High Resolution Archaeology at Verberie: Limits and Interpretations
Author(s): Francoise Audouze and James G. Enloe
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High resolution archaeology at Verberie: limits and interpretations

Françoise Audouze and James G. Enloe

Abstract

Verberie is a late Palaeolithic site with high resolution in the preservation of archaeological materials and their spatial configuration. While excellent preservation offers great promise for the interpretation of past human behavior, it cannot be assumed that this is a totally pristine site. Post-depositional pedogenetic processes have eradicated stratigraphic bedding of the sediments, leaving a methodological challenge for the archaeologists to separate materials from multiple occupation lenses, which have retained most of their spatial integrity. Impressionistic back-plotting, statistical analysis of artefact elevations, and refitting of flint, fire-cracked rock and reindeer bones have contributed to deciphering the depositional puzzle. These have revealed artefact associations and spatial configurations which can be given well-founded behavioral interpretations derived from experimental and ethnoarchaeological research.

Keywords

Verberie; Upper Palaeolithic; micromorphology; hearths; refitting.

High resolution: real or imagined?

High resolution archaeology might be seen as the dream of every field archaeologist – a perfectly preserved site, no natural or post-depositional disturbances, in short, no Schiferian N- or C-transforms (Schiffer 1987: 22). All too often, the dream is just that, more a figment of the archaeologists' imagination than a depositional reality. The archaeological record is a far more complex phenomenon, one that requires considerably more sophistication in its reading. Binford (1981a) has suggested that, while much of the archaeological record has suffered greatly from preservation and disturbance problems, the task of the archaeologist is not to dismiss those data as distorted nor to seek only the pristine as usable, but rather to find ways to use the bulk of the archaeological record in a productive manner. We must keep this in mind even when we are dealing with the rare and unusual cases of superior preservation of archaeological materials.

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High resolution archaeology refers not only to excellent preservation of artefacts and objects themselves, but also to the integrity of their spatial configurations, which are presumed to represent organizational aspects of human behavior rather than of geological processes. Even when an archaeological site appears to have been not at all or only minimally altered from its original behavioral context, that very judgement must be demonstrated rather than assumed. One may find that the terms 'pristine' or 'disturbed' are misnomers; we might more realistically seek to evaluate the degree of integrity or disturbance. Such a perspective might allow us to realize that different levels of resolution may characterize an archaeological deposit, requiring varied procedures for reading the record and extracting behavioral information for different classes of data. This appears to be the case in the methodological problem presented to us by the late Upper Paleolithic site of Verberie (Audouze et al. 1981; Audouze 1987; Audouze and Enloe 1991).

Evaluating the resolution level and its limits

In a high resolution archaeological site, it is essential not to be captivated by the good – even exceptional – preservation. We must precisely evaluate under which conditions or for which categories of observations the high resolution can be assessed. In fact, the high resolution may not be valid for all categories of remains (e.g. not for both stone artefacts and bones). The site of Verberie provides a very good example in this respect.

This late Magdalenian open air site is composed of superimposed lenses of archaeological artefacts which are embedded in multiple layers of silt deposited by repeated floods of the River Oise. Because of their thinness and the spatial integrity of the distributions of artefacts, these lenses can be considered as living floors. Six lenses or occupation levels have been identified so far. The thickness of each lens varies across the extent of each level, from the thickness of a single artefact to that of several when artefacts are piled up in dumps. The different lenses of occupation are separated from one another by silt of varying thickness and may even rest upon one another in places when two dumps are superimposed.

A series of characteristics puts Verberie in the category of high resolution archaeological sites. Each lens is flat with a thickness of less than 10 cm (except for the top one slightly perturbed by the plough). Faunal remains, ranging from reindeer to rodents, are well preserved. Features typical of Upper Paleolithic settlements can be observed: hearths with their circular linings of stones as the central basin; tool concentrations around the hearths; and concentrations of flint refuse. The distribution of artefacts in well-delimited concentrations is independent of any gravitational factor (slope movement). Their orientation shows no signs of any taphonomic factor apart from the few pieces which have been aligned by plough furrows in the top level. The artefact concentrations have a varied content: from flint refuse, the result of knapping activities, to mixed dumps filled with heated stones, reindeer bones and flint flakes and blades. The density of artefacts varies from one concentration to the next with no gravity effect apparent anywhere. At a finer level of observation, we find many bones still articulated: vertebrae found by series of five to ten (Plate 1), carpal or tarsal bones – the latter often still in connection with a distal tibia, radius with ulna, etc. At an even finer level of observation, it can be observed that

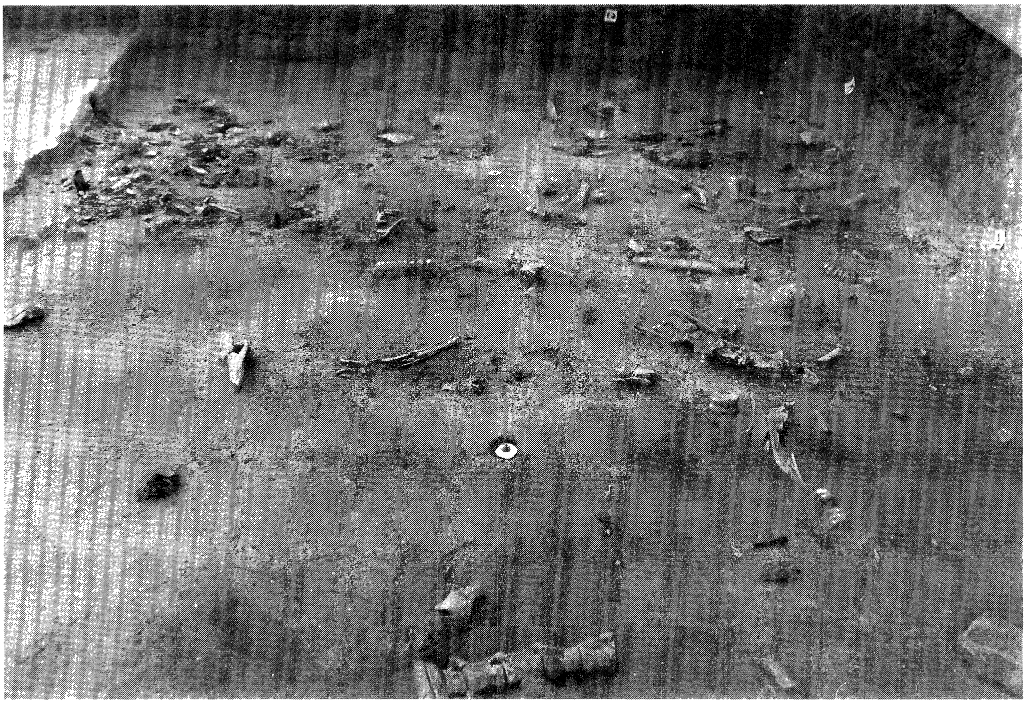

Plate 1 Intact segment of vertebral column *in situ* in level 11.3 of squares K-L1 1-12. Note also the maxillary dental series in place with thin cranial bone not preserved (photo F. Audouze).

bones are often full of old cracks but they are still entire and fall into pieces only if they are not hardened before being lifted.

This information is sufficient to establish the high resolution nature of the archaeological site. It would be unwise, however, to assume that the high resolution is good for all the components of the site. In fact, there is a major discrepancy at Verberie between the precise preservation of artefact positions and the situation of the embedding silt. At the artefact level, it is already possible to observe that intense percolation of water has taken away most of the ocher and charcoal. The first is only present as spots underneath flint pieces, usually trapped in carbonate. The latter is only represented by micro-particles (2 to 5 mm: see Wattez 1994) which give a dark hue to the sediment inside the hearths or the ash refuse areas. The main disturbance comes from the bioturbation which has been very active for a long time. This is primarily a result of worm activity, but insects have also homogenized the sediment which is composed of flecks of quartz, calcite and glauconite, and was originally deposited in successive thin layers. Though successive layers of silt deposited by floods can be discerned, the sediment has been so intensely homogenized that there is no way to record these alluvium layers through photographs, drawn profiles or even latex stratigraphic peels as at Pincevent. This means that, while the artefacts are *in situ*, most of the sediment has been reorganized. As a consequence, the smallest elements – flint, stone and bone chips created from processing activities – cannot be considered *in situ*. While their position in two dimensional space does not seem to have varied a lot (this can be deduced from their position relative to concentrations of larger artefacts), their present vertical position may derive from postdepositional processes. Thus the information which can be deduced from their presence can only be used in association with more firm information. Micromorphological analyses performed on sediment sampled from a hearth indicate a change in the sediment density (Marie-Agnes Courty, pers. comm.).

High resolution sites seem the most appropriate archaeological sites to test hypotheses about camp spatial organization and social organization, particularly when, as at Verberie, we assume that the site was created by the remains of several short-term occupations and is composed of successive living floors (we will not discuss here the relevance of the term living floors applied to Verberie: we consider that a living floor, though exposed as a two-dimensional surface, always has a minimal thickness at least). But if we want to make paleoethnological inferences it is vital to discriminate the successive occupations. The more we want to draw assumptions from the positions of artefacts, the more strictly we must control stratigraphy. Otherwise, the inferences drawn from the data may turn out to be biased through mixing of several occupations. Thus we are paying more and more attention to stratigraphic control, in order to control our inferences on seasonality and on the size and composition of the hunting group size. This is particularly tricky at Verberie, first because of the proximity of the successive living floors (five in 25 cm), and second because of the homogeneity of the sediment which does not permit any discrimination on the basis of sediment layers. After twenty years of excavation, it is clear to us that no single method is sufficient to solve the stratigraphic problem and that several complementary methods must be applied according to a heuristic procedure.

Stratigraphic control

The technique of digging naturally aims at exposing horizontal living floors as defined by the bases of the horizontal artefacts. It is impossible to rely on it completely. Not all students are always good diggers, and additionally in the case of piled dumps, and of pieces turned oblique or vertical by rodents or by later Magdalenian trampling, it is sometimes impossible to know where one living floor ends, and where another one starts.

Taking vertical photographs of the excavated meter squares before lifting the artefacts is usually preferred to drawings because it fixes an image of the dug square at a known moment in time, whereas drawings can always be enriched later. Moreover, photographs have a focus which gives a sense of depth. In several occurrences, photography has been very helpful in identifying digging errors when part of a meter square has been at one level and the rest at another one.

Since 1991 we have used an electronic theodolite connected to a microcomputer and have been able to record three-dimensional coordinates of all the artefacts (larger than 2 cm) with much more precision than before. In addition, we are able to take multiple readings on elongated objects, from which we can read orientation and inclination. The fine-grained data are thus immediately on the hard disk and can be easily and quickly converted to horizontal or vertical plots, or can be analysed statistically.

Vertical profiles allow us to inspect the range of thickness of material in an occupation level and the amount of sediment separating it from its neighbours. Figure 1 shows the

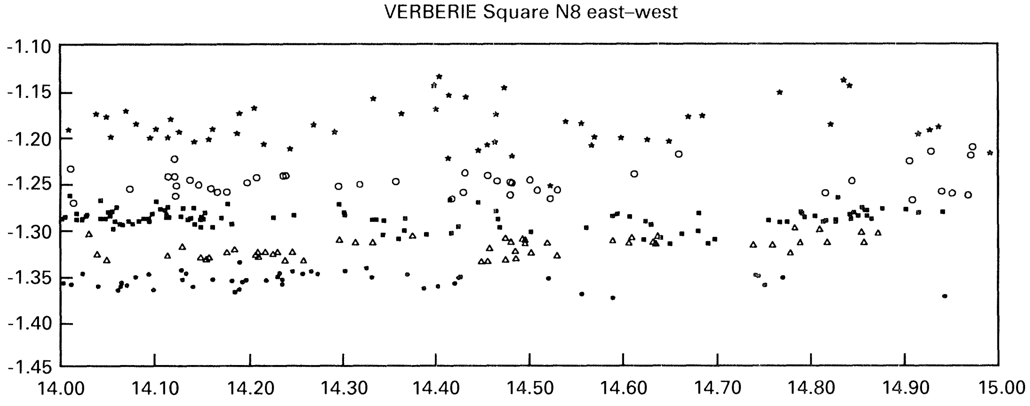

Figure 1 Vertical profile back plot of elevations of artefacts in square N8 (stars = II.1 ; open circles = II.2 ; solid squares = II.21; open triangles = II.22 ; solid circles = II.3).

vertical distribution of artefacts in square N8: note the discontinuous clusters of artefacts assigned to levels II.1, II.2, II.21, II.22 and II.3. Dibble and McPherron's (1994) plotting program also permits the display of objects from which multiple measurements were taken. Thus we can see whether objects are lying flat, thereby giving a good indication of the original ground surface of the living floor; or if they are are tilted at a greater inclination, either from being piled up in a heap of flaking debris, or in a general dump, or because they have been moved up or down by postdepositional forces. These last items can be excluded from spatial or statistical analysis of a level if their vertical position makes the level assignment ambiguous. We count more on the flat objects to define the base of the level and can use them (and the artefacts measured by single points which have similar elevations) with a greater degree of confidence in recognizing and interpreting behaviorally significant human activity patterns.

But if this method is very useful for analyzing the relation between the vertical and oblique pieces and the bulk of horizontal artefacts, the scatter of the pieces in the vertical dimension is frequently too complex for making inferences from the observations of profiles. A few automatic stratigraphic methods exist, but they rest on assumptions we already know not to be valid at Verberie. They usually proceed by attributing pieces to a given layer on the basis of its pre-defined limits, conceived as two horizontal or subhorizontal planes, and of the coordinates of the pieces. They aim at maximizing the layer content while minimizing the inter-layer content. It is not the horizontality which creates a problem (a given angle with horizontal can be introduced in the mathematical definition of the plane), but rather *limits conceived as planes:* occupation layers or living floors are not parallepipedic volumes, they are irregular lenses with a greater volume at the locations of flint refuse areas or stone and bone dumps. While it is possible to estimate the base levels of lenses precisely from the bases of the artefacts, their top limits vary greatly according to the height of the artefacts. A stone, 20 cm thick, and a flint bladelet, 3 mm thick, may rest at the same level, on the same living floor/layer, but their upper surfaces give a highly variable limit to the layer. In fact, the tops of big stones appear in higher layers.

We thus need some statistical control of the stratigraphy. This is why we eventually selected histograms of distribution per square meter. The underlying assumption is that if a living floor is an occupation lens, the levels of the bases of its artefacts will be organized in a normal distribution curve, with most of the artefacts located more or less at the mean level of the living floor. This corresponds with the empirical observation made first by Leroi-Gourhan at Pincevent when he spoke about an 'optimum de decapage' (exposure optimum) (Leroi-Gourhan and Brézillon 1972). When plotting all the artefacts found in a given meter square, we find a curve with several peaks corresponding to the different 'optima de decapage' (Fig. 2).

In order to reduce biases due to bioturbation, oblique and vertical pieces are eliminated, and in difficult cases only large horizontal artefacts are plotted because they are less likely to have moved. In the best cases, we find zero values which mark the interlayers. But even in areas of high density, a sharp decrease can be observed at the limit between two layers. There are only two exceptions: areas of large dumps which are much thicker than the rest of the layers, and those which rest directly one upon the other. Such a situation occurs between layers II.1 and II.2 in the largest dump. Its material relates the two hearths. However, the composition of the dump altered, with bones replacing flint

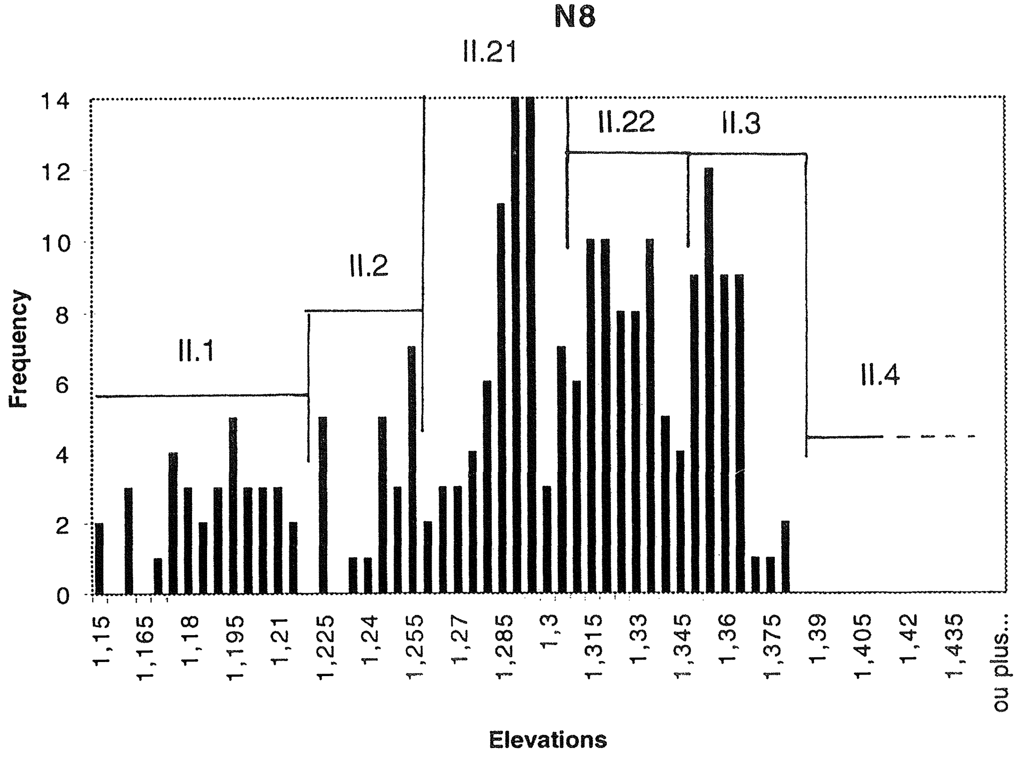

Figure 2 Histogram of elevations of square meter N8. Note clear peaks indicating mean elevations of occupation levels, particularly for II.21, II.22 and II.3. Note the sharp decrease at –.1.22, –1.26 and –1.345 which mark the discontinuity between levels II.1 and II.2, between II.2 and II.21 and between II.22 and II.3.

flakes in the later phase. This situation also occurs between layers II.21 and II.22, where two dumps of identical mixed content are directly superimposed. They can, however, be very clearly distinguished in the neighboring meter squares.

This method allows us to identify the variations of inclination but also accounts for the variability in thickness of the layers. It has even permitted us to discover the presence of two additional layers, currently identified during the excavation, but which had not been dug as separate entities at the beginning. A few years ago, the distribution curves indicated four very strong peaks separated by low values in what had been dug as three layers. The histograms allowed us to go back to the plans and find that the division often had a correlate in the excavations, because two successive exposures had been necessary to complete the uncovering of the original layer (II.2 was subsequently divided into II.2 and II.21). It was then possible to redraw plans for every layer. More recently, this new layer was redivided into two layers (II.21 and II.22), when a hearth was found during excavation away from the dump area. It was surrounded by stones, the bases of which had levels intermediate between the layers II.21 and II.3. Through analyzing the altitudes of meter squares away from the dump in a distribution histogram, it was again possible to identify a decrease in density strong enough and stable enough from one square meter to the adjacent ones to identify this intermediate layer.

Micromorphology

Micromorphological analyses which bring so much information about the history of sediment during and after the occupation raised a lot of hope when Courty et al. (1994) proved that living floors left typical micromorphological signatures. Unfortunately, these signatures are at the micromillimetric level and we have for the moment no way to correlate these micromorphological surfaces with our archaeological living floors – virtual surfaces defined by the bases of artefacts of different thickness. Moreover, at Verberie, micromorphological analyses indicate that bioturbation disturbed these surfaces, which are found as relics at different elevations (Wattez 1994). These floors engendered by human trampling seem to be better preserved in caves than in open air sites but in both types of site they raise a problem. Such pedologic floors are much more numerous than the living floors inferred from archaeological digging. One possible explanation is that, in between two identified occupations, other camps settled in the vicinity and resulted in extended stepped surfaces beyond them. In any case it invites caution about the uniqueness of occupation at any time.

Refitting patterns

The refitting of various kinds of artefactual materials has yielded information that permits evaluation of stratigraphic identifications, and that can subsequently be interrogated in a search for patterns of human behavior. Although these studies are best developed for technological analysis of flint-knapping and the identification of areas of such activities on archaeological sites, much recent progress has been made in application of refitting analysis to other materials (Hofman and Enloe 1992).

Flint refitting performed by Daniel Cahen (1981) on the local flint indicates relations between the Dl hearth and its surrounding activity area, other neighboring activity areas and the big central dump. Flint-knapping activities seem to have been conducted in a slightly different way than at Pincevent or Etiolles. Most concentrations of knapping debris are secondary refuse, mixing several knapping operations. The only exceptions are one area in square J1 where Pierre Bodu found that an 'exotic' brown bartonian flint had been knapped and left *in situ* and its refuse mostly left at the spot or distributed in the large neighboring dump. The very few complete blades and tools are distributed in the neighboring meter squares, and near the second hearth (M20). The second exception is a knapping area close to the Dl hearth, which may have been used to knap two local blocks of excellent quality and with a more sophisticated technique, in order to produce long blades which seem to have been taken away. The big central dump thus looks like a central place in the occupation and connects the two hearths.

Refitting work is not yet completed, but raises more problems than in the other Magdalenian sites from the Paris basin. The scatter in secondary position of the very homogeneous, black or grey local flint makes refitting much more difficult than in the cases of the relatively infrequent 'exotic' flints. The small amount of refitting completed on the local flint has indicated only short linkages, consisting most often of a spatial cluster of all the remaining debris from a flint nodule knapping episode. Rarer 'exotic' flint may connect the two hearths, but only by identification of the distinctive flint rather than by actual refits.

Refitting of hearth stones allows us not only to connect the D1 hearth with the big central dump but also to add a time dimension to analysis of the occupation. A small piece of limestone found in the bottom of the hearth turned out to be part of a much larger block, pieces of which were found in the big central dump. We may thus infer that the blocks which surround the hearth are part of renewed construction of the hearth after broken heated stone had been removed. This may represent the last of one or more cleanings and renewals of the hearth. We may thus infer that the Ml hearth, which is only partially surrounded by a lining of small stones, and is full of small stones, flint pieces and bones, is at a more advanced stage of use, but before cleaning.

Bone refitting can serve both methodological and interpretive purposes. Mechanical refits of fragments of the same bone, coupled with identification of bilateral pairings or adjacent articulations in limb bones of reindeer, can be used to evaluate contemporaneity within an identified occupation surface. Since food from animal resources is not of the same order of durability as flint resources, we would not expect reuse of the same pieces at any later date: and such objects thus serve as a test of the temporal separation of lenses identified as different occupation levels (Enloe 1991).

Interpretation of the patterning

It is only after we have evaluated and determined the integrity of content and spatial configuration in the archaeological site that we can move to an interpretation of the patterning for understanding human behavior. How can we best give meaning to the patterning we find in spatial patterning on high resolution archaeological sites? This must rely on well-founded knowledge about human behavior and most particularly its expression in spatial configurations of material culture that might be preserved in the archaeological record. Many statistical models of association, variation, etc. can yield robust patterning, but the challenge is in its interpretation. It is at this point that Binford's (1977: 1–10, 1981b: 21–30) arguments about middle range theory are most important. We must have sound linkages between the patterns observed in the archaeological data and our interpretations of those data. Perhaps the two most useful middle range theoretical developments for making such linkages come from experimental archaeology and from ethnoarchaeology. Our ability to read and understand the distinctive patterns that result from known kinds of behaviors depends in turn on the resolution of archaeological sites, both in preservation and in excavation and recording. If we have performed our tasks well, and have been able to demonstrate that the patterning we can see is a result of human behavior rather than of geological or other natural processes, we can look for significant signature patterns in the artefactual content and spatial configuration of materials on the archaeological site.

At Verberie, the biometrics of the human body and its effects on the spatial organization of work and its material correlates allow us to make linkages between the patterns we have found and our interpretations of them. There are significant differences between utilization of interior space and utilization of exterior space, between standing and seated work, between intensive, heterogeneous activities and extensive, homogeneous activities. Binford's (1978b) suggestions on understanding drop and toss zones and the organization of space use around hearths have allowed the reconstruction of specific kinds of tool-manufacturing and tool-use activities. This has been seen in the flint refitting previously mentioned. We can also use these principles to understand the association of artefact distributions and hearth features, such as shown by the corona of tools around hearth L8 in Plate 2.

Ethnoarchaeology can provide models for the identification and interpretation of material patterning in the archaeological record. While we cannot, and should not, expect isomorphic identity between lifeways of modern and prehistoric peoples, an understanding of some principles of the organization and content of distributional patterns will allow us to see how and where those principles may be expected in archaeological situations. One of the clearest principles that does not rely on ethnic identity concerns the differences between intensive and extensive space use. At Verberie, the hearths clearly served as foci for a variety of domestic and technological activities. We can compare the density and distribution of several different kinds of artefactual debris to recognize those activities and to draw inferences about how the use of space was coordinated or sequenced for those activities. We can compare those patterns with other Magdalenian sites such as Pincevent (Enloe et al. 1994). Other activities clearly require more space and are so messy as to preclude sharing that space with other activities. One such activity is primary butchering of large mammal carcasses, requiring extensive use of space, but not necessarily adjacent to the hearth. Binford (1983: 124, 169–70) provides an ethnoarchaeological description of Nunamiut activities and the patterning of their archaeological remains that allows identification of one particular mode of butchering, for which we can recognize content and configurational analogs repeatedly in several occupation levels at Verberie. We can discern relatively empty circular areas surrounded by reindeer bones, particularly articulated vertebral column segments, phalanges and other low food utility skeletal elements (Plate 3). These are located peripheral to the artefact concentrations adjacent to

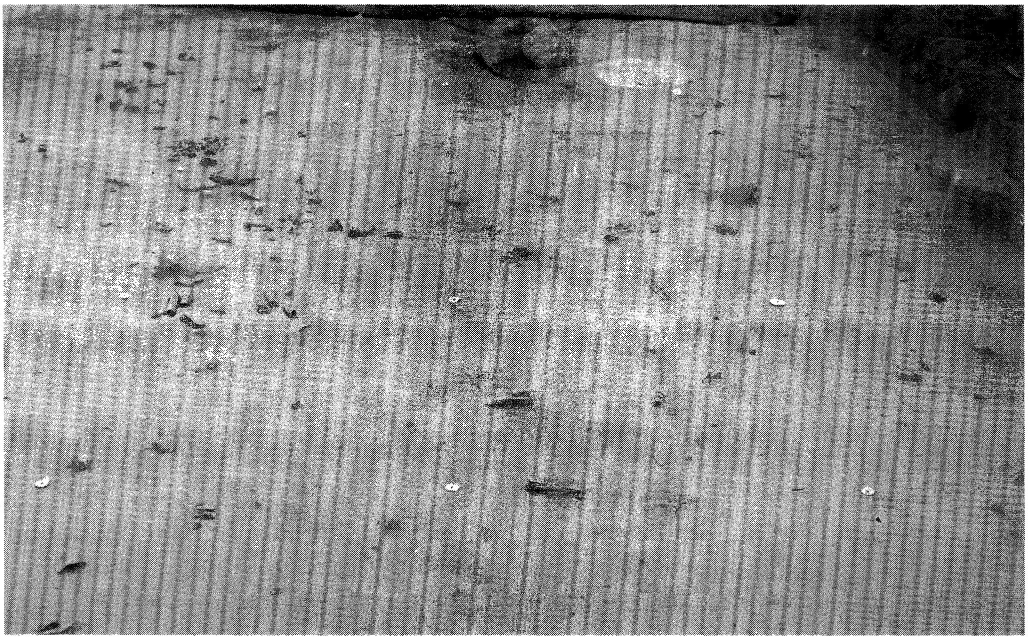

Plate 2 Corona of lithic debris, especially rich in retouched tools, surrounding hearth L8 in level II.21 (photo F. Audouze).

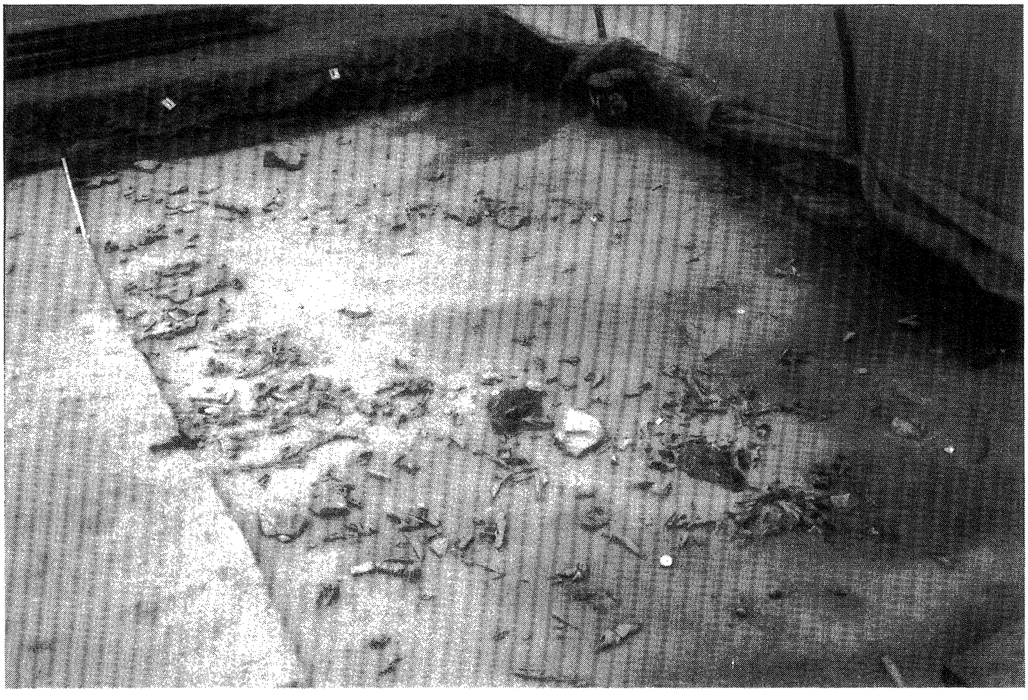

Plate 3 Portion of empty circle of butchering area in level II.22 of squares I-K/4-7, surrounded by reindeer bone fragments, with unretouched flint blade knives in the center (photo F. Audouze).

the hearths. This corresponds to the patterning that Binford identified for primary butchering. In addition, in the middle of the areas devoid of bone debris, we find unretouched flint blades of the kind Keeley (1981) has identified as carrying meat polish on their edges. This not only tells us about the internal organization of space use in the campsite, but it also helps confirm an identification of the site as primarily a hunting camp.

The horizontal distributional patterns of refits and linkages between dispersed elements of a single reindeer carcass can inform us about sequences of skinning, disarticulation and butchering procedures on the site. These are largely consistent with the butchering areas away from the hearths and the domestic activity areas adjacent to the hearths. Additionally, they can serve as the basis for inferences about carcass-partitioning relevant to the social distribution of meat and food sharing (Enloe 1991, 1992, 1994). Figure 3 shows the spatial distribution of refitted elements of portions of eight individual reindeer carcasses on level II.1. Although there are linkages evident between the Dl and M20 hearths, the majority of the refits link the hearths to, or are concentrated in, the main dump in G-H-I/17-18-19. There is thus limited evidence of social interaction between the two hearth

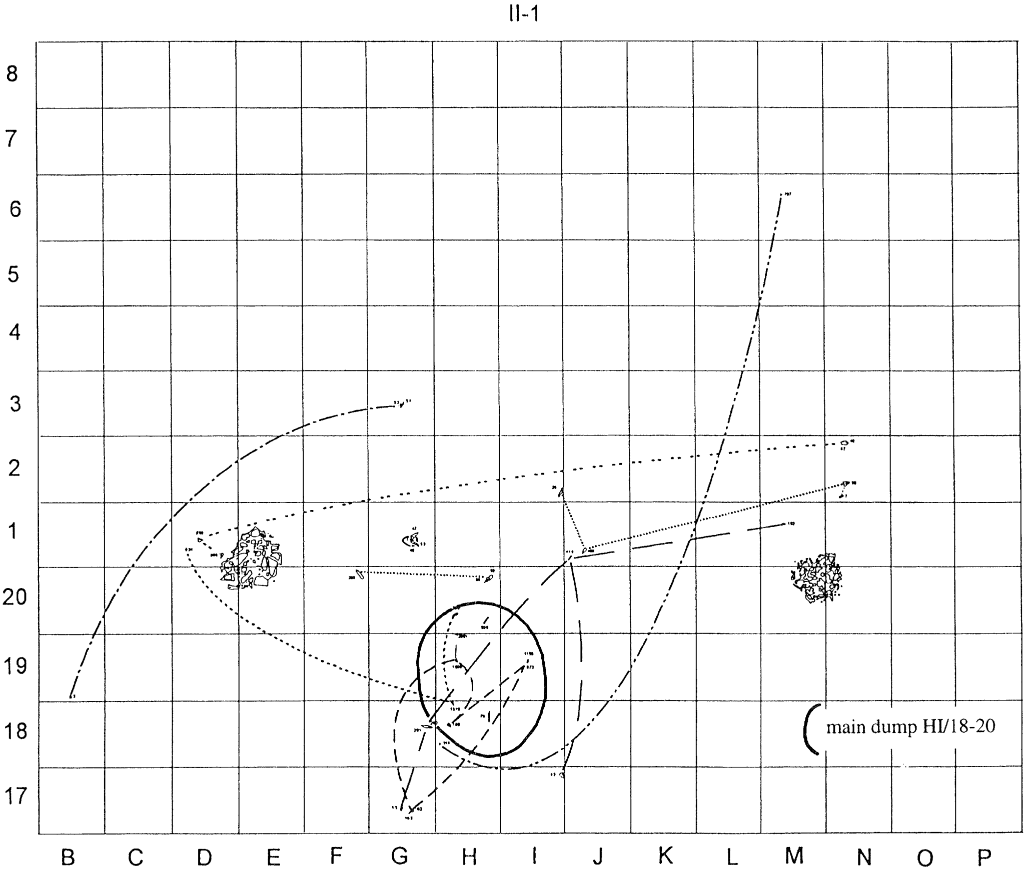

Figure 3 Refits between forelimb elements of eight different individual reindeer skeletons scattered between and around the two hearths (Dl and M20) in level II.1.

areas. This pattern contrasts strongly with the reciprocal food sharing evident at the residential campsite of Pincevent (Enloe 1992), strengthening the functional identification of Verberie as a hunting camp.

Conclusion

Verberie is not Pompeii, but it is nonetheless a high resolution archaeological site with great integrity in patterning in artefactual content and configuration, which offers great promise for the interpretation of prehistoric behavior. The problem and the potential trap of dealing with high resolution sites is twofold. First, we cannot allow the excitement or hubris at the luck of our finding such sites to override our prudence in their interpretation. We must use such archaeological opportunities to evaluate rather than to assume the degree to which high resolution can aid us in the interpretive tasks. This is a methodological challenge: to define the limitations set by varying degrees of resolution among different classes of data. Statistical and geological studies are helping us investigate site formation processes in more and more sophisticated fashions. Second, we must develop more stringent experimental and ethnoarchaeological research to enable soundly based inferences from the more intact patterning that high resolution sites can offer. Both of these conditions must be met before we begin telling stories about the past.

Françoise Audouze
Centre de Recherches Archeologiques
CNRS, Meudon

J. G. Enloe
Department of Anthropology, University of Iowa

References

Audouze, F. 1987. The Paris basin in Magdalenian times. In *The Pleistocene Old World* (ed. O. Soffer). New York: Plenum Press, pp. 183–200.

Audouze, F. and Enloe, J. G. 1991 Subsistence strategies in the Magdalenian of the Paris Basin. In *The Late Glacial in North-West Europe: Human Adaptation and Environmental Change at the End of the Pleistocene* (eds N. Barton, A. J. Roberts and D. A. Roe). London: Council for British Archaeology, Research Report 77, pp. 63–71.

Audouze, F., Cahen, D., Keeley, L. and Schmider, B. 1981. Le site magdalénien du Buisson Campin à Verberie (Oise). *Gallia Préhistoire,* 24(1): 99–143.

Binford, Lewis R. 1977. General introduction. In *For Theory Building in Archaeology: Essays on Faunal Remains, Aquatic Resources, Spatial Analysis, and Systemic Modeling* (ed. L. R. Binford). New York: Academic Press, pp. 1–10.

Binford, Lewis R. 1978a. *Nunamiut Ethnoarchaeology.* New York: Academic Press.

Binford, Lewis R. 1978b. Dimensional analysis of behavior and site structure: learning from an Eskimo hunting stand. *American Antiquity,* 43(3): 330–61.

Binford, Lewis R. 1981a. Behavioral archaeology and the 'Pompeii premise'. *Journal of Anthropological Research*, 37(3): 195–208.

Binford, Lewis R. 1981b. *Bones: Ancient Men and Modern Myths.* New York: Academic Press.

Binford, Lewis R. 1983. *In Pursuit of the Past: Decoding the Archaeological Record.* New York: Thames & Hudson.

Cahen, D. 1981. Premiers résultats de l'étude par remontage. In *Le site magdalénien du Buisson Campin à Verberie (Oise)* (F. Audouze, D. Cahen, L. Keeley and B. Schmider). *Gallia Préhistoire,* 24(l): 123–37.

Courty, M.-A., Goldberg, P. and MacPhail, R. I. 1994. Ancient people – lifestyles and cultural patterns. In *Transactions du 5e congres mondial de Sciences du Sol, symposium B: Micromorphological Indicators of Anthropological Effects on Soils*. International Society of Soil Science, Mexico, vol. 6a: 250–69.

Dibble, H. and McPherron, S. 1994. *New Plot Version 6.3.* University of Pennsylvania.

Enloe, J. G. 1991. Subsistence organization in the Upper Paleolithic: carcass refitting and 3T3 food sharing at Pincevent. Doctoral dissertation. University of New Mexico. University Microfilms 9208123, Ann Arbor.

Enloe, J. G. 1992. Le partage de la nourriture à partir des témoins archéologiques: une application ethnoarchéologique. In *Ethnoarchéologie: Justification, Problèmes, Limites* (eds A. Gallay, F. Audouze and V. Roux). Juan-les-Pines: Centre de Recherches Archéologiques du CNRS, Editions APDCA, pp. 307–23.

Enloe, J. G. 1994. Le problème du partage du gibier et l'organisation sociale des chasseurs préhistoriques. *Annales de la Fondation Fyssen,* 9: 9–20.

Enloe, J.G., David, F. and Hare, T.S. 1994. Patterns of faunal processing at Section 27 of Pincevent: the use of spatial analysis and ethnoarchaeological data in the interpretation of archaeological site structure. *Journal of Anthropological Archaeology,* 13: 105–24.

Ge, T., Courty, M.-A., Wattez, J. and Matthews, W. 1993. Sedimentary formation processes of occupation surfaces, In *Formation Processes in Archaeological Contexts* (eds P. Goldberg, M. Petraglia and D. T. Nash). Monographs in World Archaeology 17. Madison, Wisconsin: Prehistory Press, pp. 149–63.

Hofman, J. L. and Enloe, J. G. 1992. *Piecing Together the Past: Applications of Refitting Studies in Archaeology.* Oxford: BAR International Series 578.

Keeley, L. H. 1981. Premiers résultats de l'analyse des micro-traces d'utilisation de quelques objets. *Gallia Préhistoire,* 24(1): 137–41.

Leroi-Gourhan, A. and Brézillon, M. 1972. Fouilles de Pincevent: Essai d'analyse ethnographique d'un habitat magdalénien (La Section 36). VIIé Supplément *Gallia Préhistoire.* Paris: Editions CNRS.

Schiffer, Michael B. 1987. *Formation Processes of the Archaeological Record.* Albuquerque: University of New Mexico Press.

Wattez, J. 1994. Micromorphologie des foyers d'Etiolles, de Pincevent et de Verberie. In *Environnements et habitats magdaléniens dans le centre du Bassin parisien* (ed. Y. Taborin). Documents d'Archéologie Française 43, pp. 120–7.