailloutis*, and also from higher -Tertiary- levels, are stored at the Royal Belgian Institute of Natural Sciences at Brussels, where the author has had the opportunity to study them; the general morphology of the pieces matches that of the weathered pieces found at La Belle Roche (see figures in Rutot 1907 and in Cordy 1980, 1981). Karstic sinkholes may well have trapped early Middle Pleistocene (or older) remnants of this Tertiary cover, which were subsequently transported through the karstic system into the horizontal karst gallery. The Tertiary cover was eroded in later times by the downcutting of the Amblève, which today flows 60 m below the level of the site.

This alternative explanation is supported by three observations:

1. In a limited study of the literature, the author found that even today remnants of the Oligocene cover are present at Sprimont and in its environs (Calembert 1954: 515). According to W.M. Felder (State Geological Survey, the Netherlands), *cailloutis* flints of the kind as discussed above, and eluvial flints have been found on the right bank of the Amblève (pers.comm., 1986).
2. It is interesting to note that Rutot (1907: 479) also described a case near Fonds de Forêt, 7 km southwest of Liège, where a vertical channel tapped the Oligocene cover and had transported several cubic metres of this cailloutis into a cavity.
3. In discussing the site's taphonomy, Gascoyne and Schwarcz (1985) note that 'Neither the faunal assemblage nor the mode of emplacement of the deposits indicates that any part of this cave system was ever occupied by hominids. The presence of artefacts in the cave sediments may be the result of stream transport or other sediment movement into a karstic sinkhole.' (1985: 642).

In conclusion, the absence of clear traces of human modification of the Sprimont stone assemblage and an alternative explanation for the 'natural' occurrence and morphology of the lithic objects in the karst gallery calls into question the interpretation of La Belle Roche as an archeological site. Further critical study and further evaluation of the finds and their contexts is necessary in view of the problems discussed above.

In the author's opinion, it is necessary to discuss such problems openly in order to keep false information from creeping into the written 'archaeological record' and being used in other contexts. For example, in a paper by Schwarcz and Latham (1984) on U/Th dating evidence from Vértésszöllös, Sprimont is cited as one of the sites showing that by the time of the occupation of Vértésszöllös '... lithic industries, dominated by large bifacial tools, were already made elsewhere in Europe ...' (Schwarcz/Latham 1984: 334).

The best evidence of the presence of man in northern Europe in an earlier part of the Middle Pleistocene seems to be the Mauer mandible, the earliest hominid fossil found in Europe (cf. Cook *et al.* 1982). The mandible was found in the Lower Sands in the Grafenrain quarry, at which level the biostratigraphical marker horizon of the *Mimomys-Arvicola* transition has been set (Von Koenigswald 1973). This transition must have taken place after the deposition of the Cromerian type sequence at West Runton, where *Mimomys* is still present (Cook *et al.* 1982). According to Zagwijn (in press), the typical Cromerian, as defined at West Runton, correlates with the latest interglacial (Interglacial IV) of the 'Cromerian-complex' found in the Netherlands. Van Kolfschoten (in press), however, recently stated that the fauna of West Runton is *older* than the fauna known from Noordbergum in the Netherlands, dated as Cromerian IV on the basis of pollen-analytical evidence. Van Kolfschoten infers that the *Mimomys-Arvicola* transition took place in the glacial period preceding the Cromer IV (Noordbergum) interglacial. In the Netherlands the palaeomagnetic Brunhes/Matuyama boundary is set between Interglacial I and II of the Cromerian-complex (Zagwijn *et al.* 1971; Zagwijn/De Jong 1983-1984), which indicates that the *Mimomys-Arvicola* transition took place well after 700 ka; this gives us a rough idea of the age of the Mauer mandible: taking into consideration the correlation problems mentioned we thus arrive at an age of approximately 400-600 ka.

Although Rust (1956, 1957, 1965, 1971) claimed to have found artefacts at the same stratigraphical level as that where the mandible was found, recent work by Müller-Beck, reviewed in Cook *et al.* (1982), indicates that the mandible site contained no stone artefacts.

The age of the Vértésszöllös site has recently become the object of a discussion because of an incongruity between the biostratigraphical position of this site and its U/Th dating (Schwarcz/Latham 1984). Kretzoi and Vértes (1965) originally assigned a Biharian age to the site, which they equated with an early 'Mindel' stage on the basis of the faunal assemblage, which contains remains of *Panthera gombaszoegensis*, *Ursus deningeri*, *Trogontherium scherlingi* and the vole *Arvicola cantiana*. According to Schwarcz and Latham (1984), the travertines containing these faunal remains and the associated human fossils and artefacts appear to have been deposited over a span of about 40,000 years, centred around 185 ± 25 ka. Accordingly, the Vértésszöllös site should be roughly contemporaneous with, or even younger than the Belvédère Unit IV sites, which places two *biostratigraphically* completely different faunas (cf. Van Kolfschoten in press) in the same time range. This controversy clearly reveals the limitations of the dating methods currently at our disposal.

The morphology of the Vértésszöllös stone industry, made from quartz, quartzite, flint, chert and radiolarite (Kretzoi/Vértes 1965), seems to have been dictated by the small dimensions of the raw material, as was the case at Bilzingsleben. The pseudo-artefact problem mentioned above also played a role in the Vértésszöllös analysis, since it was not always possible to make a clear distinction between naturally altered and artificial pieces during the excavation (Müller-Beck 1977; Cook *et al.* 1982).

With the sites of Westbury-sub-Mendip, Sprimont, Mauer and Vértésszöllös the main European earlier Middle Pleistocene sites relevant in this context have been discussed. This is not the place to discuss southern European Middle Pleistocene sites; Cook *et al.* (1982) have extensivly discussed the Arago cave at Tautavel (France), the chronological placement of which still gives rise to problems.

Besides the sites already mentioned above a large number of sites have been published in recent years, which are said to provide evidence of hominid occupation of Europe in the earlier parts of the Middle Pleistocene or even earlier. Bosinski, for instance, mentions the presence of artefacts below the Brunhes/Matuyama boundary in the Neuwied Basin (Bosinski 1988), while Bonifay (1988) presented a large number of Early Pleistocene 'sites' in the Massif Central at the 1988 Andernach conference on the earliest occupation of Europe.

The colonization of Europe, with its interseasonal differences in productivity of the environment and its relatively low temperatures, must have required specific forms of adaptation on the part of the hominids who were to be the first inhabitants of this continent. Overcoming the 'winter stop' of the environment must have been one of the greatest problems in this context. If archaeologists are to establish *how* and *when* early hominids became capable of surviving in these northern temperate zones then the claims for all early sites in Europe must be subjected to a critical evaluation, concentrating on the artificial character of the stone assemblages, their age determinations, etc. Such a study, involving an analysis of the original lithic assemblages, could provide archaeology with a fresh yardstick with which the colonization of Europe could be measured.