RECOVERY DURING EXCAVATION AND QUANTIFICATION OF THE FAUNA

RECOVERY DURING EXCAVATION

Faunal remains were classified into two categories during excavation of the sector P16 and I11 sites. The first group consisted of large or important finds which were recorded three-dimensionally and drawn on plans; the second group consisted of more fragmentary finds which were simply collected from each excavated unit and bagged together.

Three dimensionally recorded finds

This group consists of faunal material considered important enough to be recorded in detail by giving »X« (W-E) and »Y« (N-S) co-ordinates to mark the location of the find. The third, or »Z« co-ordinate, is the height of the find relative to a fixed bench height at the site. During excavation faunal remains which belonged to an individual animal but consisted of several elements – such as rows of teeth or portions of the vertebral column – were recorded together under one find-number. Although it was correct to record finds on site in this manner, it did present problems during analysis as each complete element had to be recorded individually in the data-bank. In such cases, one element retained the original find-number and the remaining finds were given provisional numbers consisting of the quadrat number and the next available find number from the site lists. The same technique was employed to correct cases where elements from different species or different elements from the same species had been inadvertently registered under the same number.

»Secondaire« finds

Fragments of bone, teeth and antler were recorded in the category »secondaire«. Secondaire finds from each quadrat were collected and bagged together during the recovery of the three-dimensionally recorded finds. Only an approximate location on site in both the horizontal and the vertical projection was recorded for this material. As part of the current analysis, these bags of material were sorted through by hand. Each bone was investigated for evidence of human modification (worked pieces, cut-marks, impact notches) and, if found, these finds were given a number and stored with the three-dimensionally recorded material. At the same time, the remains of smaller mammals (rodents), mollusc shells and lithic artefacts were separated out for future study by specialists in these fields. Fragments of charred bones were separated from the rest of the secondaire material and weighed by archaeological unit.

QUANTIFICATION OF THE FAUNAS

A total of 4,159 faunal remains from P16 was recorded during this analysis. Twenty-six of the total number of bones differed in preservation when compared to the bulk of the material. Ten of these finds are rather fresh in appearance, and may represent recent intrusive material. The remaining sixteen horse and reindeer bones are well-preserved, yellow in colour, and are covered with a thin red calcareous crust. The preservation of these 16 objects is similar to that observed on bones from the Aurignacian deposits at Solutré, which are also characterized by their reddish colouration. There was, however, no reference to Aurignacian finds in the excavation documentation from P16 and it is possible that these finds represent the reworked Solutrean fauna mentioned in early site reports. The rest of the material, a total of 4,133 faunal remains, consists of well-preserved bones, grey-yellow in colour, whose surfaces showed varying stages of root-etching and weathering. These finds represent the Magdalenian fauna from sector P16.

The Magdalenian fauna from sector P16 comprised two types of faunal remains, those which could be identified to specific level, and those which were too fragmentarily preserved for a definite identification to either species, genus or order. The latter finds were classified into the following groups based on size of the fragment and bone thickness: small (comparable to fox in size), medium (comparable to wolf or reindeer in size) and large (comparable in size to horse or bison). The counts for these fragments are listed below, along with a number of finds which were so poorly preserved that they could not be grouped according to size:

small-sized unidentified	2
medium-sized unidentified	14
large-sized unidentified	72
unidentified to size	5
total	93

Three bird bones, five bones from small carnivores (probably mustelids) and a tooth from a large carnivore, possibly lion, were also present in the Magdalenian fauna. Altogether this category of unidentifiable or less identifiable material totals 102 finds.

A total of 528 bones was recorded from the Magdalenian deposits in sector I11. 500 of these could be identified to species. Two further finds – a fragment of a metatarsal and part of a lower third molar – belonged to a cervid comparable in size to roe deer, but a definite identification to species could not be made on this material. Twelve further fragments of bone could only be grouped according to size. The remaining 14 finds belonged to birds or smaller mammals.

The faunal remains from sector I11 resemble those from sector P16 in their state of preservation. The bones are generally well-preserved, have the same grey-yellow colouration as those from P16 and the bone surfaces have similar stages of root-etching and weathering.

Counts of faunal remains from sectors P16 and I11 which could be identified to specific level are given in table 1. Horse is dominant in the faunas from both Magdalenian sites. 466 horse remains, representing 92.8% of the total number of finds identifiable to a species were recorded in sector I11. The finds represent a minimum of six individuals. At the larger P16 site 3,577 horse remains, representing a minimum of 45 horses were identified. Even though the faunas from these sites are dominated by horse, other species such as reindeer, bison, wolf, fox, bear and wolverine are also present. Typical for reindeer, bison, wolf, fox and wolverine is that they are represented by small numbers of finds and, in the case of the reindeer and bison remains from sector P16, relatively high numbers of individuals.

Faunal list P16 (95m)

archaeological fauna				background fauna			
species	NISP	%	MNI	species	NISP	%	MNI
horse	3577	88.7	45	wolverine	4	0.09	1
reindeer	271	6.6	9	fox	7	0.17	1
bison	142	3.5	5				
wolf	30	0.7	2				

Total NISP: 4031

Faunal list I11 (2m)

archaeological fauna				background fauna			
species	NISP	%	MNI	species	NISP	%	MNI
horse	466	92.8	6	bison	4	0.8	1
reindeer	29	5	3	wolf	1	0.2	1
				small cervid	2	0.3	1

Total NISP: 502

Tab. 1 Basic counts of number of specimens identifiable to a species (NISP), percentage of the total number of NISP (%) and minimum number of individuals per species (MNI) from the Magdalenian horizons in sectors P16 and I11 at Solutré.

Based on the presence or absence of traces of human butchery, such as cut-marks or hammerstone-induced impact notches, the faunas could be separated into two groups, an »archaeological« fauna and a »background« fauna. At sector I11, only the bones of horse and reindeer had been modified by humans. At sector P16, traces of human modification were observed on the bones of horse, reindeer, bison and, possibly, wolf.
Earlier faunal lists from Solutré are comparable in species composition to those in table 1. In 1881 Arcelin published the following list of fauna from the »niveaux récents« at Solutré which had been determined by Lartet: Birds, *Lepus timidus*, *Vulpes vulpes*, *Ursus arctos*, *Mammuthus primigenius*, *Equus caballus*, *Cervus elaphus*, *Rangifer tarandus* and *Bos primigenius* (bison is probably meant here).

THE SPATIAL DISTRIBUTION OF FAUNAL REMAINS AT SECTOR P16

Finds from archaeological sites situated on slopes can be affected by the post-depositional movement of material downslope during phases of solifluction or water run-off, or due to gravitation, and are often no longer *in situ*. The location of the archaeological site on the slopes below Solutré rock suggests that finds may have been affected to some extent by such processes.
At sector P16, the results of sedimentary analyses indicate several phases of deposition over a period of time during which finds accumulated in a channel which had cut through the site. Based on his field observations, Combier described the find situation in sector P16 in 1971 as, »La nappe d'ossement de chevaux du sol magdalénien, couvre l'ensemble de P16 en une large bande diagonale orientée N-W S-E. Il ne s'agit pas d'une coulée de vestiges car à l'intérieur de cette zone, qui déborde certainement la surface actuellement en cours de fouilles, on observe des localisations secondaires, telle la cuvette remplie d'ossements du secteur N-W et la surface dallée du secteur S-E«.
In an interim report dated 1973, Combier repeated his theory that the concentration of finds revealed during excavation at P16 was the result of a long phase of *in situ* deposition of material into the channel

and not the product of movement of finds down the slope. He writes »Nous sommes ici en présence d'un thalweg d'érosion dont le comblement s'est opéré progressivement au cours du Magdalénien final et n'est pas le produit d'un glissement«. Although Combier remarked on the tendency of long bones to be aligned parallel to the long axis of the channel – a feature often recorded in channel situations, where bones have been aligned due to water action – he stressed that »La présence de plusieurs séries de vertèbres ainsi connectées exclut, pour le Magdalénien, la possibilité de remaniements, de solifluxion, ou de simples glissement des vestiges sur la pente«.
It is important to clarify whether post-depositional processes had played a role in the accumulation of finds at the P16 site as the distribution of finds in this sector has often been interpreted as the *in situ* remains of a large-game butchery site. Levine, for example, described the P16 site as follows: »The distribution of horse bones in this level is as would be expected for the butchering area of a large herd-drive kill-site. Bones are found whole and sometimes in connection. Moreover, they are sometimes found grouped according to their location in the skeleton; for example, foot bones in one area and skull bones in another. It is possible that after the animals had been butchered, the discarded bones had been thrown into the solifluction channel and possibly even buried to prepare the site for the next herd drive« (1979, p. 317). Even though Olsen (1989) described solifluction as the greatest taphononic effect operating at Solutré, a detailed analysis of these effects on faunal remains at the site has not been undertaken so far.
In an attempt to assess the extent of post-depositional disturbances affecting this site and, subsequently, to see how far the remaining patterns of faunal distribution could be related to specific human subsistence activities at sector P16 during the Magdalenian phase, a series of plans depicting the general distribution of faunal remains at the site and their relationship to the channel, plots of conjoining faunal remains, distribution plans of some of the horse and bison remains and a plan of the distribution of charred bones were drawn up.

Faunal distribution and the channel feature

As the original find distribution plans made during excavation of the P16 site were not available for copying during the course of this analysis, ink drawings had to be traced from poorer-quality photocopies of the original plans kept in the museum offices at Solutré. Despite these difficulties, the resulting inked plans give a fairly reliable impression of the distribution of material at the P16 site.
The general distribution of animal remains at sector P16 as revealed by excavation is depicted in folding illustration 1. Apart from a few bones in the southern part of sector P16, the main concentration of faunal remains is located within the channel which runs from NW-SE through the site. The distribution of bone which accumulated within this feature shows that the channel was not straight but curved slightly along its length. The concentration of bone in the channel is roughly 2-2 1/2m wide increasing to almost 3m in the centre of the site, in the region of the unexcavated quadrat 45.
Apart from a general topographical plan of the whole sector, documents specific to the size or form of the channel or sections through this feature do not appear to have been recorded, and the outline of the channel depicted in figures 6-13 was extrapolated from figure 5, where the boundaries of the main concentration of finds were taken as representing approximately the »edges« of the channel.
The topography of the site appears to have been recorded after the finds had been removed (folding illustration 2). Surface heights were recorded in relation to a fixed bench level at 50cm intervals over the excavated area but not in the NE and SW parts of the site or in quadrat 1, as these areas had either been excavated deeper onto the level of the Lias Marne prior to surface heights being recorded or had functioned as test-pits. In figure 6, it can be seen that the site slopes from NW-SE, with a difference of about 85cm between the heights measured in the NW and SE corners (height of 54cm measured at top right-hand corner of the test-pit and 139cm measured outside the channel in the SE corner of the site). The channel follows the gradient of the slope.

Four sections across the site (folding ill. 2, 1-4) were reconstructed using the height data on the topographical plan. The NW part of the site is relatively level (section 1); the channel is exposed here as a narrow and shallow depression in the centre of the section. Section 2 was incomplete, as both the NE and SW parts of the site on this transect had already been excavated down onto the underlying Lias Marne before the heights had been recorded. The channel is exposed here as a rather flat and wide trough. In section 3, the channel is about 30cms deep and in section 4, the depth of the channel could be reconstructed to about 60cms.
Density of finds within the channel appears to be related more to the gradient of the slope and channel depth than Magdalenian activities. For example, in quadrats 21, 22, 31 and 32 (see fig. 3 for position of these units) 222 three-dimensionally recorded faunal remains and artefacts were listed, whereas in quadrats 78, 79, 88 and 89, 640 finds had been registered. The bulk of the finds was therefore concentrated downslope in the SE section of the channel, where the feature attained its greatest depth.

Orientation of bones

Patterned orientations of long bones are often the result of fluvial action (Lyman 1994). Although it is clear that we are not dealing with bones which accumulated in a fluvial context at Solutré, just a brief examination of the finds depicted in figure 5 reveals numerous bones with long axes parallel to the long axis of the channel – an observation which Combier had already made in the field - indicating that parts of the faunal assemblage had been oriented after deposition, probably in connection with certain natural processes taking place within the channel. In order to test this theory, the orientation of long bones at sector P16 was analysed in more detail.
One of the ways in which orientation data are typically presented is the rose-diagram (Fiorillo 1988; Toots 1965). Rose diagrams incorporate two-dimensional orientation data based on the azimuth of the long axis of the specimens and are useful indicators of random and non-random patterning in the orientation of long bones. Shipman (1981) recommends that only samples with at least 72 bones be plotted in rose diagrams as larger samples more clearly display orientation patterns, and for this reason a large sample of 342 long bones was traced from folding illustration 1 onto a separate plan (folding ill. 3). The azimuths of the bones were measured on the plan using a protractor. Bone orientation was measured in two different directions firstly, in relation to the compass azimuth and secondly, in relation to the NW-SE orientation of the channel, as bone orientation should be related to geomorphic features and not just the compass azimuth (Frostick and Reid 1983). In the first case, the 90° mark on the protractor was pointed to the north and in the second case, the 90° mark was lined up with the approximate long axis of the channel, i.e. NW-SE. The orientation data are presented in table 2 as numbers of cases observed in 10° classes, and graphed in mirror-image rose diagrams in folding illustration 3 (a and b).
In the first rose diagram (3a), the majority of the long bones are oriented in a NW-SE direction between 0° and 90°, with the highest number of observations falling into the 0°-10° and 81°-90° classes (n = 55 and 34 respectively). Only a small quantity of bones were oriented SW-NE. The diagram shows that the bulk of the long bones is oriented parallel to, or approximately parallel to, the long axis of the channel with one of the two ends of the bone oriented downslope. This phenomenon is more clearly-defined in the second diagram (3b), where bone orientation was measured in relation to channel orientation. Here, only one major orientation group – NW-SE – can be discerned. Both rose diagrams show that within the sample bone orientation is non-random and, as in the case of find-density, related to the presence of the channel and the gradient of the slope.

Compass azimuth		Channel azimuth	
Degree class	Observed frequency	Degree class	Observed frequency
0-10°	55	0-10°	20
11-20°	28	11-20°	11
21-30°	33	21-30°	11
31-40°	30	31-40°	13
41-50°	28	41-50°	27
51-60°	27	51-60°	25
61-70°	11	61-70°	37
71-80°	16	71-80°	34
81-90°	34	81-90°	36
91-100°	13	91-100°	21
101-110°	8	101-110°	31
111-120°	2	111-120°	13
121-130°	12	121-130°	12
131-140°	11	131-140°	22
141-150°	13	141-150°	11
151-160°	8	151-160°	12
161-170°	10	161-170°	2
171-180°	3	171-180°	3

Tab. 2 Observed frequencies of 342 bone specimens per 10° orientation class from sector P16 at Solutré.

Conjoining or refitting studies of bones

Bones which have been refitted during analysis are useful in reconstructing the taphonomic history of a find from the time of its arrival at a site to the time of its recovery during excavation. They contribute to the spatial analysis of the site and, more importantly in the case of sector P16, are useful tools for understanding site formational processes and the recognition of post-depositional disturbance of faunal assemblages. Attempts to conjoin, or refit back together, as many fragments of bone, teeth and antler as possible, were carried out during the course of this analysis. However, the large number of faunal remains from sector P16 meant that bones from only two neighbouring excavated units (or at the most three to four units where find-density was low) could be spread out on the tables in the laboratory at one time for refitting. Thus, the total of 312 conjoins plotted in folding illustrations 4 and 5 represents only a small percentage of the potential total number of conjoining bone fragments from the P16 site.

Three categories of bone conjoins were recorded at sector P16:

Mechanical conjoins are refits between the fragmented pieces of a single element and can consist of single conjoin sets, involving only two fragments, or multiple sets where several fragments of bone could be successfully refitted back together. Mechanical conjoins record bone fracturation which originally took place in the green or »fresh« bone condition, as a result of deliberate smashing of bone by humans to obtain marrow or carnivores cracking bones open when gnawing for example. Fresh or green bone fractures are identified by their smooth fracture surfaces with fracture planes running obliquely to the long bone axis (eg. spiral fractures). Mechanical conjoins also record fractures which took place in the dry or fossilized bone condition, usually after deposition had taken place. Dry or fossilized fractures are characterized by roughened fracture surfaces parallel and transverse to the long axis of the bone.

Anatomical conjoins are re-articulated skeletal elements and also consist of single or multiple sets of finds. Re-articulated bones record the dispersal of skeletal elements as a result of humans disarticulating

animal carcasses during butchery, or carnivores pulling apart an animal carcass during consumption, or the natural disintegration of parts of a cadaver during decomposition.

Skeletal elements from an individual animal record the spatial dispersal, or scattering, of elements from the carcass of an individual animal. Elements were attributed to the same individual animal by comparing size, bilateral symmetry, morphological details or a combination of any of these criteria. Several sets of elements, such as rows of cheek teeth from different individuals of horse, had already been found more or less in anatomical connection during excavation.

Mechanical and anatomical conjoins

Horse remains form the bulk of the conjoined bone fragments and re-articulated bones depicted in folding illustration 4, and 87 out of a total of 88 mechanical conjoins are horse bones. The majority of these (n = 84) are refitted fragments of bones which had fractured in a dry condition and illustrate the post-depositional scattering of horse remains at sector P16. Only three of the conjoining sets comprised fragments from horse bones which had been fractured in a fresh condition, but as none of these pieces bore traces of cut-marks, hammerstone-induced impact notches or carnivore tooth marks, the agent of fracturation remains unclear. One conjoin (C99) comprises fragments from the antler of a reindeer.
43 sets of re-articulated bones could be attributed to horse; two further sets belonged to the wolf (A54) and the bison (A12) respectively. None of these sets could be directly linked to the disarticulation of carcasses by humans, and these sets all appear to be the products of natural processes of disarticulation, which probably took place after deposition of the articulated bones at the site.
Except for conjoin 12 – which connected three bone fragments over a distance of about 6 m – conjoin lengths in both categories were relatively short, varying between a few centimetres to 1.5 metres in length. The predominance of short conjoins is not necessarily a characteristic of the site and conjoin 12 shows that long connections between bone fragments do exist at sector P16. The lack of other long conjoins more likely results from the technical problems encountered during refitting of the material (see page 16).
Most of these conjoins, regardless of conjoin length, follow the preferred axis of orientation already noted for the long bones – downslope and roughly parallel to the long axis of the channel. Some conjoining sets of finds in the channel and those extending over the reconstructed »edges« of the channel are transverse to the preferred axis of orientation. Such refits illustrate movement of material which probably took place within the channel and down its sides; they possibly indicate periods when the main processes of post-depositional dispersal down the slope had temporarily ceased.
Incidentally, conjoin orientation and conjoin length of the three sets of fragments from horse bones fractured in a fresh condition were found to be the same as those observed for conjoins of fragments which had fractured in the dry bone state, showing that the dispersal of freshly-broken bone fragments was also a result of post-depositional processes.

Elements from individual animals

The 179 sets of skeletal elements belonging to individual animals are plotted in folding illustration 5. Once again the bulk of these sets (n = 167) comprise horse remains. The majority of these consists of rows of upper or lower teeth, found together during excavation and indicated in the figure by symbols sized according to the numbers of teeth in each set. Whether the presence of partially-preserved rows of upper and lower horse teeth was due to the smashing of crania and mandibles during butchery episodes or simply the result of natural disintegration of thin-walled skulls and jaws is difficult to assess, as only two mandibles of horse showed traces of deliberate fracture in the form of impact notches.
Dispersal of teeth from these sets appears to have been minimal, probably due to their being contained in the crypts of the mandible or maxilla. In some cases bone disintegration had already taken place, as can be seen in examples of sets of teeth from an individual animal scattered over the site, or in cases

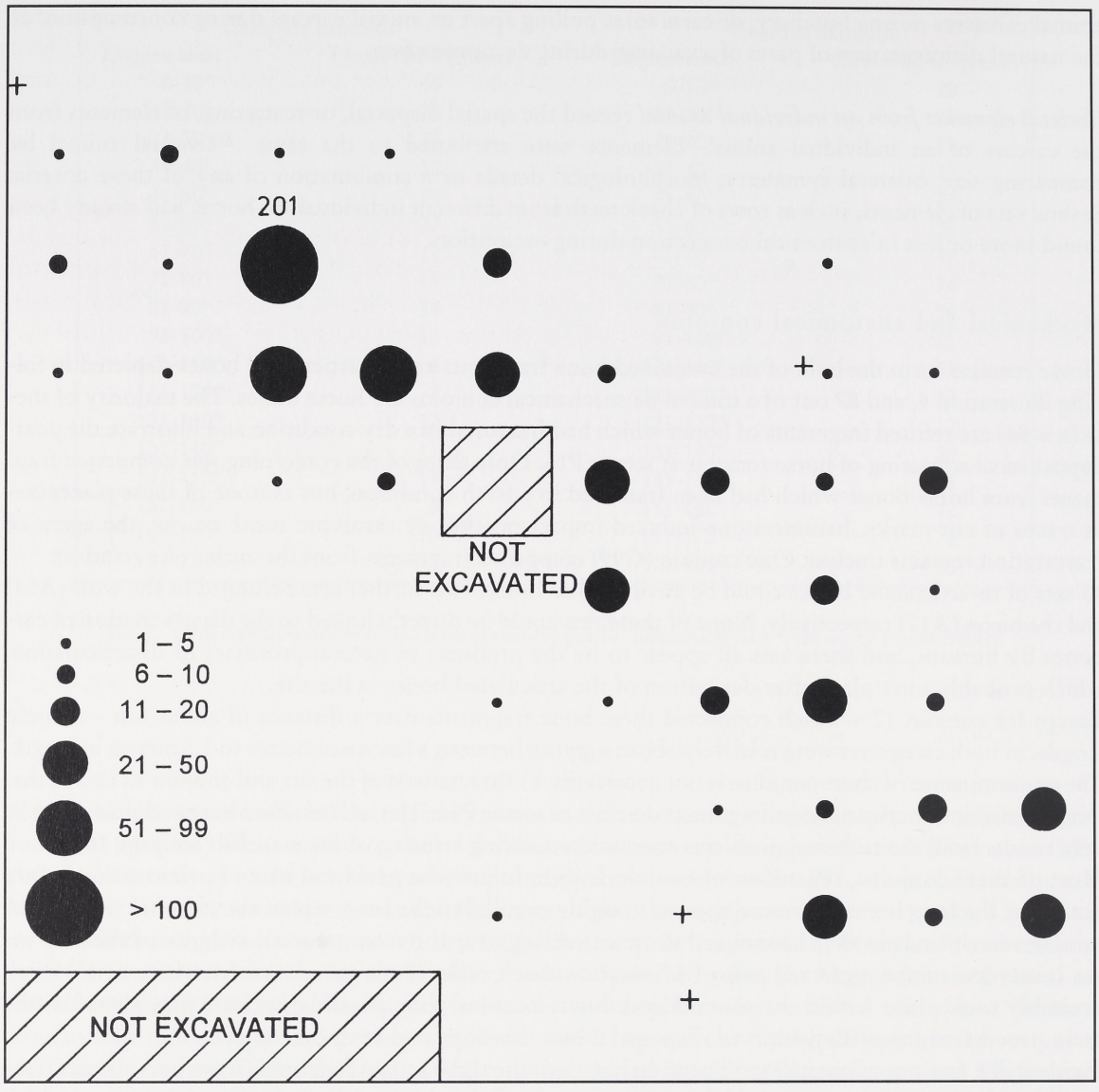


Fig. 5 Distribution of charred bone fragments by weight (grams) in sector P16. – + three-dimensionally recorded charred bones.

where a single, isolated tooth could be re-positioned in its tooth row. Seven sets of teeth of reindeer and three sets of teeth of bison were also recorded. Sets of post-cranial elements from individual animals are not as common as sets of teeth, and include bones from horse, bison and wolf.

Eight sets of finds depicted in folding illustration 4 are located just outside the channel; the remaining 172 sets are distributed within the channel. Conjoin lengths between elements belonging to individual animals were more or less the same as those connecting mechanically refitted and re-articulated finds, and showed that bones and teeth had scattered over distances between a few centimetres to about 1,5 metres apart. The only example of a longer conjoin – almost four metres in length (B60) – is located in the northern section of the channel, in an area where find-density was so low that the search for conjoining remains could be undertaken between several non-contiguous excavated units.

Although a few of the conjoins depicted in folding illustration 4 follow the preferred axis of orientation others, particularly those connecting sets of bones in the southern section of the channel, are transverse to

this. This pattern is probably related to the form and depth of the channel in the southern part of the site (folding ill. 2), where finds may have rolled down the steep channel sides, or could only disperse over short distances within the narrow confines of the base of the channel (see folding ill. 2 for cross-section of channel at this point).

To summarise, the location of the sector P16 site on a slope, the presence of a channel running parallel to the gradient of the slope, the general distribution of finds in the channel, a direct association between find-density and the depth of the channel, categories of refitted faunal remains indicating post-depositional dispersal of finds, a preferred orientation down the slope and parallel to the long axis of the channel of both some long bones and the majority of conjoined bones, all indicate post-depositional movement of faunal remains down the slope and within the channel. Conjoin lengths show movement of material up to 1,5 m; longer conjoins were observed (up to 4 m), but these were only rarely found due to technical difficulties during the refitting analysis.
Bearing these results in mind, plans were drawn plotting the distribution of selected skeletal elements of horse and the distribution of bison remains, to see if the spatial patterning of some elements from these species gave any indication of humans processing animal carcasses directly at the site. In order to assess this, the distribution of horse crania, humeri and radii, and the distribution of the remains of bison were graphed in folding illustrations 6-9. All categories of conjoins found amongst these remains were depicted and those finds with attributes such as cut-marks, hammerstone-induced impact notches or traces of carnivore attrition were marked. The distribution of charred bones, as a possible indication of the position of hearths, is shown in figure 5.

The distribution of horse crania

A concentration of horse crania had, apparently, been observed during excavation (pers. comm. J. Combier). In the site report dated 1973 this feature was described as »un ensemble arrière-crânes de chevaux«. The location of horse occipital bones is depicted in folding illustration 6. The occipital bones are spread thinly through the main zone of find distribution in the channel, with one piece located outside this area, in quadrat 4. There are no concentrations of this bone type. A single occipital bone had been modified by humans (cut marks) and this find is located in the northern section of the channel. Probably due to the very fragmentary nature of these elements, only two sets of occipital bones could be refitted (C27 and 76). These conjoins, their lengths and direction contribute very little to a further interpretation of this category of finds.

The distribution of horse humeri

A detailed depiction of the distribution of horse humeri is shown in folding illustration 7. The humeri are drawn in outline, are distinguished according to side of the body and to which portion of the bone is represented (proximal, shaft, distal), and whether they are from juvenile individuals. Circular symbols around some of the bones indicate the presence of human modifications (cut-marks/hammerstone-induced impact notches) or traces of carnivore gnawing.
Folding illustration 7 shows that humeri of horse were spread thinly throughout the main area of find distribution in the channel. There are no clear concentrations of this element, or of humeri from the left or from the right sides of the body, or of portions of this element (eg: distal ends together). There are no concentrations of humanly-modified humeri, and their pattern of distribution is otherwise not significant. Similarly, there is no patterning in the distribution of those fragments of this element with traces of carnivore gnawing; carnivores had gnawed humeri which are located on the periphery, as well as in the centre of the main distribution of horse humeri at the site.
Conjoin 94, located in the southern part of the channel, is one of only three sets of conjoins between fragments of bones fractured in a fresh condition. As discussed above, conjoin length and direction in

these three cases is comparable to that observed for conjoins of bone fractured post-depositionally, and thus cannot be interpreted as the scattering of bone fragments due to human activities.

The distribution of horse radii

The distribution of horse radii is depicted in folding illustration 8. The bones are graphed in a more simple manner than those in figure 11, and are distinguished according to body-side only. Bones with traces of human or carnivore modifications are marked with circular symbols.
Horse radii are thinly distributed throughout the channel and there are no concentrations of this element at the site. Three radii with traces of human modifications were clustered fairly close together in squares 33, 34 and 44, but on the whole the scatter of radii with cut marks or impact notches resulting from marrow fracturing could not be interpreted as reflecting Magdalenian butchering activities. The few radii modified by carnivores are located on the periphery of the main concentration of finds and in the centre.

The distribution of bison remains

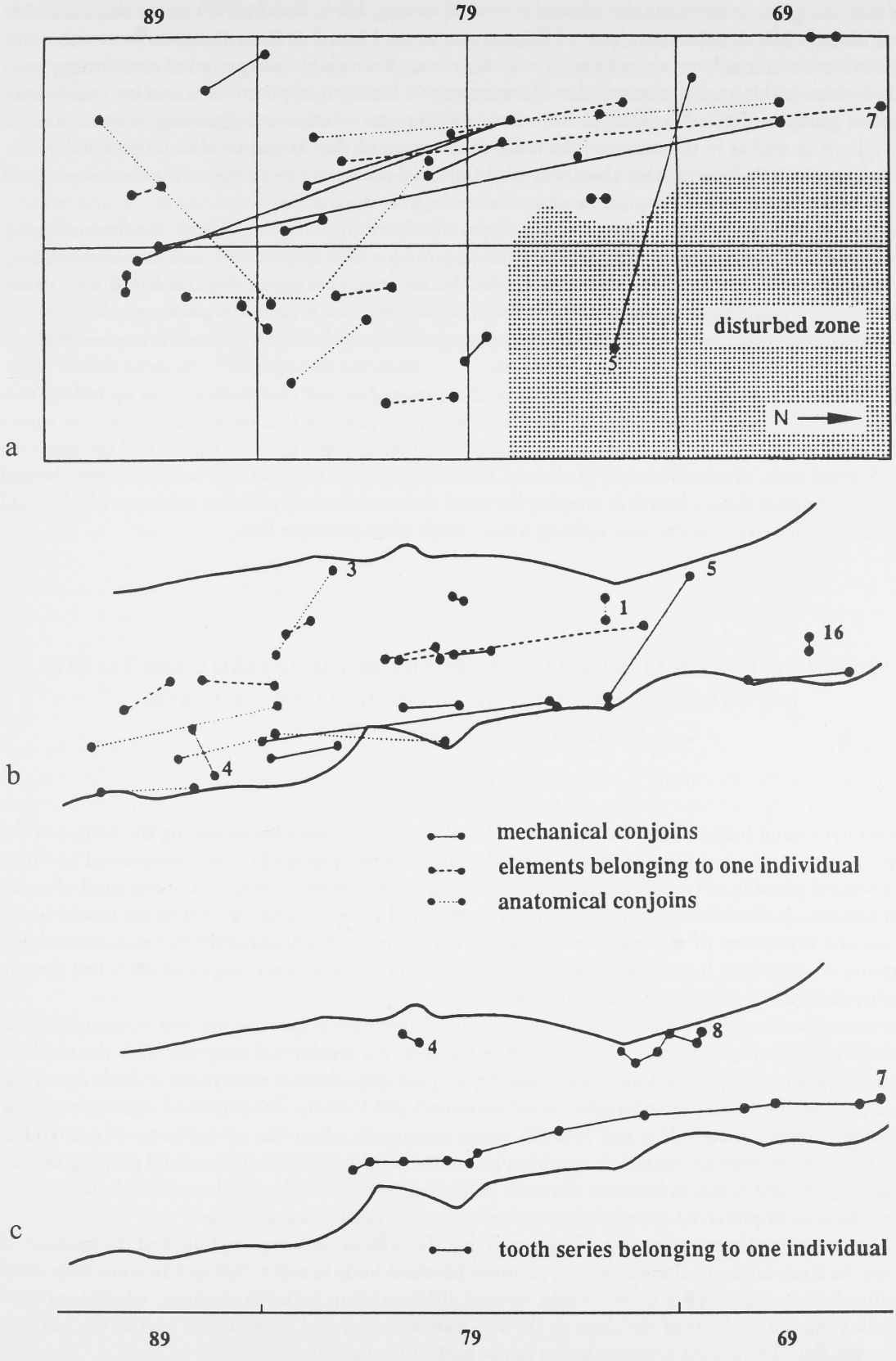
The distribution of bison bones closely follows the general pattern of faunal distribution at the site, and the bulk of the bison remains is located in the channel (folding ill. 9). Only a few bison remains were recorded outside the channel, in squares 14, 26 and 27. There are no concentrations of bison remains at the site, with the exception of some teeth preserved in tooth rows (B211, 212 and 213). The slightly higher number of bison remains preserved in the south-eastern section of the channel, probably reflects the generally higher density of finds due to the depth of the channel in this part of the site. There are no concentrations of humanly-modified bison bones and bison bones modified by carnivores are located in the centre of and on the periphery of the main distribution of finds of this species.

The distribution of charred bones

Small amounts of charred bone fragments were sorted out of the »secondaire« material and weighed during this analysis. The distribution of charred bone by weight (grams) is shown in figure 5. Four larger charred bones, two of horse, one of reindeer and one from an unidentified large animal had been recorded three-dimensionally, and the location of these pieces is also shown in figure 5.
Charred bones are spread mainly through the channel area. A few charred remains, including three of the finds recorded three-dimensionally during excavation, were recovered outside the channel feature. According to site reports, the remains of a hearth were revealed in the north-western part of sector P16 during excavation, and the »largest« amounts of charred bone are located in this area, in quadrats 23 (201 g), 33 (54.0 g) and 34 (61.0 g), providing very tentative evidence to support this observation.

In general, all categories of bones plotted in folding illustrations 6-9 showed the typical pattern of find distribution already noted in folding illustrations 1, 3, 4 and 5, in other words the faunal remains were deposited mainly in a channel. Within this feature, neither the distribution of some skeletal elements of horse or the remains of bison, or the distribution of cut-marked or marrow-fractured bones from these species could be interpreted as resulting from specific butchery activities which had taken place at sector P16.

Fig. 6 Conjoining bone fragments from the sector I11 site. a) horizontal plotting of mechanical and anatomical conjoins and elements belonging to individual animals. b) vertical plotting of mechanical and anatomical conjoins. c) vertical plotting of teeth belonging to individual animals. →


89
79
69
7
5
disturbed zone
N
a
3
5
1
16
4
b
mechanical conjoins
elements belonging to one individual
anatomical conjoins
4
8
7
c
tooth series belonging to one individual
89
79
69

In his analysis of bison bones at the Horner site in Wyoming, USA, Todd (1987) noted that carnivore gnawed bison bones were located closer to the margins of the Horner II Bone Bed than were either ungnawed bones or humanly produced artefacts. A distribution which he interpreted as conforming to »a model of zones of increasing 'natural' disorganization as a function of potential access by non-human agents to a group of carcasses« (ibid. p. 152). Bones with traces of carnivore gnawing, were located on the periphery as well as in the centre of the main distribution of the categories of finds depicted in folding illustrations 6-9, showing that there was no differential access of carnivores to the carcass portions depicted here and no evidence for zones of natural disorganization at this site.
Taken altogether, the location of the site on a slope, the distribution of the bulk of the finds within a channel, evidence of movement of finds down the slope and within the channel, and lack of patterning in the distribution of humanly or carnivore modified bones, strongly suggest that the distribution of the bones revealed during excavation at sector P16 is the product of a series of natural post-depositional processes which probably took place over a long period of time, rather than the *in situ* remains of a butchering site which was later visited by carnivores.
Conjoin lengths between fragments of bone show that material moved over a distance of up to four metres down the slope and, based on this information, it is quite possible that the butchery site – or sites – from which this material originated was located much further upslope towards the base of the southern cliff of Solutré rock. A concentration of charred bone fragments in the northern section of the channel and site reports describing a hearth in roughly the same area, are the only pieces of evidence which could suggest that an activity – in this case lighting a fire – took place at sector P16.

CONJOINED FAUNAL REMAINS AND THEIR CONTRIBUTION TO THE INTERPRETATION OF THE DISTRIBUTION OF FINDS IN SECTOR I11 (Q69, 79 & 89)

Attempts to conjoin fragments of bone, teeth and antler were also carried out during the course of the analysis of the faunal assemblage from the Magdalenian horizon in sector I11, as conventional horizontal and vertical plotting of faunal remains from this horizon produced no evidence of any kind of spatial distributions. A situation that was probably to be expected at such a small site where the results of solifluction and movement of material downslope – as shown in the predominantly N-S (i.e. downslope) orientation of some long bones and long bones embedded in the deposits at angles of 45° – had already been observed during excavation (Combier 1987).
The horizontal and vertical projections of the mechanical and anatomical conjoins and of sets of skeletal elements from individual animals are presented in figure 6. All mechanical conjoins were the result of fracture in the dry or fossilized bone state and depict post-depositional movement of finds down the slope at the site (fig. 6a). Conjoin lengths varied between 5 and 150 cms. The preferred orientation of the conjoins was approximately N-S and NW-SE except conjoin 5, where the co-ordinates of one find in this set had been incorrectly recorded, resulting in a more W-E orientation. Horizontal plotting of anatomical conjoins and conjoins between elements belonging to individual animals produced more or less the same pattern of preferred orientation as recorded for the mechanical conjoins.
Plotting in the vertical projection (fig. 6b) showed that the bulk of the conjoins followed the gradient of the slope. In comparison to these conjoins, conjoins between finds in sets 1, 3, 4 and 16 were more steeply inclined. There did appear to be a slight vertical differentiation between conjoins, where long conjoins following the gradient of the slope at the site were concentrated in the lower part of the horizon and shorter, sharply inclined conjoins in the upper part of the horizon.

A similar pattern of vertical differentiation can be seen when the conjoins of sets of upper cheek teeth from three individual horses are plotted vertically (fig. 6c). The long conjoin formed by several teeth belonging to horse 7, traces quite clearly find-movement down the slope over what must have been a relatively open surface with few topographical obstructions. Horizontal plotting of this set shows that the teeth had been transported almost in a straight line down the slope (fig. 6b, 7). In contrast to this, sets of teeth from individuals 4 and 8 had short and steeply inclined conjoins.

It is possible that this vertical differentiation could be the result of two phases of post-depositional movement and accumulation of material. During the earlier phase, comparatively more finds were transported down the slope at a time when the fossil surface was relatively clear of vegetation, talus deposits or other find-material, resulting in long conjoins closely following the gradient of the slope. During the later phase the post-depositional movement of finds appears to have been restricted, possibly due to the finds becoming entangled in the mass of animal remains which had already accumulated at the site? Vertical plotting of lithic artefacts during a preliminary analysis of the finds from this sector showed a similar distribution into two separate horizons.