



## LATE QUATERNARY PREHISTORIC INVESTIGATIONS IN SOUTHERN BELGIUM

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*Although Wallonia was one of the first regions of Europe to have Stone Age prehistoric research (as early as the 1820's) and one whose record had sometimes been considered to be largely exhausted, recent research has provided significant evidence for the study of the fluctuating human settlement of NW Europe during the course of the Upper Pleistocene and initial Holocene. Here we report on the excavation and interdisciplinary analysis of cave, rockshelter and open-air sites pertaining to the Mousterian, Aurignacian, Gravettian, Magdalenian and Mesolithic periods (c.100 kya-8 kya). A critical aspect of hunter-gatherer adaptations to southern Belgium in all periods was the juxtaposition of the cave-rich NW flank of the Ardennes upland with the flint-rich, loess-covered plains to the north, on the frontier of glacial age human habitation in western Europe.*

Southern Belgium (Wallonia) played a crucial role in 1.) the demonstration of the antiquity and evolution of humans through the discovery of associated stone tools, extinct fauna and hominid remains in 1829-30 at Engis by P-C.Schmerling, 2.) the development of the standard culture-stratigraphic sequence for the Middle and Upper Paleolithic of western Europe based on numerous excavations in caves along the Upper Meuse and Lesse Rivers by E.Dupont in the 1860's, and 3.) the confirmation of the nature of Neandertal as a pre-modern form of human with the discovery and study of the Spy burials in 1886 by M.De Puydt, M.Lohest and J.Fraipont (TOUSSAINT 1992). Unfortunately many of the extensive late 19th-early 20th century excavations of the caves along the edges of the Ardennes and of open-air sites on the low, loess-covered Hesbaye Plateau were neither conducted nor published with the degree of care that had

been the case with the extraordinary work of Dupont, perhaps leaving the impression that the remaining Belgian Paleolithic record had been sacked.

Nonetheless, the post-World War II period did see the meticulous excavation, analysis and publication of two very significant open-air sites: Maisières-Canal (early Gravettian, c. 28,000 b.p. [DE HEINZELIN 1973; HAESAERTS and DE HEINZELIN 1979]) and Meer (Tjongerian, now thought to date to c.11,000 b.p. [VAN NOTEN 1978]). And even more recently came the discovery of the pristine Scladina cave site at Sclayn, whose long terminal Middle/early Upper Pleistocene deposit, with abundant faunal, artifactual and Neandertal remains, is still being excavated (OTTE 1992). Similarly defying the common wisdom that Belgium had little left to contribute to the record of the Paleolithic or Mesolithic are the recent or on-going excavations at Couvin Cave (Middle to Upper Paleolithic transition [ULRIX-CLOSSET *et al.* 1988], Walou Cave (Middle and Upper Paleolithic [DEWEZ 1993]), Blaireaux and Chaleux Caves (Magdalenian [BELLIER and CATTELAINE 1986; OTTE 1994]), the open-air sites of Kanne and Orp (Magdalenian [VERMEERSCH *et al.* 1985, 1987]), Rekem

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[VERMEERSCH *et al.* 1985, 1987]), Rekem (Tjongerian [DEBIE 1996]), Weelde, Remouchamps/Leduc and Place St.-Lambert (Mesolithic [VERMEERSCH 1989; GOB and JACQUES 1985; GUSTIN *et al.* 1994]), and many more. In addition, a number of major syntheses of Belgian Stone Age prehistory available by 1990 (e.g., ULRIX-CLOSET [1975] on the Middle Paleolithic; OTTE [1979] on the Early Upper Paleolithic; DEWEZ [1987] on the Late Upper Paleolithic; GOB [1981] on the Mesolithic; Cahen and Haesaerts [1984] on the paleo-environments and cultures of the whole Belgian Paleolithic and Mesolithic) made the time ripe to investigate specific problems and periods, and to obtain sets of new chronostratigraphic, paleo-environmental and cultural data, especially in light of the major international debates on the Middle to Upper Paleolithic transition (e.g., MELLARS 1990; MELLARS and STRINGER 1989), on the Upper Pleniglacial abandonment and Tardiglacial reoccupation of northern Europe (e.g., SOFFER and GAMBLE 1990; STRAUS 1991), on readaptation to interglacial conditions (e.g., STRAUS *et al.* 1996; ERIKSEN and STRAUS n.d.), and on the replacement of Mesolithic foraging adaptations by Neolithic food production (e.g., ZVELEBIL 1986 ; GREGG 1988).

The research results summarized here are the fruit of five summers of excavations by the Universities of Liège and New Mexico that built on previous work by the former and by other Belgian institutions. The project was designed to provide the maximum amount of information from limited-area excavations that "rescued" modern-quality observations from classic Paleolithic sites that had been dug in the past (Trou Magrite, Huccorgne-Hermitage), continued the exploration of a recently dug protohistoric/late prehistoric site back into the pre-agricultural period (Abri du Pape), and completely dug a small cave whose Magdalenian component had survived the nearly total looting of surficial Mesolithic and Neolithic deposits (Grotte du Bois Laiterie). Our sample of sites, together with other recent research in and near Belgium, permits us to draw some tentative conclusions about change through time in the human settlement of and adaptation to both the upland and lowland zones of this pivotal region of NW Europe.

## THE REGION

The study area is drained by the Upper Belgian Meuse and its major tributaries the Lesse (which descends from the high Ardennes Plateaux to the Southeast), the Sambre (which flows from the low hills and plains of Hainaut to the West) and the Méhaigne (which cuts through the low Hesbaye Plateau to the North)(FIG.1). The area is essentially the NW flank of the Ardennes and lies between 50 and 51 degrees North latitude in Namur and western Liège Provinces---the center of the autonomous region of Wallonia. The Ardennes is a Paleozoic massif composed of sandstones, quartzites and schists, but the intensively folded Devonian beds on its western margins are interstratified with highly karstified Carboniferous limestone bands. Although the floors of the deeply entrenched Upper Meuse and Lesse valleys are at c. 100 m.a.s.l., summit elevations of hills and ridges between Givet (at the French border south of Dinant) and Namur are commonly 250-300 m.a.s.l. (The highest elevations in the whole Ardennes Massif are no more than 700 m.a.s.l.) Hence, 100 m. cliffs along the principal canyons are not uncommon and tributary gorges are deep, narrow and steep, with significant differences in insolation and temperature between south- and north-facing and between west- and east-facing valley sides. The Ardennes is bereft of good-quality flint, although there are some local quartzites and poor-quality cherts in the Carboniferous limestone, which itself can also be knapped.

The sinuous course of the Upper Meuse runs 40 km northward from France along the western edge of the Ardennes until Namur, where, joined by the Sambre, it turns 90 degrees and flows 55 km eastward until Liège, at which point it turns north again, entering the Netherlands at Maastricht and flowing toward the presentday North Sea. The West-East stretch of the Meuse sharply divides the hill country of Upper Belgium from the 160-190 m.a.s.l. plains of Middle Belgium: the loess-covered Hesbaye Plateau, stretching from Brabant to Limburg and bisected by the linguistic and political line between Wallonia to the South and Flanders to the North. The Hesbaye is underlain by Maastrichtian (Upper Cretaceous) limestone which is rich throughout in excellent-

quality, nodular chalk flint (CASPAR 1984). This is a flat, exposed region with little natural protection except for a few small caves and rockshelters where one of its few significant rivers, the Méhaigne, cuts through the limestone just upstream (North) of its confluence with the Meuse at Huy, midway between Namur and Liège.

Although we excavated no sites in the adjacent Sambre drainage, it is important to the overall picture too, as it is the setting of the cave site of Spy (10 km upstream [West] of Namur). And the open-air site of Maisières (in the Haine valley, a tributary of the Scheldt, 5 km East of Mons) is near the interfluvium with the Sambre. This landscape (eastern Hainaut) is one of low, rolling hills, generally between 100-200 m.a.s.l. It is underlain by a separate outcrop of Upper Cretaceous limestone rich in a wide variety of excellent-quality nodular chalk flints (CASPAR 1984). These are the same limestone formations that produced the well-known chalk flints of NW France and southern England (and the "white cliffs" of Calais and Dover 200-250 km due West.) Both the Hesbaye and Hainaut flint sources were heavily exploited by shaft mining in Neolithic times, the most famous sites being at Orp and Spiennes, respectively. Not surprisingly, both these areas also have Upper Paleolithic sites.

The relatively mild Holocene climate of the lower elevations contrasts sharply with the rigorous winter conditions of the high Ardennes ridges and valleys, the only part of the country to presently receive significant snowfall. Vegetation along the NW flank of the Ardennes presently includes luxuriant, well-watered, mixed deciduous woodlands. But the high precipitation and temperatures and relatively equable seasonality of presentday Belgium are results of its proximity to the North Sea and English Channel (and the interglacial Gulf Stream). During the almost entire time of human occupation discussed here (oxygen isotope stages 5b-early 1) Britain was attached to the European mainland and there was no North Sea, although sea level had risen high enough by about 8500 b.p. (uncal.) to breach the Straits of Dover and connect the English Channel with the North Sea. These events led to making the territory of Belgium an oceanic region once again, having been a far more continental one during the Last

Glacial. During Pleniglacial maxima the continental ice sheets had extended as far south as the base of the Jutland Peninsula (Denmark and NW Germany) and northern Norfolk (England), leaving the Low Countries a very cold, hyperarid, loess tundra (HAESAERTS 1984). Under intermediate, interstadial conditions, steppe-tundra conditions often reigned, sometimes marked with slight to moderate arbustive or even arboreal growth under the most favorable glacial-age conditions, especially of humidity. These oscillations had significant consequences for the ability of mammalian communities—including humans—to inhabit the territory of what is now the Kingdom of Belgium. Some of the most significant paleo-environmental records in the region are the long sequences of loess deposits punctuated by episodes of weathering and soil formation. These permit both short-range chronostratigraphic correlations to cave deposits and long-range correlations to other regions of Eurasia (e.g., HAESAERTS 1978, 1984; HAESAERTS and LAVILLE 1988).

#### LATE MIDDLE PALEOLITHIC INDICATIONS

Mousterian sites and indeed Neandertal remains are relatively abundant in Belgium, but unfortunately, with the major exception of the ongoing discoveries at Sclayn, most were excavated in the early decades of prehistory, so detailed information of all sorts is generally lacking. Thus even our relatively small-scale Middle Paleolithic finds contribute significant elements to the question of settlement near the northern edge of the Neandertal range. We uncovered traces of Mousterian activity in the lower levels of Trou (Cave) Magrite and of the Huccorgne-Hermitage open-air site.

Le Trou Magrite (hereafter, "TM") is a large, ideally oriented cave on the south-facing valley side of the deeply entrenched Lesse River, 3 km upstream of its confluence with the Meuse above Dinant. Results of our recent excavation on the terrace in front of the cave (the apparently only remaining intact area of this classic site)(FIG.2) have recently been fully published (OTTE and STRAUS 1995). The remnant Mousterian deposits at TM underlay a pair of Aurignacian levels (FIG.3), the lower of which (Stratum 3) is accelerator

radiocarbon dated to  $41,300 \pm 1690$  b.p. (CAMS-10352) and conventionally C-14 dated to  $>33,800$  b.p. (GX-18539). Younger determinations from the Mousterian levels themselves (Strata 4 and 5) should be considered in reality to be infinite. An owl regurgitation pellet lens, very rich in micromammalian remains and lying within Stratum 5, is attributable on the basis of its distinctive micromammalian spectrum (also present at nearby Sclayn Cave) to the cold phase identified in the Grande Pile (NE France) pollen core as Melisey II, equivalent to oxygen isotope 5b which is dated to 85-95 kya (CORDY 1995). The culturally and faunally sterile underlying alluvial sediments (Stratum 6) are attributed geologically to the Last Interglacial (*sensu stricto*, oxygen isotope stage 5e), while Stratum 5 is characterized by heterogeneous redeposited sands and silts, with evidence of relatively high humidity (HAESAERTS 1995). Stratum 6 was probably the original source of a hippopotamus tusk we found in old, mixed backdirt--thus consistent with early reports of the presence of this warm climate pachyderm in the Last Interglacial of Belgium (GAUTIER 1995). Conditions became markedly more rigorous in Stratum 4, with massive collapse of the limestone cave overhang and deposition of more homogeneous loess attributable to the beginning of the Lower Pleniglacial (oxygen isotope stage 4) (HAESAERTS 1995).

Faunal remains in TM Stratum 5 are overwhelmingly dominated by rodents and lagomorphs: the prey of owls roosting in the cave mouth. There are also small numbers of remains of arctic fox, weasel, and cave bear. There is scant evidence for human agency in the accumulation of the faunal assemblage; even the few woolly rhino remains might have washed into the cave from the overlying plateau via a chimney at the rear of its vestibule. The few remains of horse, reindeer (5 each) and ibex (NISP=1) may have been brought in by hominids, but there is no strong cut-mark or other evidence to positively assert this hypothesis (GAUTIER 1995). Microfauna is far scarcer in Stratum 4 and macro-mammalian remains are even scarcer than in Stratum 5. Fox and badger (the latter probably intrusive) are the only carnivores. There is one item each from woolly rhino and mammoth and only a very small representation of horse, reindeer, ibex and chamois (1-3 items each). Again, human

agency for these isolated bones and teeth was at most only partial (GAUTIER 1995). Field lab analysis suggested that cut and burning marks are all but absent, while carnivore gnaw marks are relatively common on the small sample of bones from these levels, but these identifications are tentative.

Stratum 5 yielded only 110 lithic debris and 7 formal tools. These artifacts are made on a surprisingly wide variety of raw materials---mostly local limestone, poor-quality local flints/cherts, quartz crystal, phtanite and quartzite. There are small numbers of artifacts (including 2 tools) on non-local, good-quality flint (22% by count, but only 4% by weight, a fact that testifies to their small average size). Blades and even bladelets are present in this early Mousterian assemblage. The tools include an atypical Levallois flake, 2 simple straight sidescrapers, an atypical burin on a blade, a raclette and 2 denticulates. The proportions of non-local flint among the 141 lithic debris from Stratum 4 are virtually the same, but not even one of the 10 tools were on this good-quality material, although one sidescraper is on a material that may be Brussels sandstone from central Belgium. Half the tools are notches; there are also 2 burins (one of which may be an accident), two retouched flakes and a simple straight sidescraper. The burins were found lower in the stratum than the sidescraper. Blades are few (no more abundant than in Stratum 5: 9%). In short, in at least the outer sector of TM, a hominid (Neandertal) presence was apparently discrete and ephemeral; much or most of the faunal assemblages may have been the result of non-hominid or even geological agencies; there is no evidence of structures (including hearths); artifacts are few and mainly made on local materials (notably the surrounding limestone and its poor cherts); yet there are some (albeit scarce) indicators for contacts with regions of Belgium that do contain sources of excellent-quality chalk flint even in Middle Paleolithic times. One such place could be on the Hesbaye Plateau at the open-air site of Hermitage-Huccorgne (hereafter, "HH"), 42 linear km NNE of TM (70 km via the valleys of the Lesse, Meuse and Méhaigne). HH is best known for its Gravettian component (see below), whereas several caves above it along the gorge of the Méhaigne (Grottes de l'Hermitage, Grotte du Docteur, Abri Sandron, Trou du Chena, Grotte du Curé, *et al.*) have yielded Mousterian

materials in old and/or poorly controlled excavations (ULRIX-CLOSET 1975). HH is on an Osterbeek oxbow ridge formed of alluvial, colluvial and aeolian sediments around a bedrock outcrop in the center of a deep gorge cut by the Méhaigne as it descends southward from the Hesbaye Plateau to the Meuse. The gorge exposes abundant Maastrichtian flint, which occurs in the form of nodules upstream of the site along the valley.

The existence of a Paleolithic site was revealed by the excavation of railroad and road trenches across the ridge in the late 19th century (FIG.4). While HH was first known for its Gravettian deposits when first archeologically dug in the 1880's by F.Tihon, M.De Puydt and M.Lohest, the existence of Middle Paleolithic human occupation was made somewhat clearer during the course of extensive (but still unpublished) amateur excavations led by J. Destexhe in 1969-70. The position of Mousterian artifacts (in P.Haesaerts' stratigraphic Unit E2), below a depositional hiatus that separates the Upper and Lower Pleniglacial loess series, was confirmed in major geological sections dug by P.Haesaerts (1978) along both the railroad and road trenches in 1976. He attributed the Mousterian component to the Moershoofd oscillation early in the Interpleniglacial (oxygen isotope stage 3), after which there had apparently been massive erosion by running water. The consequent telescoping of Gravettian and Mousterian components, the latter being associated with or right under a stony layer (Stratum 5) and with some evidence of weathering (dark, clayey silt, Stratum 6=incipient soil development?), was confirmed in test pits we dug in 1991-93.

In one 2x2 m pit on the E side of the road (Q-R/25-26), Stratum 6 produced a side-scraper, a flake and 2 blades. In a 3x3 m pit on the W side of the road (J-L/53-55), the separation between the stony layer and the humic zone is less clear than in the E-side pit. Amidst weathered limestone blocks in a colluvial silt matrix we found a total of 131 flint artifacts. These included a large, mixed-removal (flake + blade) Levallois core, to which we refitted a Levallois flake with a faceted butt and a plain flake (from different squares). The presence of numerous primary and secondary cortical elements (including tiny trimming flakes and shatter), a second Levallois flake and a platform renewal flake are all additional indicators

that a significant Mousterian activity here was lithic procurement and *in situ* reduction at this prominent flint source. The assemblage here also includes several blades, but no retouched tools. Otherwise the whole operatory chain is represented. In addition we uncovered a concentration of burnt flints and limestone blocks in an area of somewhat less than 1 sq.m. Five of the burnt flints from this simple hearth were refitted. There was no trace of any construction involved in this hearth, which seems to have just consisted of burning on the ground surface. Unfortunately neither charcoal nor bones were preserved in either our W-side or E-side pit areas. A radiation dosimeter reading was taken at the depth of the hearth feature and a sample of burnt flint is pending thermoluminescence dating in H.Valladas'lab.

A 1x1 m sondage within the main W-side pit (J-L/53-55) revealed a series of earlier levels, most of which produced small numbers of presumably Mousterian lithic debris, including cores, chunks, platform renewal flakes and other flakes (including chips and shatter), often with cortex. There are no blades in the small samples from Strata 6-11 (total n=80). These data confirm the fact that Mousterian activity at HH centered on lithic reduction. Perhaps the blanks for tools or the tools themselves were removed from the open-air locus for use in the adjacent caves and/or at sites further away, such as at the cave sites in the flint-poor hill country South of the Meuse.

Further confirmation of the erosional event following Mousterian occupation of HH was provided by a second 2x2 m pit along the W side of the road trench (JJ-KK/45-46), 25 m down-slope (S) of the main W-side pit. Here there are channel features (as were observed by Haesaerts along the nearby W face of the road cut itself), and the Gravettian and Mousterian components are mixed. To observe developments in Belgium during the later part of the Interpleniglacial, we must turn again to the Magrite cave deposits.

#### THE EARLY UPPER PALEOLITHIC

Despite the limited area (22 sq.m.) of intact Aurignacian deposits that remained for us to discover and excavate after some 160 years of diggings of various sorts at TM, the

results are adequate to characterize a *mosaic* nature to the Middle-Upper Paleolithic transition in at least the Ardennes uplands of southern Belgium. Some changes do seem to have been relatively abrupt and radical, while others came more gradually, with more evidence of continuity than of rupture between the Mousterian ways and those of the succeeding Aurignacian. Part of this picture has to do with an independent reinterpretation of the provenience of the works of art discovered at TM by E. Dupont in 1866 (DEWEZ 1985) and with the correlation of our stratigraphy to that of Dupont as reconstructed by Dewez. The results are all the more significant if one keeps in mind the fact that TM was one of the chief sites outside SW France to be used by H. Breuil (1907:186-8) in support of his seminal scheme for the subdivision of the Upper Paleolithic originating in the Aurignacian, with a sharp break *vis à vis* the Mousterian. Yet TM was also a site where the presence of a supposed "Protosolutrean" industry could have been seen (as Dupont did) as support for G. de Mortillet's view of a Mousterian technology that developed into an early Upper Paleolithic leaf-point industry (SMITH 1966:8).

As noted above, the middle of TM Stratum 3 is accelerator dated to  $41,300 \pm 1690$  b.p. The bone which was dated was exceptionally well preserved, with protein content nearly as great as that of a modern bone (T. STAFFORD, pers. comm.). Thus, this determination, with which much care was taken in biochemical analysis and dating (specifically done on aspartic acid), should be considered to be quite reliable. However, with its (for this antiquity) typically wide standard deviation, radiocarbon age, at 2 sigma, could lie anywhere between 44,680 and 37,920 b.p. The latter extreme is intuitively more likely. True age may not be far from radiocarbon age, if current theoretical projections of the calibration curve prove to be true (H. SCHWARCZ, pers. comm.). Such antiquity is not challenged by a conventional C-14 date of  $>33,800$  b.p. on bone gelatin from upper Stratum 3. Conventional dating of two samples of bone gelatin from the base of overlying Stratum 2 yielded determinations of  $34,225 \pm 1925$  (GX-18537) and  $30,100 \pm 2200$  b.p., with a combined 2 sigma range of 38,075-25,700 b.p. Another conventional date on bone gelatin from higher within Stratum 2 yielded  $26,580 \pm 1310$ , which essentially falls within

the same range. All this suggests an age of c. 30,000 b.p. for the upper Aurignacian horizon (Stratum 2) at TM.

Haesaerts (1995) observed a marked discordance between Strata 5+4 and Strata 3+2, with a major change in slope and depositional mode. Eboulis-rich Strata 3 and 2 were the products of cryoclastic processes under humid conditions, but with severely cold episodes punctuated by more temperate ones (even including some weathering at the base of Stratum 3). These oscillations are in line with an attribution to the unstable conditions toward the end of the Interpleniglacial (oxygen isotope stage 3).

Based primarily on the macro-mammalian remains from these levels, Gautier (1995) reconstructs Aurignacian environments as "mammoth steppe", but without permafrost and with only limited snowfall in winter. Wooded areas existed in favored areas such as along the Lesse valley. Both arctic and common fox, marmot and hare are present, along with wolf and possible cave bear, but all in very small quantities. Woolly rhino and mammoth are also both present in Strata 3 and 2. Reindeer, horse and ibex, however, are the main ungulate species--and were probably procured by humans, while the pachyderms may have at most been scavenged. There are also traces of boar in both levels, again testifying to the existence of gallery woods, despite prevailing steppe on the plateaux surrounding the Lesse canyon. There are also traces of a bovine and of chamois. The main game species are more numerous and anatomically better represented in Stratum 2 than in Stratum 3:

Stratum:	3		2	
Measure:	NISP	MNI	NISP	MNI
Reindeer	36	1	91	7
Ibex	10	1	31	1
Horse	17	1	39	2

Indeed both total number and weight of faunal remains (identifiable and unidentifiable) are at least twice as great in Stratum 2 ( $n=6,833$ ;  $wt.=6,934$  gm) as in Stratum 3 ( $n=2,834$ ;  $wt.=3,590$  gm), possibly testifying to more intensive human hunting activity during the more recent Aurignacian occupations than during the earliest ones. While carnivore gnaw marks continue to be present in both Strata 3 and 2, cut and burning

marks are especially numerous in Stratum 2, according to tentative field observations.

The lithic assemblages also show both differences and continuities between one another and with the underlying Mousterian. Strata 3 and 2 yielded almost the same number of retouched stone tools (119 and 122), but Stratum 2 had more than twice as many lithic debris (cores + débitage) (5204 versus 2614 for Stratum 3). The ratios of debris to tools are respectively 43 to 1 and 22 to 1. This immediately suggests some functional differences between the two sets of occupations in terms of on-site lithic reduction. In absolute terms cores are abundant ( $n=30$ ) in Stratum 2, but scarce (9) in Stratum 3, though their percentages of the total assemblages are low (0.6 & 0.3% respectively). Microdébitage (chips and shatter <1 cm in length) makes up 26% of the Stratum 3 assemblage and 33% in Stratum 2. Blades plus bladelets make up 8% and 11% of the debris respectively. (By way of comparison, blades and bladelets make up 9-10% of the admittedly small debris assemblages from Mousterian Strata 3 and 4 respectively.) Typologically, there are similarities between the two Aurignacian tool fractions: nearly one-quarter of the tools in both strata are endscrapers (including keeled, thick and thin nosed, and Aurignacian retouched blade endscrapers---actually slightly more abundant in Stratum 3 than in 2); a few burins and perforators (the former also more frequent in Stratum 3); about one-quarter of the tools in each level are continuously retouched pieces (very few approximate classic Aurignacian scalar retouch, however, and these are in Stratum 2 only, which also has a Dufour bladelet); both levels have foliate point fragments (2 unifaces in Stratum 2 and a biface in 3). Nonetheless, the cumulative percentage graphs for the two assemblages are virtually identical (FIG.5). It is also Stratum 2 that produced two non-diagnostic antler point fragments; there are no bone tools in Stratum 3. Slightly less than 10% of the Stratum 3 tools are made on blade blanks versus 24% in Stratum 2.

Other (related?) differences concern the use of lithic raw materials in the two Aurignacian levels. There is a dramatic shift between Strata 3 and 2 in terms of the amounts of excellent-quality non-local flint transported to and abandoned at TM. In

Stratum 3 this material (possibly from the Spiennes and/or Orp late Cretaceous sources, which are the closest to TM) makes up 29% of the debris by count and 6% by weight, while in Stratum 2 these proportions increase to 44% and 9% respectively. Always favored for tool manufacture, in Stratum 3 the non-local flint was used in making 38% of the tools (22% by weight), while in Stratum 2 the relative frequencies climb sharply to 61% and 36% respectively. Limestone continued to be very well represented especially among large flakes, but declined in terms of smaller debris and tools. Flint debris of all sorts (cores and débitage) are consistently smaller and lighter than limestone ones. The good flint was favored for blade production, and blades became somewhat more common in Stratum 2 times---especially as blanks for tools. Clearly, in Stratum 2 times, humans were procuring more exotic, excellent-quality flint either via direct acquisition or through down-the-line, intergroup exchange---and they were exploiting it to the maximum. In contrast, Stratum 3 had a lithic raw material regime more reminiscent of the Mousterian assemblages. It is intermediate between Strata 4 and 2 in terms of its percentages of non-local flint and local limestone. Stratum 5 is different in having a wider variety of lithic types, but they are also of local origin (either from the surrounding limestone or from the Lesse River bed). These include poor-quality local flint and chert, limestone, quartz, phtanite and quartzite. This is absolutely in line with the situation in the pencontemporaneous Mousterian Level 5 at Sclayn (i.e., use of a wide variety of local rocks)(OTTE *et al.* 1988), even though that cave is closer to sources of good-quality flint than is TM. In short, at TM there seems to be a trend of increasing exploitation of non-local, higher quality material through time, from the early Mousterian to the late Aurignacian, as links or contacts with the flint source areas of Belgium became stronger or more common, perhaps even involving periodic visits to the plains of Middle Belgium, especially by ca. 30,000 b.p. While the lithic assemblages from both Strata 3 and 2 can be called "Aurignacian" on the basis of tool typology, there is much evidence for behavioral continuity (including in terms of raw material economy and blade production) between the earliest manifestation of this techno-complex and the Mousterian (despite an intervening depositional hiatus) and, to the contrary, much evidence for distinction between the two

"Aurignacian" strata. A Middle-Upper Paleolithic transition in Belgium that involved the continued manufacture and use of leaf points (hence the old designation of "Protosolutrean") is furthermore suggested by recent discoveries at nearby Trou de l'Abîme in Couvin, where a "technically intermediate industry" with foliate points has been dated to 45,000 b.p. (OTTE 1990).

Despite the evidence for considerable lithic continuity between the Mousterian and early Aurignacian at TM, there may be one major piece of evidence for "radical" change: the appearance of highly developed mobile art. If M.Dewez's (1985) reconstruction of Dupont's stratigraphy is correct (and we tend to think that it is, as the logic is impeccable), the carved ivory "Venus" (phallus?) and the engraved reindeer antler found by Dupont in his "troisième couche ossifère" came from the lower of two Aurignacian levels, corresponding to our Stratum 3. Given the radiocarbon dates, this would place the TM works of art at an age equivalent to the oldest mobile art objects of SW Germany (Geissenkloesterle, Stadel and Vogelherd): 37-32,000 b.p. (HAHN 1993, 1995).

Finally, limited seasonality evidence (STUTZ *et al.* 1995; GAUTIER 1995) sheds some light on the place of the Aurignacian occupations of TM in the late Interpleniglacial landscape of southern Belgium. Thin-section dental cementum analyses of one bison molar from Stratum 3 and of two reindeer molars plus one ibex molar from Stratum 2 all indicate cold season (winter-early spring) adult kills. Dental eruption sequence analyses of juvenile reindeer mandibles indicate 1 early fall and 2 winter kills in Stratum 2, plus 2 fall and 1 winter kills in Stratum 3. There is no evidence of summer occupation of TM for either Aurignacian stratum. In fact, TM would be an ideal place for a cold-season residential camp, with its ample shelter, SW orientation, protection from north winds, 26 m elevation above the Lesse Valley floor (and hence relief from the worst effects of cold air drainage), and strategic hunting location dominating the gorge, but with easy access to the plateau above via an adjacent tributary valley. The increasing use of non-local, high-quality flint might be indicative of (summertime?) visits to source areas in Middle Belgium, a possibility which leads us back to Huccorgne, if not for the Aurignacian,

then for the early Gravettian shortly thereafter.

#### THE MIDDLE UPPER PALEOLITHIC

The principal prehistoric occupation of HH has long been known to be of Gravettian age. The largest excavations were those of J.Destexhe across a wide area in the center of the densest concentration of Gravettian materials on the ridgetop between the road and railroad trenches (FIG.4). Collagen from several bone fragments from the unpublished Destexhe excavation was conventionally radiocarbon dated to 23,170 ± 160 b.p. (GrN-9234) (HAESAERTS *et al.* 1981). Subsequent to that excavation, in 1976 and 1980, P.Haesaerts conducted extensive geological section cleaning, principally along 20 m of the E side of the road trench, but also (and most deeply) at the W side of the railroad cut. A third campaign, also under the direction of Haesaerts but with S.Froment (1980), involved cleaning a short part of the W section of the road cut later in 1980. Both road-cut sections yielded significant Gravettian artifact collections (studied by Straus in 1993 at the Institut Royal des Sciences Naturelles de Belgique, with the authorization of the Director, D.Cahen).

Our excavations in 1991-93 consisted of a 18.5 sq.m. block (E-M/6+H-L/7-9) dug back from Haesaerts' railroad trench section in a previously unexcavated right angle between the 1886-90 Tihon trench and the 1969-70 Destexhe trench. As noted above, we also dug a 2x2 m pit from the surface of the ridge near Haesaerts' E road trench section, plus two pits (3x3 m and 2x2 m) to the W of the road-cut in a heretofore unexcavated part of the site. Most of our Gravettian finds came from the block excavation near the railroad trench, where the Upper Pleniglacial loess (Stratum 4, with subdivisions 4.1 and 4.2) is very thin. It thickens rapidly and markedly toward the West, such that the uppermost Gravettian materials always found at its base are only c.50 cm below present ground surface at the W edge of the railroad trench, but c. 1.0 m below present ground surface at the W edge of our block excavation (FIG.6), c. 1.7 m at the E edge of the road trench and c. 2.9 m in the main pit W of the road (FIG.7).

Since the earliest description of De Puydt and Lohest in 1885, there has been the impression of a single Gravettian artifact-bearing horizon at HH, which Haesaerts (1978) originally chose to assign to the Tursac oscillation (specifically, to the beginning and end of this phase of relatively temperate, humid conditions), perhaps because of the single C-14 date from the Destexhe dig. Yet either separation into at least two vertical concentrations or fairly continuous vertical dispersion of artifacts across a more or less broad horizon, may in fact have characterized the nature of the cultural horizon in the central area of the site, whereas the Gravettian materials are less dense and apparently more concentrated in a single lense at the base of the upper loess at both the far eastern and far western edges of the site. Haesaerts divided his unit G from bottom to top into G1 (light beige pure loess which yielded the majority of the Gravettian finds in the central area dug by Destexhe), G2 (yellowish brown silt with soliflucted limestone rocks and some Gravettian lithics and bones) and G3 (a channel filled with loess seen along the E roadside section). The evidence suggests that the main Gravettian occupation(s) corresponded to G1, although a later occupation (or set of occupations) in G2 cannot be excluded.

Lithic refits done by Straus and Martinez among the c.5800 items of Haesaerts' E roadside section collection (43 refitted items forming a total of 17 sets) yielded 7 cases of refits that cross-cut geological subdivisions of Haesaerts' unit G. Some mixture between what may have originally been two or more separate "episodes" of Gravettian human use of HH cannot, therefore, be denied, especially in the western area of the site where contemporaneous gullying and small artifact winnowing has been amply demonstrated by Haesaerts, Froment and us.

That HH may have been used repeatedly is also indicated by a series of accelerator radiocarbon determinations on individual mammoth bones from Stratum 4 of our excavations (equivalent to Haesaerts' units G1-2): 24,170 ± 250 b.p. (CAMS-5893), 26,300 ± 460 b.p. (OxA-3886), 26,670 ± 350 b.p. (CAMS-5895) and 28,390 ± 430 b.p. (CAMS-5891). Although the conventional GrN date was done on a bulk sample from G (with all

the contamination problems that may entail), it is not far removed from our youngest AMS date, so it is conceivable that there were two periods of Gravettian occupation at HH: G2 during the Tursac oscillation (c.24,000 b.p.) and G1 (main occupation) during the Maisières (a.k.a. "Kesselt") oscillation sometime between c.28-26,000 b.p. (see HAESAERTS and LAVILLE 1988).

The most reliable radiocarbon age for Gravettian occupation(s) at the open-air site of Maisières-Canal is c.28,000 b.p. The Maisières occupation is argued to be older than those of HH, because unit G (basal Upper Pleniglacial loess) at HH overlies a permafrost ice-sorted silt (unit F) which is equivalent to the silt deposit containing the Gravettian artifacts at Maisières. The 28,000 b.p. date at HH might predate the actual human occupation if the bone which was dated had been moved by geological processes. Both Maisières and Huccorgne are located at excellent flint sources; both have vast quantities of lithic quarry-workshop debris; and, among their tools, both have foliate and Font-Robert tanged points (both also present among Dupont's finds from the totally dug-out Gravettian deposit at Trou Magrite). HH and Maisières also have shouldered points. Yet Otte (1979) has argued on the basis of typology that Maisières' may be a slightly more archaic Gravettian than that of HH.

In our block excavation at HH we uncovered a dense concentration of flint artifacts (mainly cores and débitage) associated with limestone blocks (some possibly "arranged" by humans) and faunal remains (notably of mammoth) in Stratum 4. The base of this horizon is characterized by a thin red lens (4.1), possibly the result of post-depositional weathering under the relatively moderate, humid conditions that obtained during the time of human visits to the site. With the exception of a mammoth tooth from our E roadside pit, all the c. 250 faunal remains we found at HH came from the W railroad-side block. Reindeer is the numerically dominant species (represented by teeth, postcranial bones and antler fragments), followed by the mammoth tooth and several rib fragments, and several horse teeth and 2 postcranial bones (A.Gautier, pers. comm.). This spectrum is like the depauperate large mammal fauna from Maisières, although no small fauna have

been preserved at HH, while a few were found at Maisières. The mammoth may either have been hunted or scavenged--or its bones simply collected after death for construction material or fuel on the tree-poor landscape. (Pollen analysis by Cl.Noirel-Schutz has produced limited evidence for localized thickets of trees and shrubs, with moderately humid conditions at the time of Gravettian occupation.) We found no clear traces of hearths, and indeed an attempt to date charcoal flecks in the Stratum 4 silt yielded an age of about A.D. 1665, clearly indicating that the charcoal had percolated through at least 75 cm of humus and loess.

The block excavation yielded in particular a large prismatic blade core (abandoned when it still weighed 430 gm) to which could be refitted 29 flakes and blades (MARTINEZ and GUILBAUD 1993) (FIG.8). Typical of the débitage at HH, many of the refitted pieces are large, serviceable, but were abandoned without working into tools and apparently even without use. The interesting aspect of this refit set is that the core was initially reduced at one spot, abandoned, later picked up and moved about 2 m NNE, struck again causing it to shatter, and was definitively abandoned (FIG.9). The reason for shattering on second use seems to have been dehydration due to exposure to freezing on the ground surface. The implication is that there were at least two occupations that formed the palimpsest artifact scatter in our block excavation area. The amount of time that separated these occupations was of unknown length, but is in line with the stratigraphic telescoping observed (and testified to by the AMS dates) at the E side of the site (in contrast to the much thicker loess deposition and vertical artifact separation observed further toward the center). This is a site that was probably frequently re-visited and used, both for its proximity to abundant, high-quality, large-size nodular flint and for its strategic location cutting across the Méhaigne gorge--excellent for hunting migrating game.

The artifact collections from our principal excavations and those of the Institut Royal des Sciences Naturelles, both in the main part of the site (between the railroad and road trenches) and in the western area, are summarized in TABLE 1. Almost all the lithic raw material (generally >90%) is the excellent-quality,

blue-grey flint, that patinates white and can be found today in fields and gardens above Huccorgne in the form of large nodules. However, there are limited numbers of pieces of Brussels sandstone (from central Belgium) and of a dark grey-black, extremely fine-grain flint that might come from Obourg, near Mons and Spiennes in the Hainaut outcrop area where Maisières is located.

Before reviewing some differences among the various excavated areas' collections, a few general observations are in order. Altogether, these collections contain 8292 items of lithic debris (almost all débitage) and only 175 retouched implements, for a staggering ratio of 47.4 debris per tool. (These numbers apparently pale in comparison to the Destexhe collections from the central--and richest--part of the site, where, nonetheless formal tools were also relatively rare vis à vis knapping debris.) Surprisingly, cores (mainly prismatic and pyramidal ones for removal of laminar blanks), as well as platform renewal flakes and crested blades, are relatively few, at least in most of the areas we & Haesaerts excavated. On the other hand, chunks (large angular debris, many of which may be exhausted cores) are generally common--and actually abundant in the western area, where cores and platform renewal flakes are more frequent. Items bearing cortex range in relative frequency from 20-40%--again with more evidence of primary knapping in the W area.

Microdébitage (trimming flakes and shatter) varies widely from sector to sector, but part of this variance may be due to winnowing by running water, especially in the W road section. The proportions of blades are fairly constant throughout (10-20%) and it should be noted that, although many fine blade blanks were abandoned without transformation into tools, almost all the tools at HH are made on blades. Bladelets are also common (except in the W road section with its winnowing problem), yet backed bladelets are virtually absent (there are only 9: 6.5% of the tools from the large E road section collection).

Burins (both truncation and dihedral) are the most prominent Upper Paleolithic tool types at HH, while endscrapers are very rare. This could suggest that hidescraping was not a significant activity here, while bone/antler work may have been done. That

burins were made on site is indicated by the presence of a few burin spalls. Other processing/manufacturing/maintenance tools (perforators, sidescrapers, denticulates, etc.) are scarce, however. But the presence of Gravette and shouldered points (and of tanged points in the old collections), plus the fact that many of the backed blade fragments in the IRSNB collections could be Gravette point bits, all hint that hunting, as well as extravagant flint knapping, was done at HH--not surprising, given the site's strategic location alluded to earlier. The overall assemblage is typically Gravettian and the persistence of a few leaf-points in the old collections is characteristic of Belgium and NW Europe.

Unfortunately, we have no seasonality information for HH (or for its virtual "twin", Maisières). One can only put forth the hypothesis that Gravettian-age groups which spent the cold season in caves in or along the Ardennes uplands (and there were many Gravettian levels in such caves---including TM---unfortunately almost all excavated long ago), went down to the flint-rich areas of Middle Belgium (perhaps during summer) both to hunt and to procure lithic raw materials eventually to be transported back to the flint-poor hills in the form of blanks, tools or, more rarely, cores. Whether such moves were logistical or, more likely, residential in nature, remains to be demonstrated. There is a logic to such an hypothesis that is imposed by the structural (lithological) facts of the region. These constitute the framework to a history of *longue durée* that would continue to make sense during the still open-wooded steppe conditions of the late Tardiglacial. It was then that humans had to relearn the resource structure of the Ice Age landscape at 50 degrees N (shelter, water, food and workable lithics) at the time of recolonization of Belgium (and NW Europe in general) after an abandonment during the Last Glacial Maximum that was to last for some 10 millennia. To help investigate that recolonization, we turn to a brief discussion of our excavation of a small, specialized Magdalenian occupation in Bois Laiterie Cave.

## THE LATE UPPER PALEOLITHIC

Again we owe the original study of the Belgian Magdalenian to E. Dupont with his work in the caves of the Lesse and upper Meuse (notably Chaleux, Frontal and Goyet). Because he realized that the flint used in these caves could not be procured strictly locally and because he found fossil molluscs (especially at Chaleux, where he recorded 64) that were not known in Belgium, Dupont (1873) concluded that the Magdalenian inhabitants of Wallonia were in contact with bands inhabiting regions of north-central France that provided the flints and fossils. More recently, B. Gordon (1988) has argued that Magdalenian hunters actually based in the Paris Basin travelled northward in summer in pursuit of migrating reindeer herds. Both models minimize or deny the existence of a separate Magdalenian settlement-subsistence system ("territory") in the area that is now southern Belgium, despite the proven existence of a large number of pene-contemporaneous sites, large and small, in caves and in the open air. Many of these sites are now rather precisely dated (by both conventional and accelerator radiocarbon) to the period between 12,900-12,300 b.p. (uncalibrated), corresponding to the traditional Bölling phase near the middle of the Tardiglacial (RENSINK 1993; CHARLES 1994; GERMONPRÉ 1997). With the demonstration that recolonization of Belgium (and other regions of NW Europe such as southern England and Germany) took place at the very end of Dryas I and especially during Bölling, and with the finding of both pollen and charcoal of relatively thermophile trees and shrubs in the Bölling-age Magdalenian level at Chaleux (re-excavated recently by Otte and his students [1994]), the nature of this phenomenon was ripe for re-interpretation. This task was begun by E. Teheux (1994) who argued that many or most of the raw materials found by Dupont and his successors in the caves of the Lesse (and upper Meuse) could have been procured locally or at least within the territory of Belgium. This argument was strengthened by dental cementum analyses that showed cases (admittedly numerically limited) of not only summer, but also winter ungulate kills (including reindeer) in pene-contemporaneous Magdalenian sites of the region, namely at Chaleux, Dasomme and Nutons (STUTZ 1993, 1997). In light of these competing hypotheses

and developments, the discovery of a small but pristine Magdalenian site (in a region where so many cave sites had been dug either completely or substantially in the 19th or early 20th centuries) by Ph.Lacroix in 1990 provided an important opportunity not only to acquire modern-quality data on the age, environments, technology, subsistence and other activities of humans in this period, but also to test some of the competing views of the nature of Magdalenian settlement of Belgium. Hence, the excavation of Bois Laiterie (hereafter, "BL").

BL is a small cave located on the northern edge of the hill country above a tributary gorge that descends from the Sambre-Meuse interfluvial plateau, 0.5 km from its confluence with the Meuse 14 km upstream of Namur. The lower mouth of the cave (which is where the geological and archeological deposits are localized) faces due north and is at the top of a very steep talus slope. Because BL has an upper mouth, it is very drafty, as well as being cold and dark. The habitable area of the lower vestibule (the rest of the cave floor being much too steeply sloped) was never more than c. 40 sq.m.--including the narrow ledge in front of the cave mouth (FIG.10). The only apparent advantage to this site location is its strategic position *vis à vis* the Burnot gorge, which provides one of relatively few easy accesses between the western plateau and the Meuse valley. BL is physically the mirror opposite of Chaleux, which--like nearby TM--is capacious and faces SW. Yet 3 virtually identical accelerator radiocarbon dates (one on a *sagaie* discovered by Lacroix in 1990 [CHARLES 1994]) place the Magdalenian horizon at 12,650 b.p., which falls at the middle of the distribution of 6 dates from Chaleux (12,990-12,370 b.p.). The contrast and contemporaneity obviously suggest an hypothesis of functional complementarity between these sorts of sites.

Despite gradual sedimentological differences within the deposit yielding Magdalenian artifacts, manuports and fauna (Strata YSS+BSC) (FIG.11), the existence of several inter-strata lithic refits and many steeply tilted psammite slab manuports (STRAUS & MARTINEZ 1997; MILLER & LÓPEZ 1997), as well as the results of micro-morphological analysis (M-A.COURTY 1997) all suggest that there had been minor disturbance and

mixing, probably by trampling and minor solifluction on the steep bedrock slope. Nevertheless, most of the lithic artifacts are very "fresh" and sharp (with no evidence of battering or rolling) and the faunal remains (including fragile elements and bone artifacts such as needles and points) are well preserved---despite the abundance of psammite slabs, potentially very destructive if totally churned. The contents of the two strata are considered together as one Magdalenian horizon.

As detailed in the BL monograph (OTTE and STRAUS 1997), Strata YSS+BSC are silt and clayey silt respectively, and are bracketted by archeologically and paleontologically sterile coarse sand layers, the upper of which contained large, angular roof-fall blocks in direct contact with the surface of YSS. Loess was still being deposited by the winds according to COURTY (1997). But limited pollen and wood charcoal evidence (EMERY-BARBIER 1997; PERNAUD 1997) testify to the presence of some trees and shrubs (including mesophile taxa, such as alder, hazel and walnut) in the vicinity of BL. Malacological analysis by LÓPEZ-BAYÓN *et al.* (1997) indicates a mixture of taxa that prefer or require humid, dry, open and wooded conditions, suggesting (as do the micromammals studied by J-M.CORDY & LACROIX [1997]) that the landscape at the time of Magdalenian occupation was a complex mosaic or succession, including woods (probably along sheltered, south- and west-facing river valleysides, such as the slope directly in front of BL) and surviving open steppe-tundra (especially on the plateaux such as those above and around the site). Conditions at the beginning of the time of human use of BL were milder and more humid, but worsened toward the end. All these indications suggest that, as with all the other Belgian Magdalenian cave sites, human occupation took place during the Bölling phase, traditionally defined as starting c. 13,000 b.p. (uncalibrated). Human visits to BL may have continued into early Dryas II. The cryoclastic deposits immediately below and above YSS+BSC would pertain to periods of severe freeze-thaw during Dryas I & II respectively.

In light of this, the large mammal remains, studied by Gautier (1997) are most interesting. They include arctic or steppe/tundra forms such as reindeer, arctic

fox, musk ox (also found in other Belgian Magdalenian levels, notably at Chaleux (OTTE 1994) and Goyet [GERMONPRÉ 1997]), and European wild ass. On the other hand (and with no stratigraphic separation among the respective ecological groups of large taxa), the BL Magdalenian (like that of other regional sites, such as Chaleux 1865 and 1985-88 excavations [OTTE 1994]) also contains remains of more mesophile animals that sometimes prefer wooded or well-watered habitats (red deer and moose, respectively). Bison and horse (more likely to be open-country dwellers) are also present, along with the rocky cliff-dwellers, ibex and chamois. Both arctic and common fox are also represented in this ecologically "mixed" assemblage---characteristic of glacial-age azonal faunas especially in regions with relatively complex relief and at times of climatic transition. Wolf and hyena are virtually absent (1 element each) and the small felids and mustelids are only slightly better represented. The abundant fox remains, distributed throughout the cave, have no traces of human butchery---or even use of their canines for pendants, so common in other Upper Paleolithic sites. They may have denned and died in the cave when humans were not there (in winter?). Together with raptorial birds (DEVILLE and GAUTIER 1997), the foxes may have been responsible for the accumulation of some or many of the relatively abundant micro-mammalian and bird remains at BL. But, it was humans who killed, butchered and transported parts of the ungulates to (and from?) BL. The c.3300 well-preserved Magdalenian ungulate remains are highly fragmented, although the identification rate is quite high (27%). Carcasses are only very partially represented and minimum numbers of individuals are low (4 reindeer, 3 horses, 2 ibex and musk oxen, 1 ass, red deer, moose, chamois and bison each). Humans may also have been responsible for catching all the fish, including large species (salmon and pike) (VAN NEER 1997).

Dental cementum and eruption sequence analyses indicate that 3 reindeer were killed during the warm season (late spring-summer-early fall) (GAUTIER 1997; STUTZ 1997). This conclusion is not contradicted by any evidence on those birds that may have been dispatched by humans, though some of the fish may have been caught in late winter-early spring. The latter finding suggests that there may have been

more than one type of human visit (presumably all brief) to BL.

The BL Magdalenian artifact assemblages speak eloquently of this site's function or place on the landscape. Virtually all the knapped lithics are non-local flints of the Upper Cretaceous nodular chalk type found either on the Hesbaye Plateau (closest source: near the Magdalenian open-air sites at Orp, 35 km to the N) or around Spiennes-Obourg-Mons in Hainaut (around the possible Magdalenian open-air site of St.Macaire, 65 km to the W). Although we excavated all the remaining Magdalenian deposits in BL (some 25 sq.m.), we found a total of only 3 tiny (average length=45 mm; average weight=32 gm), exhausted blade(let) cores among the c. 3500 artifacts. Large angular debris, platform renewal flakes and crested blades are all very rare, as are any items with any cortex (only 6% of the total assemblage). Completely cortical pieces are virtually absent. There are no hammerstones or antler flakers (despite preservation of antler). While primary debris is scarce at BL, microdébitage is abundant (58%), suggesting fairly frequent *in situ* tertiary knapping and retouching. Burin spalls are also fairly common. The assemblage is highly laminar: 15% unretouched blades and 9% bladelets (defined here as blades <2 cm long; with most of the BL blades falling between 2-5 cm in length).

The 266 retouched tools produce a low debris to tools ratio of 12 to 1. Most of the tools are made on bladelets and small blades. The main tool groups are distributed as follows:

Endscrapers	8.6%	Perforators	8.3%
Burins	13.8%	Truncations	9.5%
Backed Blade(lets) & Points			37.4%
Denticulates & Notches			7.1%

The burins are almost equally divided between dihedral (n=18) and truncation (n=14) types; their relative abundance might be related to the fact that there are a number of antler and bone tools at BL (and more may have been made there that were removed from the site). The scarcity of end-scrappers (and absence of sidescrappers) might indicate the rarity of hidescraping here. Pervasive patination has unfortunately prevented extensive high-power microwear analysis. Limited results do suggest the use of

burins for grooving and scraping, endscrapers for scraping and perforators for boring, while a few points and backed bladelets have impact traces (JARDON 1997).

BL also yielded 3 nearly identical, large, round-section, single bevel base *sagaie* fragments, plus an unfinished blank. There are 3 bone needle fragments (one eyed), an engraved bird bone "flute" and other bone artifact fragments. Bone working with burins may have been done at BL.

Overall, the abundance of weapon tips (backed bladelets and small blades, points and *sagaies*) and the paucity of such processing tools as scrapers, combined with the rarity of primary knapping debris and absence of hammerstones, suggest a site where opportunistic hunting together with tool/weapon manufacture or re-working were the principal activities. Flint was brought into BL in the forms of laminar blanks and finished tools from distances equivalent to at least 1-2 days' walk (Orp or Spiennes) and carcass parts may have been taken out, perhaps to larger, more comfortable residential loci, such as Goyet or Chaleux.

That the BL visitors were participants in the larger Upper Belgian Meuse settlement-subsistence system which was in turn in contact with that of the Paris Basin (with such penecontemporaneous and technologically similar sites as Pincevent, Marsangy, Etiolles, St-Jacques and Verberie) is strongly suggested by the finding of 8 fossil shells (like those found earlier at the Belgian sites of Frontal, Dasomme, Goyet, Verlaine, Coléoptère and especially Chaleux [RENSINK 1993]) from that region or other more distant regions of France. The fossils from BL are *Bayania lactea* (4: 2 of which are perforated), *Sigmesalia* sp. (1, perforated), *Campanile giganteum* (1, perforated), *Glycymeris pulvinata* (1), and *Terebralia bidentata* (LOZOUET and GAUTIER 1997). The first and third taxa have also been found at Paris Basin Magdalenian sites; the first, second and fourth have been reported from other Magdalenian sites in Belgium. All but *Terebralia* are from Middle Eocene (Lutetian?) beds within a 100 km radius of Paris. That means that these fossils were transported from a *minimum* of 150 km. The closest source of *Terebralia* would have been the Loire Basin of Touraine---at least 350 km S. These finds suggest the maintenance of

social relations (visits, trade, intermarriage, etc.) between the Magdalenian bands of the Belgian "frontier" territory and their possible (logical) "hometown" in north-central France. The open-air site of Roc-la-Tour, overlooking the Meuse-Semois confluence just inside the French Ardenne border, would have been the southernmost of the "Belgian" sites en route across the shelter- and flint-less "marchlands" of Champagne (ROZOY 1989). On the other hand, the discovery at BL of a fragmented piece of worn pyrite (like 3 such pieces found at Chaleux) suggests that this "strike-a-light" mineral was procured (perhaps together with some/all of the chalk flint) in the Mons area of Hainaut, where the nearest pyrite source is situated (LOZOUET and GAUTIER 1997). Both human movements within the Belgian territory (seasonal, logistical and residential) and contacts with the Parisian territory are suggested by the data from BL and the other Belgian sites. The only other possible item of adornment at BL is a perforated circular piece of sandstone.

Detailed comparisons of the BL, Chaleux, Orp (E and W) and Kanne Magdalenian assemblages (the first two definitely contemporaneous and the latter two also thought to date to Bölling) (STRAUS and ORPHAL 1997) (FIG.12) not surprisingly show great similarities between the upland cave sites of BL and Chaleux, although the latter assemblage (combined with Chaleux's richer, more diverse fauna and constructed hearths) is much more suggestive of a multi-functional residential occupation (albeit distant from good flint sources)(see OTTE 1994). While there are some tool typological similarities between those two sites and the open-air sites of Orp and Kanne on the low, loess-covered plateaux of Middle Belgium (VERMEERSCH *et al.* 1985, 1987), not surprisingly there are significant differences in terms of debris, item sizes and weaponry between the two groups. The Orp and Kanne sites are quarry-workshop loci at excellent chalk flint sources (like several other sites in nearby Dutch Limburg around Maastricht [RENSINK 1993]). Reminiscent of the Gravettian sites of Maisières and Huccorgne, they are rich in large, prismatic cores, abandoned unused blades, hammerstones, and huge amounts (67-87%) of microdébitage. Specifically rare, however, are precisely the same kinds of bladelets and small blades that are so

predominantly represented at BL and Chaleux. Virtually absent too at Orp E and W and at Kanne are the backed bladelets (weapon elements) that are so abundant in the cave sites. All these facts might suggest a complementary functional relationship between open-air sites specialized in lithic blank production and cave sites that were residential and/or hunting camps. Unfortunately, faunal remains are not preserved at the open-air sites, so we cannot test the obvious hypothesis that they were visited in the warm-season. BL seems to have been a warm-season transit camp physically located between the many caves sites in the Meuse-Lesse confluence area closer to the Ardennes, where there is evidence of both warm and cold-season human residence (based on reindeer, red deer and ibex kills determined by A.Stutz [1993,1997]). The possible relationship between the upland and lowland sites and the penecontemporaneous existence of a diversity of Magdalenian site types on the territory of Belgium argue strongly for the existence of a separate, complete settlement-subsistence system ("a regional band"), albeit one which maintained social contacts with the Paris and Middle Rhine Basins.

Finally, intra-site spatial analyses of BL materials (distributions of artifacts, manuports and faunal remains; lithic refits)(FIG.13) show a simple site structure (STRAUS & MARTINEZ 1997). There were burning areas (not constructed hearths), psammite slab-paved areas and knapping areas on the sheltered ledge just outside the cave mouth and in the area just inside the mouth. These two sunlit areas of intensive activity are linked by refits, and both of them are linked to a discard area at the penumbral rear of the cave. Faunal remains are scattered generally. There was no substantial investment in making this a habitable site; it simply is too uncomfortable and could only serve limited purposes for short periods of time. The psammite slabs are available strictly locally, as they outcrop on the Bois Laiterie hillside and surroundings. A large number of the psammite slab fragments refit.

## THE EARLY AND MIDDLE MESOLITHIC

One other cultural component was discovered---serendipidously---at BL. The clandestine pothunters who had shovelled out the surficial, culturally fertile deposit down to either sterile sands above the Magdalenian at the E or bedrock at the W side of the cave, left a concrete-hard breccia adhering to the E and cave walls. While excavating the Magdalenian deposits beneath this breccia, we observed human bones and ceramic sherds and assumed the existence of a Neolithic ossuary. Because they were exposed and in danger of further looting, we carefully removed a human foot and other miscellaneous bones. A talus from the foot was AMS dated with the surprise result of  $9235 \pm 85$  b.p. (GX-21380, uncalibrated)---early Mesolithic---despite the total lack of any characteristic Mesolithic artifacts (even in the masses of old pothunter backdirt that we fine-screened). The presence of the sherds probably means that there was mixing of closely juxtaposed Neolithic and Mesolithic depositional episodes.

BL has thus joined a long and growing list of early Mesolithic funerary caves with few or no cultural remains in the Upper Meuse-Sambre Basin of Namur Province: Loverval (9640-9090 b.p.), Petit-Ri (9270 b.p.), Claminforge (9320 b.p.), Margaux (9190-9590 b.p.) and Les Autours (9090-9500 b.p.) (TOUSSAINT *et al.* 1996; CAUWE 1993, 1995; JADIN *et al.* 1995). Some of these are individual burials and others are collective ossuaries, presaging funerary practices in the regional Neolithic which also used caves but provided grave offerings. Another interesting aspect of the BL human Mesolithic foot is that carbon and nitrogen stable isotope analyses by H.KRUEGER (1997) indicate a largely herbivorous diet, with limited animal protein. The  $\delta^{13}C$  of bone gelatin ( $n=3$ ) averaged  $-20.5 \pm 0.1$  o/oo and the  $\delta^{14}N$  ( $n=3$ ) averaged  $+8.3 \pm 0.3$  o/oo. If confirmed by analyses of human remains from other Belgian Early Mesolithic cave interments currently underway, this evidence would call into the prominence generally given to the role of hunting in initial Holocene subsistence in NW Europe (e.g., Rozoy 1993), and would tend to support the less ungulate meat-dominated scenario proposed 20 years ago by David Clarke (1976).

Besides diet, one of the other poorly known aspects of the early-middle Mesolithic in the Belgian uplands is settlement. Most of the well-excavated Mesolithic sites in Belgium are in the sandy lowlands of Flanders and Limburg (and they lack faunal remains) or in the Middle Meuse Basin (notably the recently excavated, 7800 b.p. Mesolithic component at the Place St.-Lambert in Liège, which does have fauna [GUSTIN *et al.* 1994; LÓPEZ BAYÓN 1994]). As part of the South Belgium Prehistoric Project, we excavated 14 sq.m. of Mesolithic deposits at the base of a trench in the Abri du Pape where J.-M. Léotard (1989) of the Université de Liège had earlier excavated some 3.5 m of Medieval, Roman, Iron Age and Neolithic deposits (FIG.14).

L'Abri du Pape (hereafter, "AP") is a small rockshelter discovered by Ph.Lacroix at the foot of the 100 m Freyr cliff on the right (E) bank of the Meuse, 5 km downstream from the French border at Givet and 3.5 km upstream of the Lesse confluence at Dinant. The excavation trench is in the center of the shelter and in Mesolithic times the habitable area seems to have been a narrow hollow between two lateral scree cones and between the rear of the shelter and the steep talus bank of the Meuse. Most of this area was probably uncovered by our excavation. All the levels are composed of angular gravels spalled off the limestone cliff, with varying amounts of sand, silt and organic matter. The Mesolithic levels are 20, 20.1, 21, 21.1, 22 and 22.1 (FIG.15). (A few artifacts from 23 and lower levels might be of Magdalenian age, but this is as yet not positively demonstrated.) Charcoal from Stratum 20 was AMS dated to  $7843 \pm 85$  b.p. (uncalibrated) (GX-19365). Strata 21, 22 and 22.1 yielded a series of statistically identical uncalibrated AMS dates on charcoal of  $8817 \pm 85$ ,  $8780 \pm 85$  and  $8756 \pm 83$  b.p. (GX-19366-68) respectively. Stratum 20 is therefore contemporaneous with the Place St.-Lambert open-air Mesolithic site and Strata 21-22 are almost contemporaneous with the youngest of the Mesolithic burial caves (including Margaux and Autours, which are adjacent to AP on the Freyr Cliff). Fires, from which the abundant charcoal fragments came, seem to have been informal affairs; there is no evidence of constructed hearths or any other features in what was apparently a brief, but repeated, SW-facing bivouac location on the bank of the Meuse.

Attempts to recover pollen from numerous samples largely failed due to poor preservation conditions (as was also essentially the case at TM and HH). Preliminary wood charcoal analysis of Stratum 22 reveals the overwhelming dominance of hazel ( $n=70$ ), with small amounts of pine and traces of elm and some member of the apple family. Stratum 23 has traces of hazel, pine and birch (PERNAUD n.d.). Analysis of snails from columnar samples shows that in Stratum 23 and below, vegetation conditions at AP were still relatively open and humidity relatively low (probably early Preboreal and Dryas III), whereas Strata 22 and 21 were populated by mesophile taxa requiring or preferring wooded or parkland habitats (LACROIX and LÓPEZ BAYÓN n.d.). Analysis of the micromammalian faunas provide similar results: dry, open habitats are suggested for the basal (virtually culturally sterile) levels with hamster; forestation occurs in Stratum 22 and above, with the presence of mice, edible dormouse and squirrel (GAUTIER and LACROIX n.d.).

Large mammal remains are not abundant; only in Stratum 20 are there significant (albeit still small) numbers. Carnivores include trace quantities of wild cat, marten and otter among the various Mesolithic levels, plus a better representation of fox (NISP=12) in Stratum 20. Boar is present in Strata 20, 21 and 22; roe deer and bovine (aurochs or bison) in Strata 20 and 22; red deer in Strata 20, 21 and 21.1. NISPs for Stratum 20 are 8 for boar, 17 for roe deer, 11 for red deer and 5 for bovine (GAUTIER n.d.). These taxa are fully compatible with woodland-parkland habitats. These are the same taxa that dominate the penecontemporaneous fauna at Place St.-Lambert, although that site also has beaver and dog (LÓPEZ BAYÓN 1994). In terms of human activity at AP, they are indicative of very minor, ephemeral visits to the site: perhaps no more than "one-night-stands", as also suggested by the lack of constructed hearths and the absence or absolute scarcity of formal tools in the hollow between the scree cones. Bird remains are abundant and varied; they and many of the micromammals may have been taken by owls, goshawk, harrier and kestrel, some of which may have roosted in the rockshelter or on the surrounding cliffs. The carnivores may have also taken some of the rodents and waterfowl,

while humans were responsible for catching the many fish (currently under study by W. Van Neer). The extent of the human role in procurement of birds and fish remains to be determined. Unfortunately no seasonality evidence has yet been obtained. The poverty of large mammalian remains might be an argument in favor of a diet with a significant plant component.

The AP Mesolithic lithic raw materials are diverse and include both poor-quality cherts probably of local origin and some excellent (but small-size) flints that probably come from the distant Hainaut (70 km WNW) or Hesbaye (60 km N) chalk sources. Interesting in the Belgian context is the absence of Wommersom quartzitic sandstone. This material, from a source in Brabant (central Belgium) 70 km from AP and near the closest Hesbaye flint source at Orp, is otherwise common in and characteristic of Mesolithic assemblages, including Place St.-Lambert 42 km from Wommersom. This might suggest that the chalk flint at AP was procured in the Spiennes (Hainaut) area, rather than in the Orp area near Wommersom. Certainly the existence of a distinctive, local tradition of human burial in caves bereft of associated artifacts, in the Upper Meuse and Sambre valleys, suggests the existence of a relatively small cultural "territory" that encompassed that (W) sector of Namur Province which abuts E Hainaut and its flint sources. This might correspond to the (or a subgroup of the) Ardennian "tradition", as distinct from the penecontemporaneous Beuronian, which is centered further to the E in Liège Province. Apparently gone now are the extensive networks of social relationships and large annual territories of the Magdalenian.

Lithic debris at AP is very unevenly distributed among the Strata: 1,916 in 20, 209 in 21, 352 in 22 and 136 in 22.1+22.2. Items with any cortex decrease steadily from 22% of the Stratum 22.1+22.1 assemblage to 9% of the Stratum 20 assemblage. A few cores are present (as many as 6 in Stratum 20) in all levels except 22, but they are very small and exhausted. All were used to produce bladelets and small blades either exclusively or partially. Bladelets and small blades make up between 35-45% of the lithic debris among Strata 20-22, but only 25% in Strata 22.1+22.2, where flakes and cortical items are relatively more frequent and microdébitage is

less abundant than in the other levels. Platform renewal flakes are present in all levels except 21, and 3 broken tips of antler punches were found (in Strata 20 and 22). Small prismatic and pyramidal cores were brought to AP and small laminar blanks were struck from them at the site. Two standardized sorts of blade(let)s were produced: thin, narrow and short versus thick, wide and slightly longer. Although many unmodified blade(let)s were abandoned *in situ*, microlithic implements (projectile tips/barbs, sickle/knife elements) may have been taken from AP and did not make it back to the site simply because people may not have returned immediately or often to this *ad hoc* campsite.

Stratum 20 also yielded the majority of the retouched tools: a mere 31. They are mainly end- and sidescrapers, denticulates, notches and other (quite "informal") retouched flakes and blades. There are no geometric microliths, as is typical among assemblages of the Ardennian Mesolithic (ROZOY 1990). Nor are there any backed bladelets. Stratum 21 yielded only 7 artifacts (all of the same sorts, plus a perforator). Stratum 22 and the lenses below it (22.1+22.2) have together yielded 2 triangles, a possible Tardenoisian point tip, 2 truncated blades, 5 pieces with continuous retouch and a notched bladelet.

The presumed larger, residential Mesolithic camps that provided the dead for the burials in the caves of the Freyr Cliffs remain to be found. Slightly further S in the French Ardenne, Rozoy (1978,1990) has located several open-air sites that dominate the Meuse valley from its rim. Such a site also once did exist at the top of the Sept Meuses hill above Bois Laiterie Cave: Sart à Soile. It is however attributed to the late Mesolithic, because of the presence of lithic trapezes, circle segments and invasively retouched "mistletoe leaf" arrowheads (ROZOY 1978).

The fascinating question of the nature of the relationships between Mesolithic foragers and Linear Bandkeramik farmers in southern Belgium (KEELEY 1992) cannot be addressed by the deposits in AP, because there seems to have been a depositional hiatus above Stratum 20 which is directly surmounted (and partially disturbed) by middle Neolithic burials. A (permeable?)

Mesolithic-Neolithic frontier between the hill country and the loess-covered Hesbaye plateau seems to have existed for a short time after c.7000 b.p. (uncalibrated) along the middle-lower course of the Belgian Meuse. AP does have a sequence of Michelsberg middle Neolithic ( $4450 \pm 360$  b.p., uncalibrated, GX-20206) and Seine-Oise-Marne late Neolithic ( $4190 \pm 60$  b.p., uncalibrated, Lv-1747) levels, mainly dug by Léotard (1989). Both sets of levels have evidence for both mortuary and residential activities. There are large quantities of ceramics accompanied by small numbers of lithic artifacts that include relatively many formal tools: points and scrapers in Stratum 18 and a burin and a retouched flake in Strata 14-12. But this is now a world of farmers.

## CONCLUSIONS

The South Belgium Prehistoric Project of the Universities of Liège and New Mexico, to varying degrees, sampled all the major phases of human habitation of Wallonia between nearly 100,000 and 4000 years ago. During this immense stretch of late Quaternary time, the environments of this region at 50 degrees N latitude swung between temperate, humid and relatively oceanic and frigid, arid and continental, between wooded and open (with various intermediate permutations as well), and then back again. These changes were far more dramatic than in the southern refugia of the European Mediterranean peninsulas, while the latitudinal position and complex relief of S Belgium (despite the absence of major mountain chains) created highly complex ecological mosaics that, under intermediate ("interstadial") climatic conditions, supported mixtures of faunas that are today widely separated zonally (if not extinct). Humans were among the species that responded to the vicissitudes of Belgium's environmental possibilities by alternately moving into or out of this frontier territory. They were part of the great biotic fluxes of the Pleistocene.

Even when habitable, there were times when occupation of S Belgium was marginal and depended on the ability to seek winter shelter in the favorably oriented caves of the Ardennes foothill valleys. It also depended on the maintenance of social

contacts with human bands to the south for the acquisition of mates and as an "insurance policy" in times of resource failure (e.g., reindeer or horse herd crash). Under optimal climatic conditions, in contrast, movement may actually have been hindered by the density of interglacial woodlands especially in the areas of high or broken relief, potentially limiting the size of effective human territories. One aspect of reality in Belgium that did not change was the structural relationship between the Ardennes uplands (rich in ecotonal situations, caves and rockshelters, but poor in knappable lithic raw materials) and the plains of Middle Belgium (rich in excellent chalk flint, but poor in shelter and vegetal resources). Survival as a hunter-gatherer in Belgium often required the ability to use both environments, especially under marginal climatic conditions. Our research has contributed to the understanding of how that relationship between the uplands and the plains developed and changed throughout the course of those times when the territory of Belgium was tenable for human settlement.

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Table 1: HUCCORGNE-HERMITAGE SITE:

SUMMARY OF LITHIC ASSEMBLAGES, 1976, 1980, 1991-93 EXCAVATIONS  
(INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE [IRSNB] AND  
UNIVERSITIES OF NEW MEXICO [UNM] & LIEGE [ULg])

Excavation	Between Railroad & Road Trenches			West of the Road Trench	
	Unit: E RR Block (H-L/6-9)	Road Pit (Q-R/25-26)	E Road Section	W Road Section	Main W Pit (J-L/53-55)
	<u>UNM/ULg</u>	<u>UNM/ULg</u>	<u>IRSNB</u>	<u>IRSNB</u>	<u>UNM/ULg</u>
<b>Debris</b>					
Core	0.2 %	0.1 %	0.1 %	1.3 %	6.5 %
Chunk	7.6	7.3	3.8	20.0	9.9
Platform Renewal Flk.	-	-	0.8	0.4	1.6
Crested Blade	-	-	1.1	-	-
Flake (>1cm)	26.5	44.6	19.7	47.1	39.3
Microdebitage (<1cm)	55.6	23.7	50.4	10.3	23.0
Blade (>2cm)	9.9	17.4	16.6	19.6	11.5
Bladelet (<2cm)	11.2	6.7	7.5	0.9	22.5
Burin Spall	0.2	-	0.8	0.9	-
N	1,327	998	5,681	225	61
All Cortical Items	22.1 %	21.2 %	20.9 %	36.5 %	40.9%
<b>Tools</b>	<b>n</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>n</b>
Endscraper	1	1	2.9	2	1
Burin	7	-	23.1	2	2
Endscraper-Burin	2	-	-	-	-
Perforator	1	-	2.1	-	-
Backed Blade(let)	-	-	25.3	-	-
Point	1 Gravette	1 Gravette	1.4 Shouldered	-	-
Truncated Pc.	-	-	6.4	1	-
CRP+S/S*	5	3	18.0	2	1**
Dentic.+Notch	3	-	16.0	-	-
Ret.+Dentic.Bladelet	-	-	4.3	-	1**
N	20	5	138	7	5

\*: Continuously retouched piece + sidescraper.

\*\* : From the small western pit, JJ-KK/45-46.

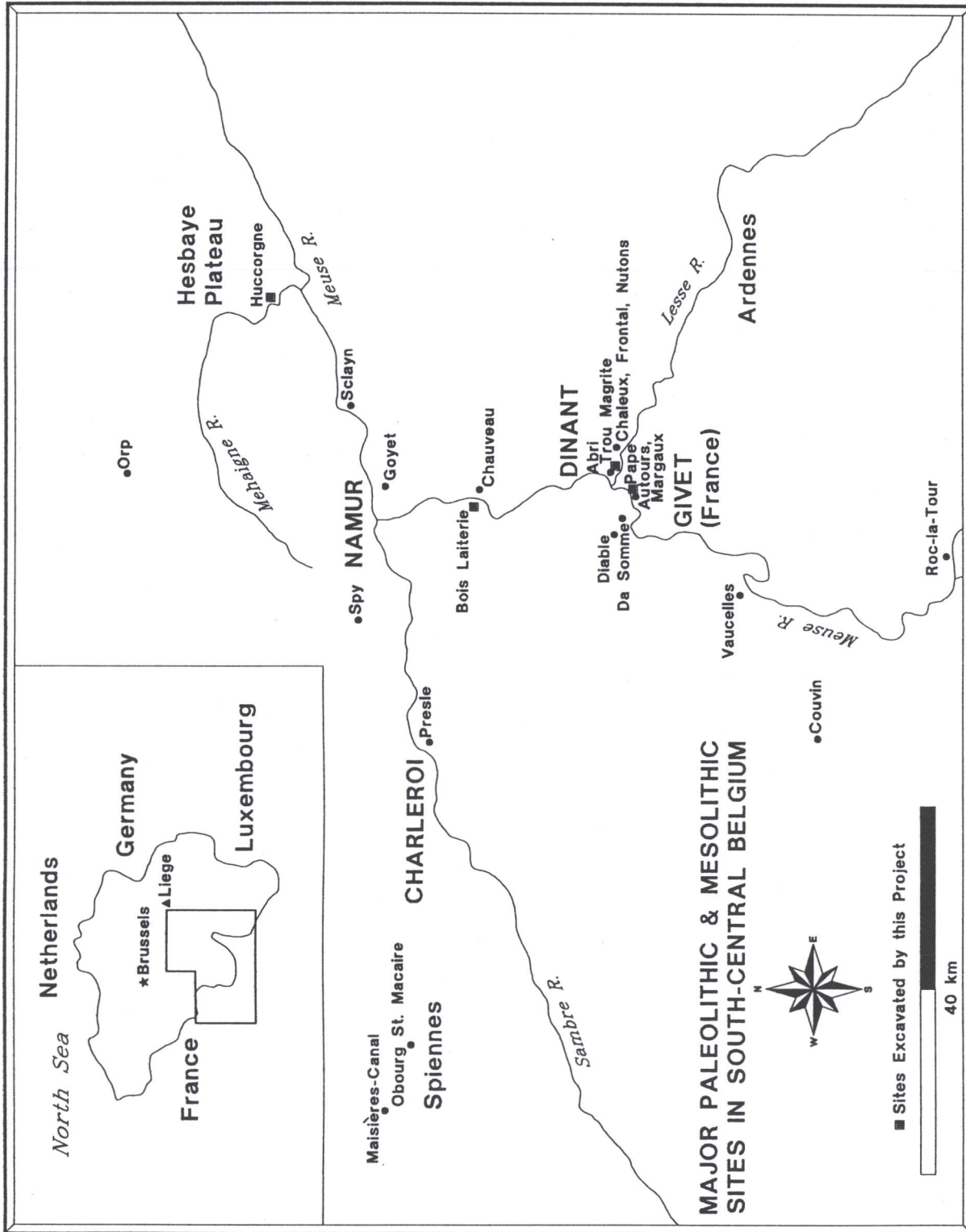


Figure 1. Map of South-Central Belgium (Namur Province and parts of Hainaut, Liège and Brabant Provinces---all in Wallonia), showing the locations of major Paleolithic and Mesolithic sites referred to in the text.

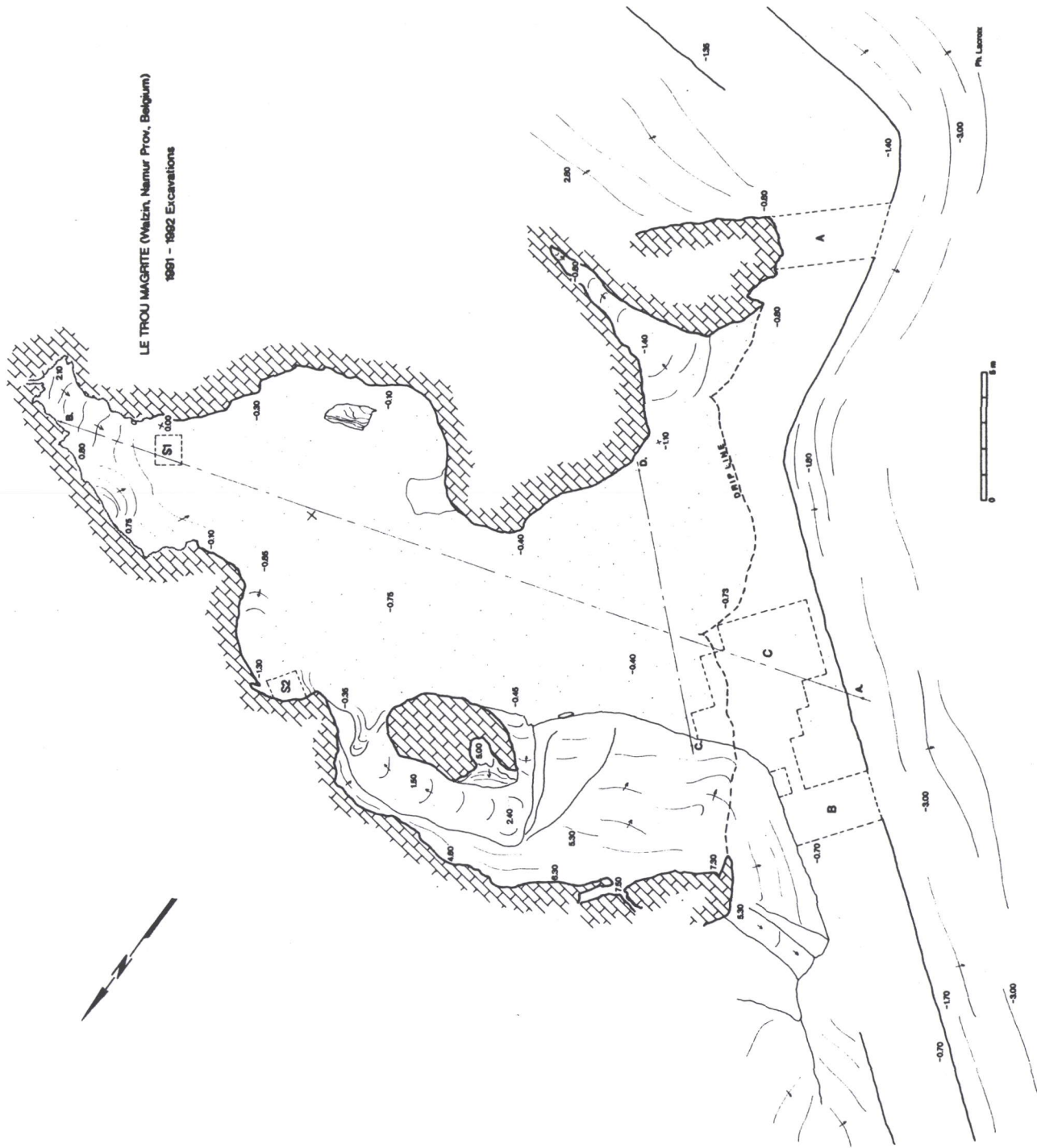


Figure 2. Plan of le Trou Magritte. Remnant intact Paleolithic deposits were found and excavated in our "Trench C" (plan by Ph.Lacroix).

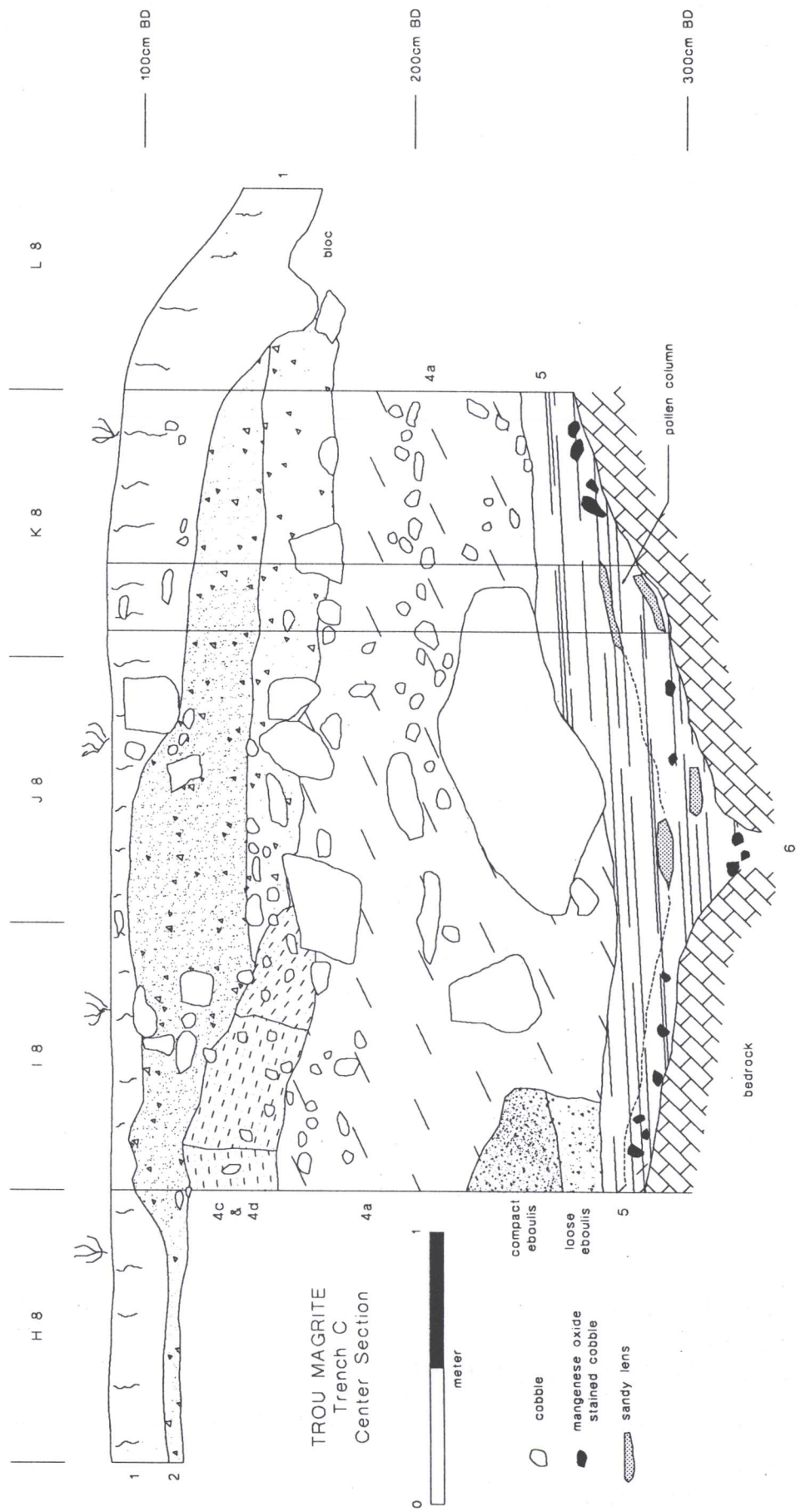


Figure 3. Stratigraphic section in Trench C of le Trou Magrite. Mousterian finds are in Strata 5-4; Gravettian in Strata 3-2.

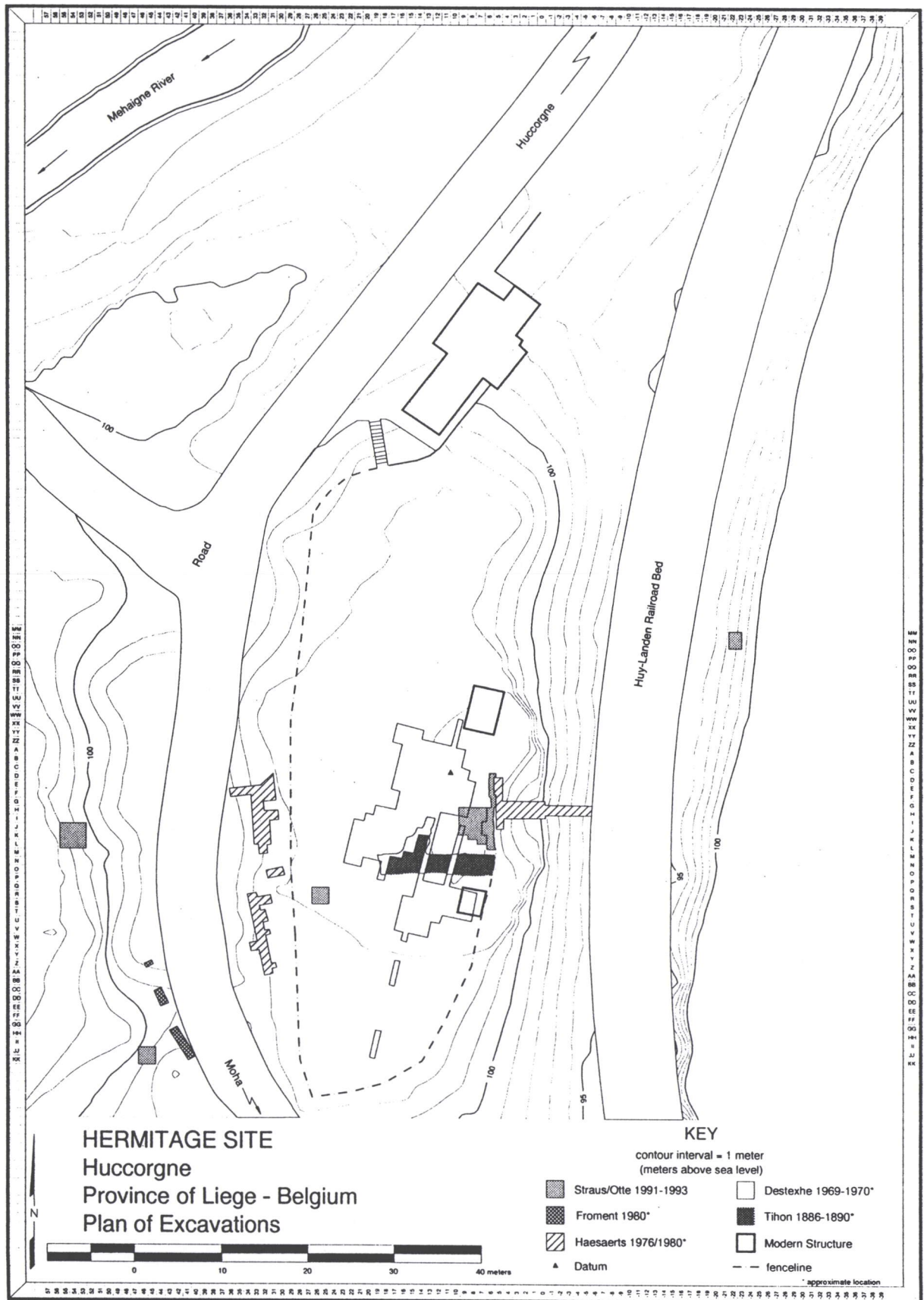


Figure 4. Plan of the Huccorgne-Hermitage open-air site showing the locations of excavations since the 19th century)(plan by A.Martinez).

TROU MAGRITE, 1991-92  
Aurignacian Lithic Tools

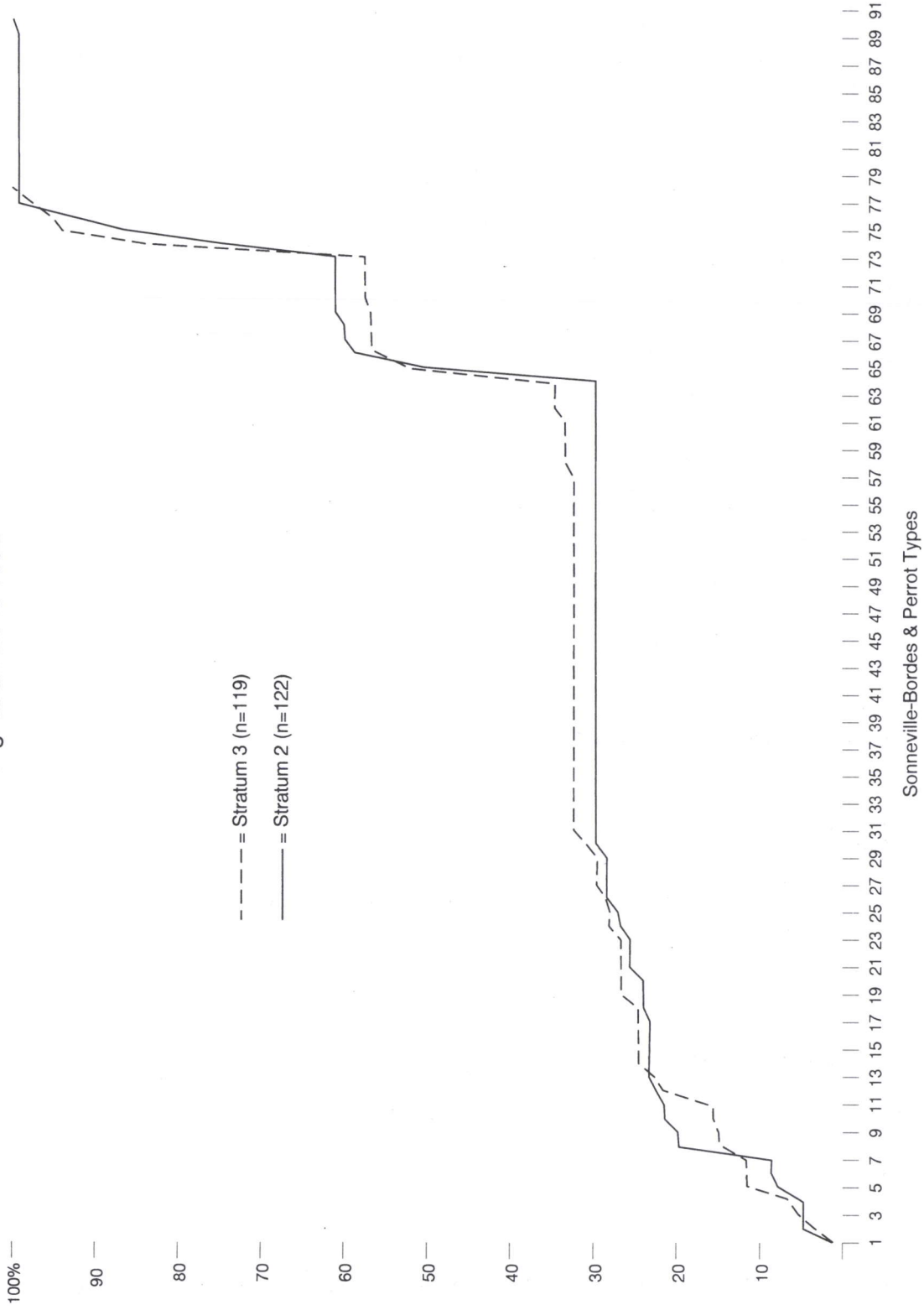
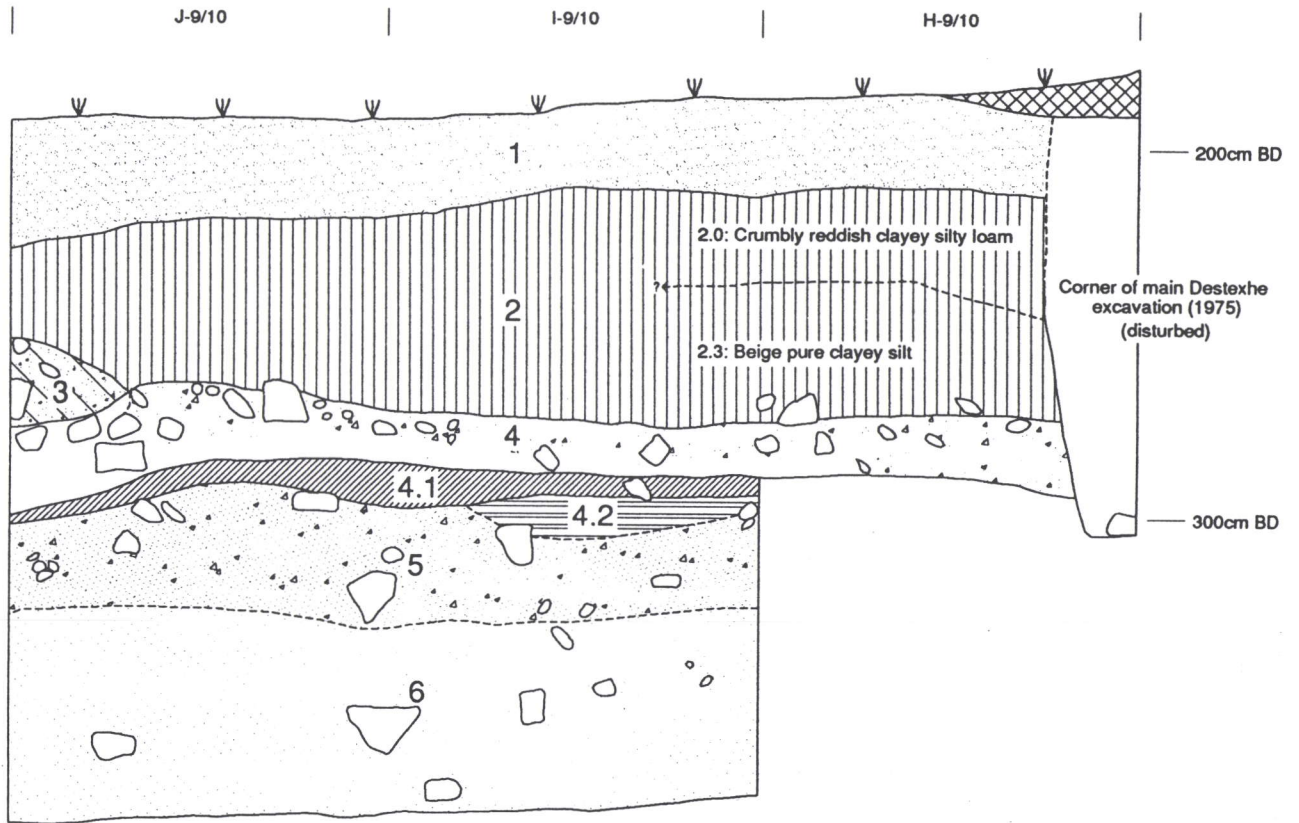
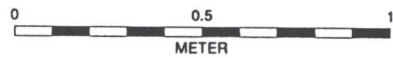


Figure 5. Cumulative percentage graphs of the tool assemblages of the early and late Aurignacian levels (3 and 2) at le Trou Magrite.



- Recent burned trash layers
- Present ground surface
- Mottled gray-brown loam w/roots, worm holes
- Rock
- Mottled crumbly reddish-brown loam w/roots, worm holes
- Reddish-brown to light brown gravelly silt
- Upper: beige silt w/gravel  
Lower: light brown to beige loess
- Reddish loess
- Yellowish-beige silt w/charcoal flecks
- Beige very clayey silt w/gravel
- Pure beige clayey silt



WEST SECTION, HUCCORGNE - DOCK  
Main Excavation, 1992

Figure 6. Stratigraphic section of our main block excavation area at the eastern end of the Huccorgne-Hermitage site. Strata 4-4.2 are Gravettian.

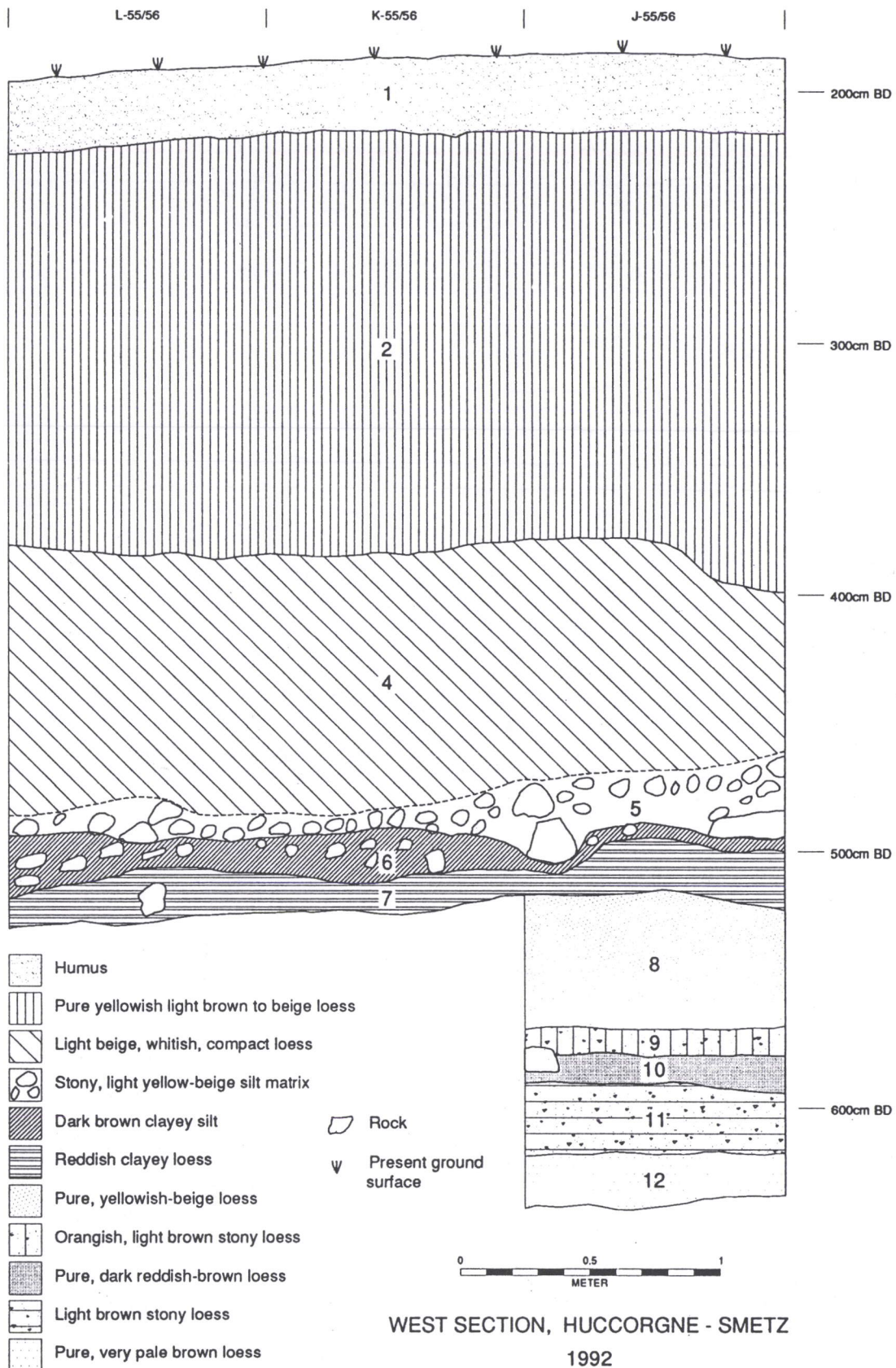


Figure 7. Stratigraphic section of our main test pit in the western area of the Huccorgne-Hermitage site. Gravettian occupation is at base of Stratum 4; Mousterian is in Strata 5-9.

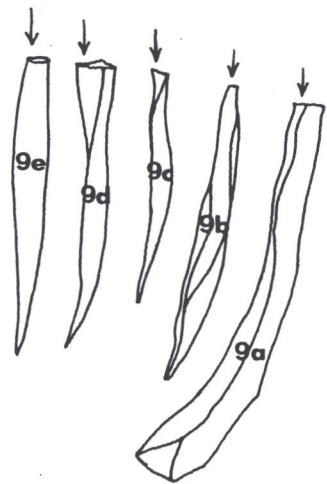
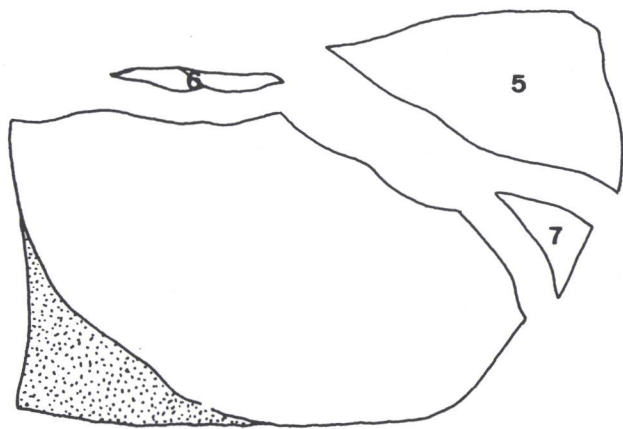
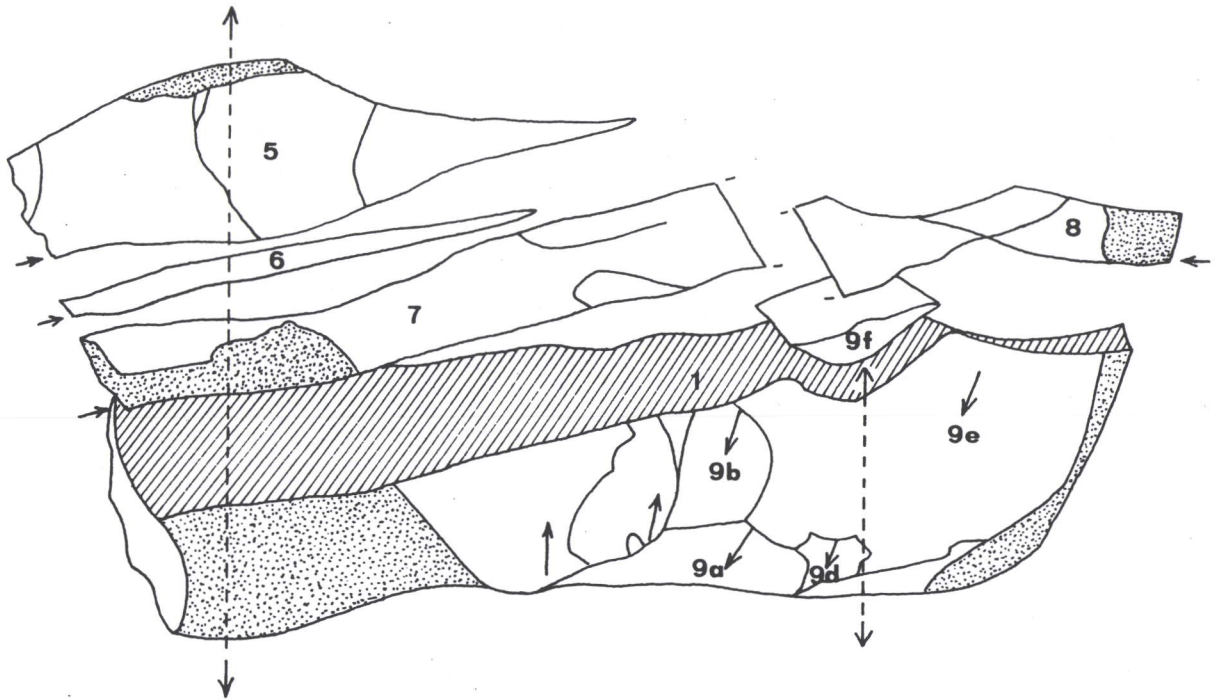
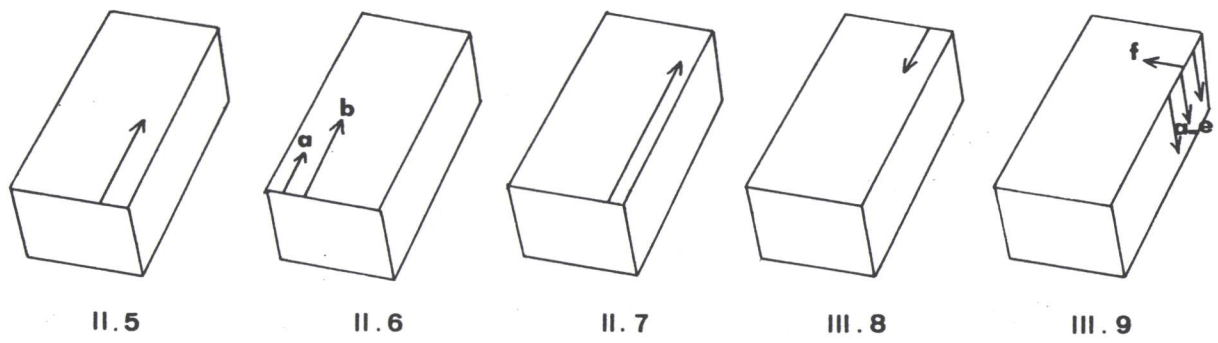


Figure 8. Refitted blade core from our excavation of the Gravettian component at Huccorgne-Hermitage (study by A.Martinez and M.Guilbaud).

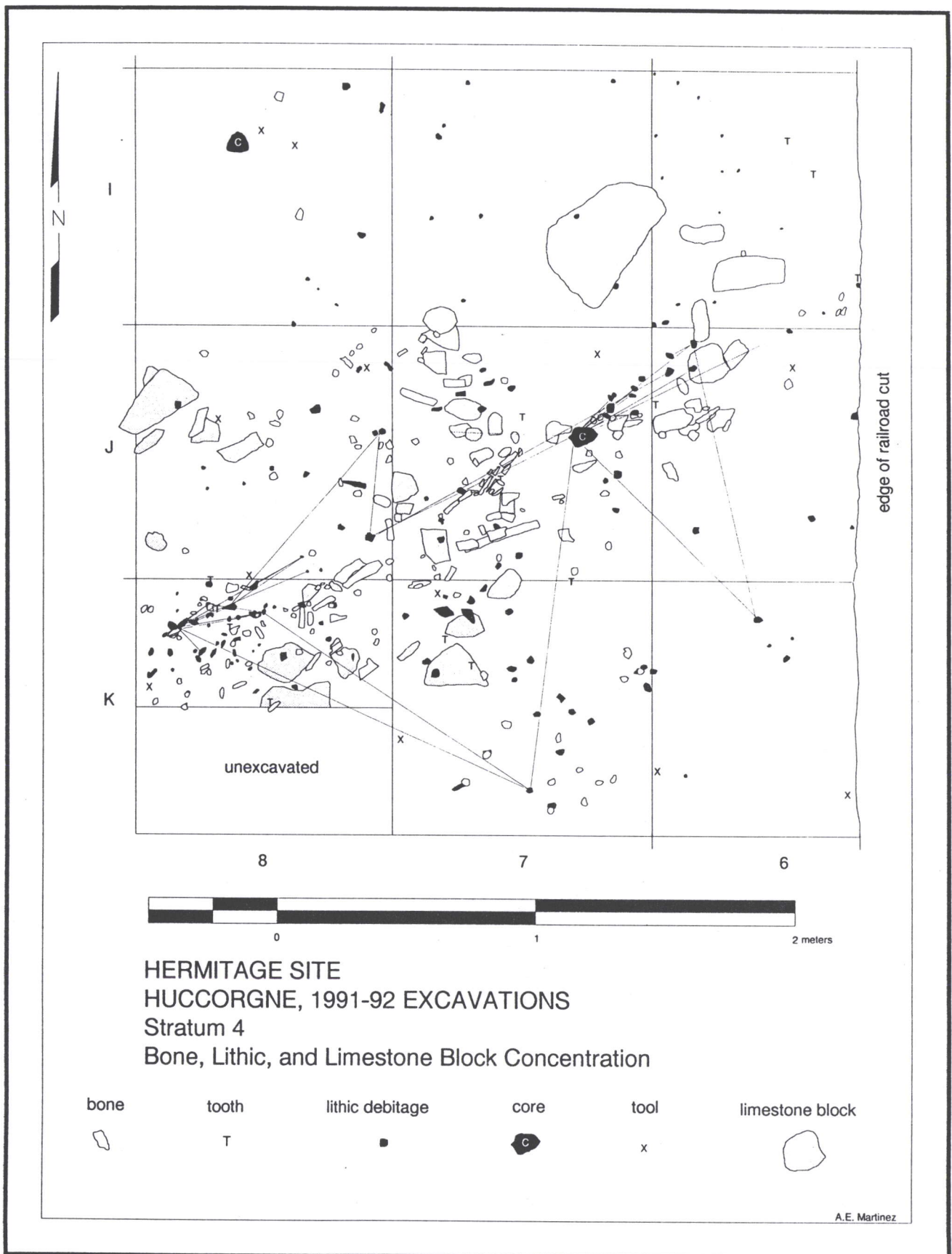


Figure 9. Plan of débris items refitted to the core in the Gravettian level of our main excavation block at Huccorgne-Hermitage (plan by A.Martinez).



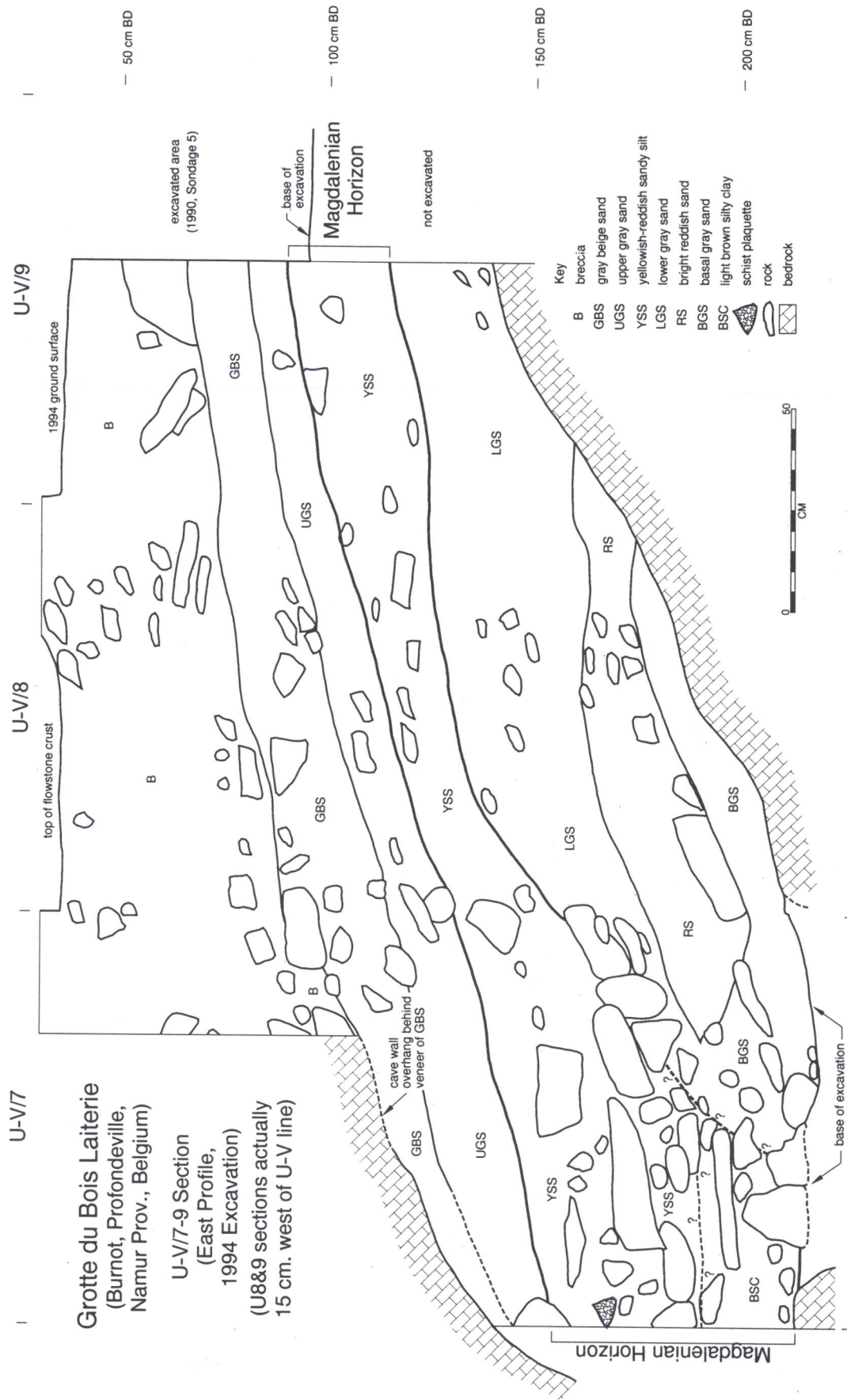


Figure 11. Main (north-south) stratigraphic section in the interior of Bois Laiterie Cave. The Magdalenian horizon corresponds to Strata YSS and BSC.

CUMULATIVE PERCENTAGE GRAPHS OF MAGDALENIAN ASSEMBLAGES:  
BOIS LAITERIE, CHALEUX, ORP EST, ORP OUEST & KANNE

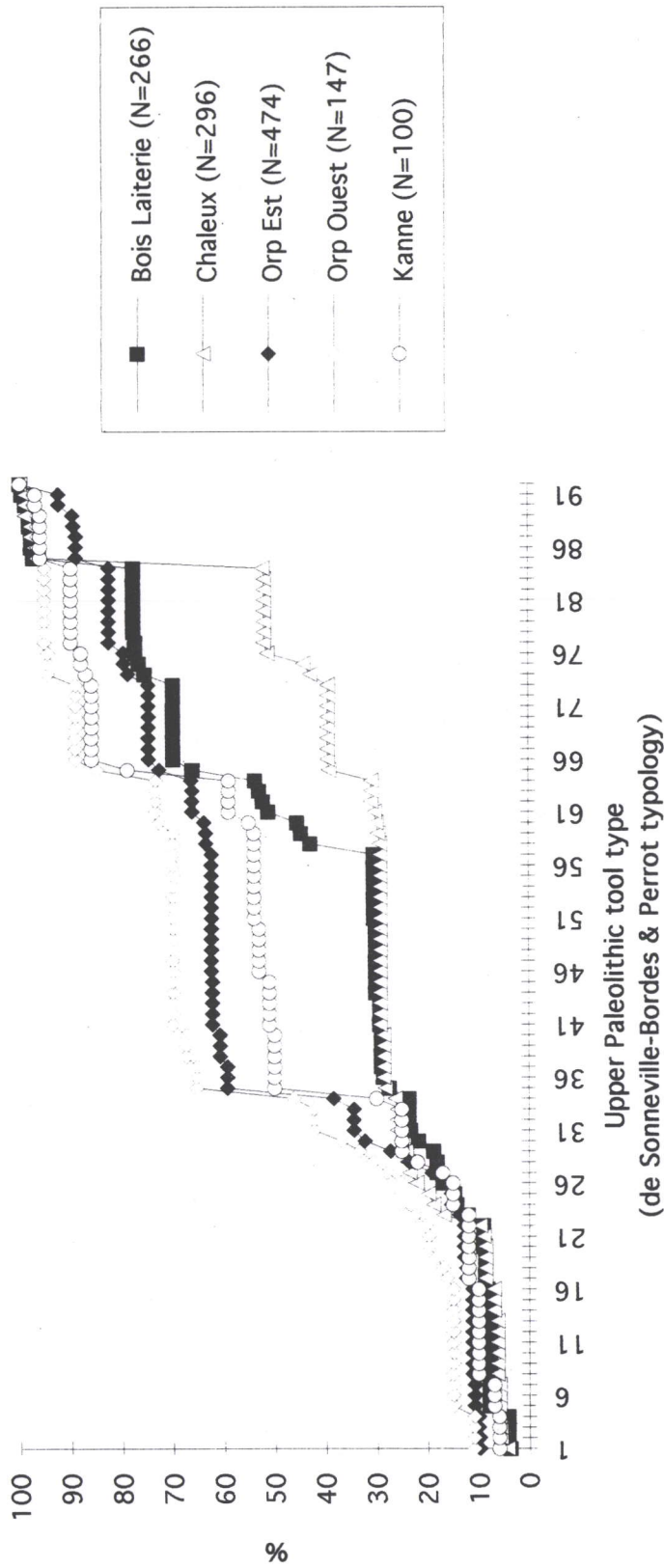


Figure 12. Cumulative percentage graphs of the Magdalenian tool assemblages from the caves of Bois Laiterie and Chaleux (Otte excavation) and the open-air sites of Orp East, Orp West and Kanne (Vermeersch excavations)(figure by J.Orphal).

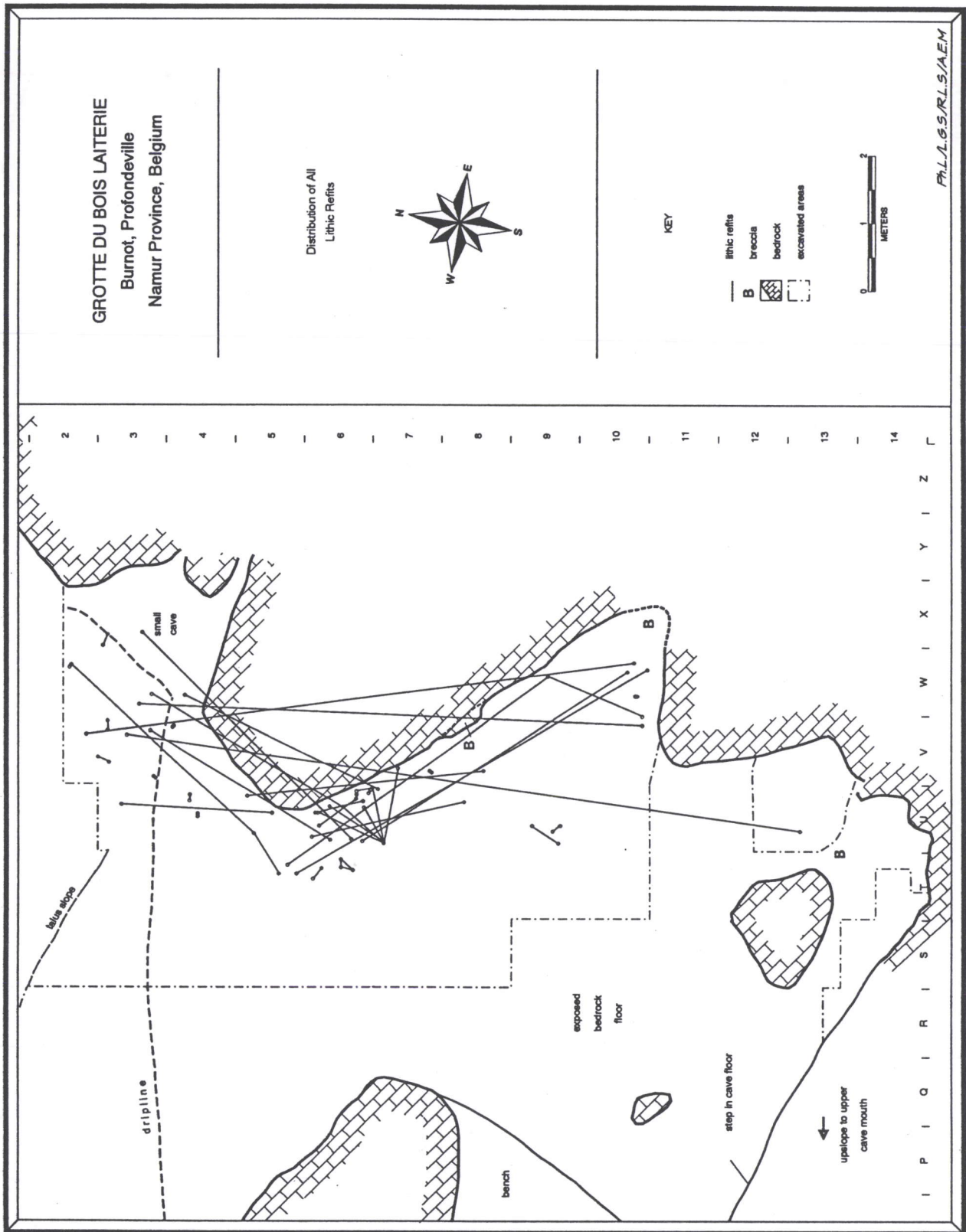


Figure 13. Plan of Magdalenian knapped flint artifact refits in Bois Laiterie Cave (by A.Martinez).

ABRI DU PAPE  
 Freyr  
 Province of Namur - Belgium  
 Plan of Excavations

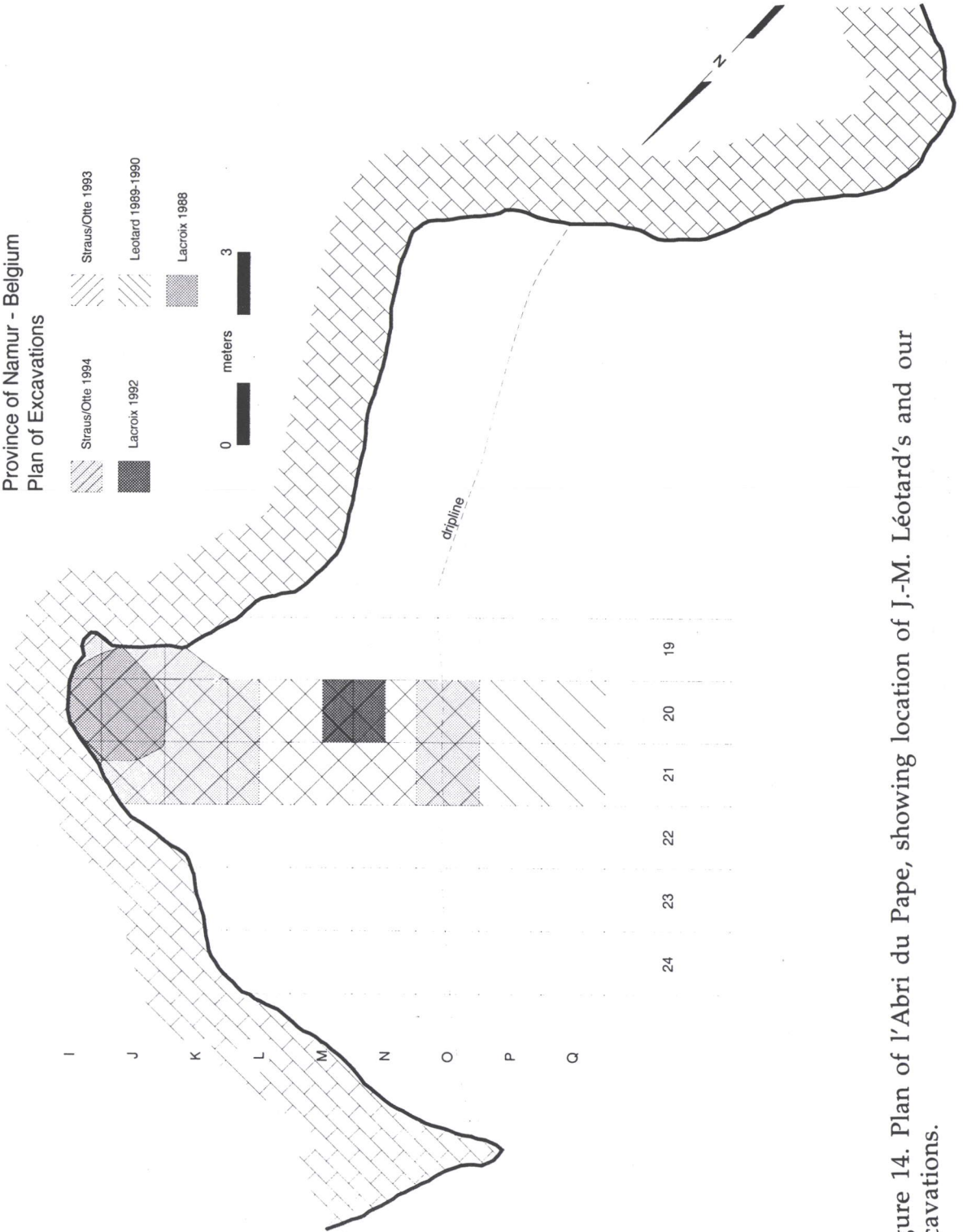


Figure 14. Plan of l'Abri du Pape, showing location of J.-M. Léotard's and our excavations.

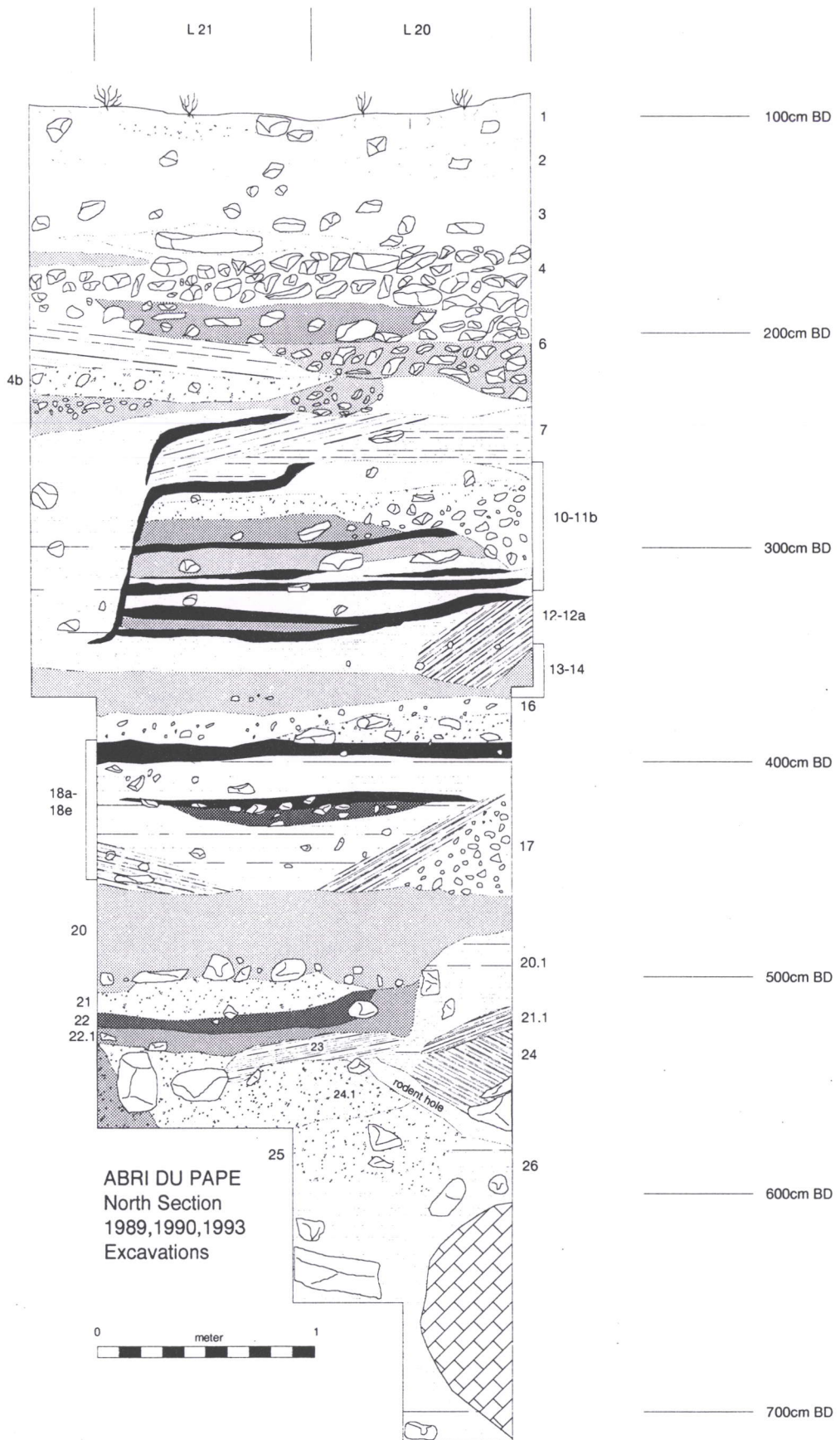


Figure 15. Stratigraphic section of l'Abri du Pape (by J.-M.Léotard, continued by us below Level 18).

