Straus L.G., Otte M. et Haesaerts P. (éds.), *La Station de l'Hermitage à Huccorgne*. Liège, ERAUL 94, 2000.

CHAPTER 10

HUCCORGNE AND MAISIÈRES-CANAL: A COMPARISON OF THE RAW MATERIAL, TECHNOLOGY AND TYPOLOGY FROM TWO OPEN-AIR GRAVETTIAN SITES IN BELGIUM

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INTRODUCTION

The sites of Huccorgne and Maisières-Canal (de Heinzelin 1971, 1973; Haesaerts and de Heinzelin 1979) are the only two open-air Gravettian sites known to date in Belgium (Fig. 1), located on the eastern Hesbaye Plateau and in the western Hainaut Basin, respectively. Other Gravettian sites (Grottes de Goyet, Grotte de Spy, Le Trou Magrite, Fond de Forêt, Grotte Walou) are found in caves along the Meuse river basin and its tributaries (see Otte 1979 for discussion and complete bibliographies; Dewez 1981; Eloy and Otte 1995; Toussaint *et al.* 1998).

In addition to being open-air sites, both have several other features in common. They are located near sources of good quality Cretaceous flint: Hesbaye flint at Huccorgne and Obourg flint at Maisières-Canal. Both are strategically placed for subsistence procurement: Huccorgne on a promontory overlooking the Mehaigne River and Maisières-Canal near a ford of the ancient watercourse of the Haine River; both sites afforded access to a range of resources in the river valleys and on the nearby plateaux. From the archaeological data, both show evidence of hunting and butchery activity, as well as a high degree of lithic reduction activity, and both appear to have served as short-term, perhaps seasonal, camps. It is possible, even probable, that the sites contain accumulations resulting from multiple occupations to take advantage of both subsistence and lithic resources available in the Hainaut and Mehaigne valleys. Lithic refitting studies (see Martinez and Guilbaud 1993; Martinez, this volume) have shown that there were *at least* two separate occupations at Huccorgne, but these may have occurred over the short-term; the duration of time between them cannot be measured.

Detailed analyses of lithic assemblage structure, in terms of raw material, technology and typology, show further similarities which, it is suggested here, reflect the application of similar lithic economic strategies for the procurement of flint during the Gravettian in Belgium. Based on recent research on the structure of the raw material lithic economy during the Early Upper Paleolithic in Belgium (Miller 2000), Huccorgne and Maisières-Canal appear to represent a departure or development from Aurignacian procurement strategies. For the first time, open-air sites are found in proximity to sources of good-quality flint, reflecting a more substantial or sustained effort to procure good quality flint, such that occupation of such lithic procurement sites leaves a substantial material record, rather than being ephemeral.

BACKGROUND AND METHODOLOGY

The lithic analyses take into account three different aspects of the assemblage structure in order to address the organization of lithic raw material economy: 1) the kinds of raw materials used in relation to distances to sources exploited, 2) techniques of core reduction and

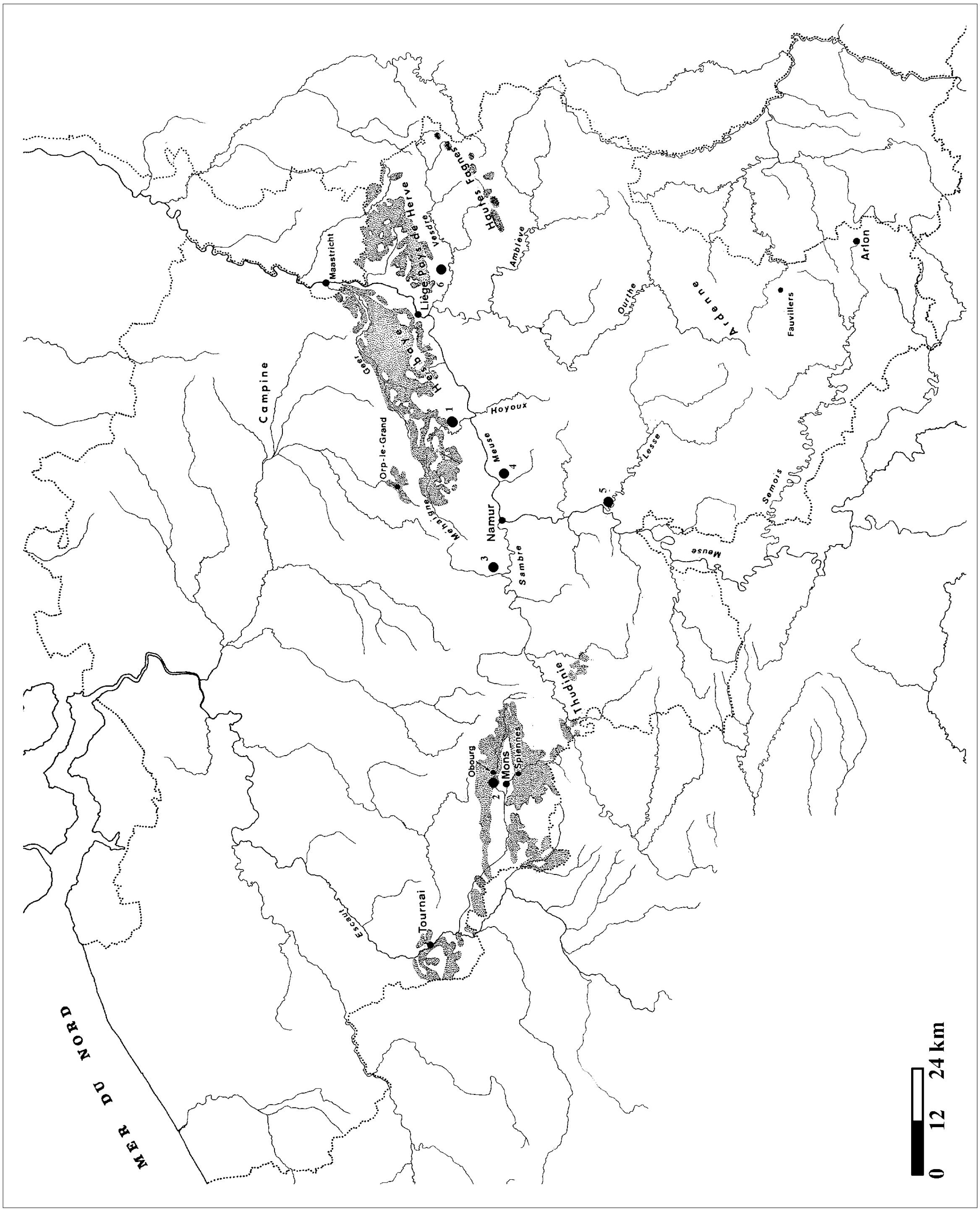

Figure 1. Sites mentioned in the text. 1: Huccorgne; 2: Maisières-Canal; 3: Spy; 4: Grottes de Goyet; 5: Trou Magrite; 6: Fond-de-Forêt.

tool production for each material type present, and 3) the kinds of retouched tools produced on the different materials. (For a more detailed discussion of the methodology, see Miller 2000).

Flint sources in Belgium are found in a broad, but interrupted, band across Middle Belgium, stretching from the Hainaut Basin in the west, across the Brabant and Hesbaye Plateaux to Dutch Limburg in the east, with more significant concentrations in the western and eastern zones. On the Hesbaye Plateau, flint can be found along river valleys, such as the Mehaigne. In both the Ardennes schist uplands region and the sand-covered Flanders lowlands, flint is absent.

Based on the distribution of flints and distances from archaeological sites to flint sources, three raw material zones can be defined:

Zone 1: flint sources found between 5 and 20 km from an archaeological site (western Hainaut basin and eastern Hesbaye Plateau)
Zone 2: flint sources found between 20 and 40 km (Brabant Plateau situated between the Hainaut basin to the west and the Hesbaye Plateau to the east; series of tributary valleys and plateau region fringing the Meuse river from Namur to Liège)
Zone 3: flint sources greater than 40 km (Ardennes region of Upper Belgium to approximately the Meuse-Lesse confluence)

Both Huccorgne and Maisières-Canal are found in Zone 1. The raw material context in Zone 1 is ideal: minimal transport costs in terms of time and energy, flint abundant and of good quality. Under such conditions, there are no constraints on the lithic economy such as to maximize the productivity of the reduction process. Cores need not be reduced to exhaustion (since it would not be necessary to use small blanks), only the most suitable raw blocks need be selected for reduction, and only the most suitable blanks need to be selected for tool retouch.

Raw material types in archaeological context were identified by means of macroscopic characteristics (grain size, color, texture, amounts and kinds of inclusions, cortex, etc.). These types were then compared with samples from lithic reference collections at Katholieke Universiteit (Leuven) and Bonnefanten Museum (Maastricht) to tentatively identify geological sources. This permitted estimation of distances from sites to different sources.

A series of variables was measured on each artifact to address the form in which raw material arrived at the site (i.e., as raw nodules, prepared cores, blanks, or tools), the procurement context in which the material was obtained (primary or secondary geological context), the stages of reduction present, the degree of reduction activity, the reduction techniques employed, the kinds of blanks selected for tool retouch, etc. Tools were identified according to the classic de Sonneville-Bordes and Perrot typology. Statistical analyses of these data were then done to interpret the technological and typological structure for each raw material type present.

DESCRIPTION OF THE SITES

Huccorgne

A description of Huccorgne and history of excavations are presented elsewhere in this volume (see Straus, Otte and Haesaerts chapters) and are omitted here. Two collections were

available for study from different areas of the site, resulting from the 1991-93 Straus/Otte excavations and the 1976/1980 Haesaerts/Froment excavations (Fig. 2), giving a total sample of 8295 artifacts. Data from the Haesaerts excavations was collected by L.G. Straus and kindly made available to me for analysis. Unfortunately, the more extensive 1969/70 Destexhe collection was not available for similar raw material, technological and typological analyses. In the tables below, "Straus/Otte" refers to the material obtained in Stratum 4 of various areas in the Huccorgne-Dock excavation zone (and excludes material from the two Huccorgne-Smetz sondages on the other side of the road). The Haesaerts excavations covered a total of around 55 m², in two long trenches along the road cut and a third along the railroad cut.

Primary sources of good quality flint were available locally in the Mehaigne Valley, from Cretaceous limestone deposits exposed by the Mehaigne River. Today these sources are no longer observable, buried beneath substantial loess deposits. However, worn nodules, heavily patinated and naturally broken, can be found in fields on the plateau and in gardens in the valley, evidencing the effects of erosion of flint from the local Cretaceous limestone with redeposition within the loess.

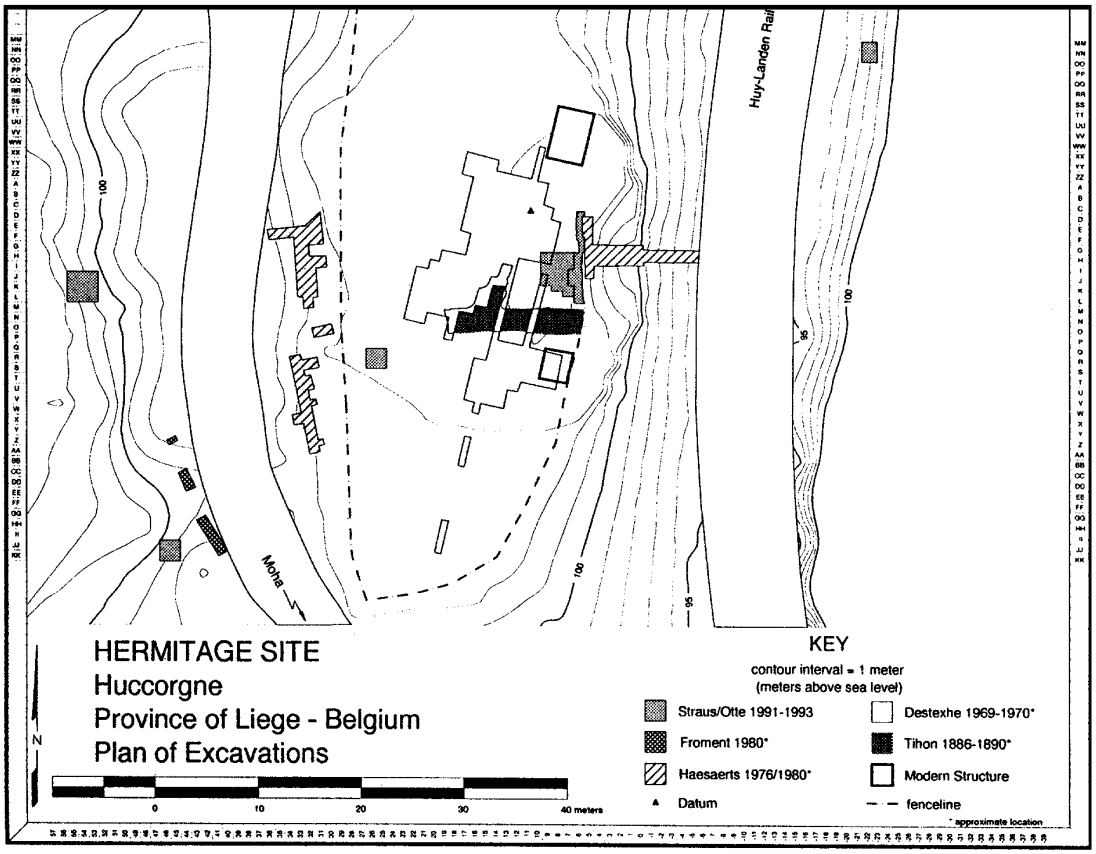

Figure 2. Huccorgne. Plan of excavations.
(after Straus *et al.* 1997:172, Fig. 4, drafted by A.E. Martinez)

Maisières-Canal

Maisières-Canal was first discovered by G. Bois d'Enghien in the 1940s and subsequently excavated by J. de Heinzelin and P. Haesaerts (Institut Royal des Sciences Naturelles de Belgique) in the 1960s when the Canal du Centre underwent modernization. The site consists of two areas separated by approximately 100 meters (Fig. 3). The occupation probably extended over the silty promontory toward the north slope of the Haine Valley but much of this area was destroyed during the canalwork.

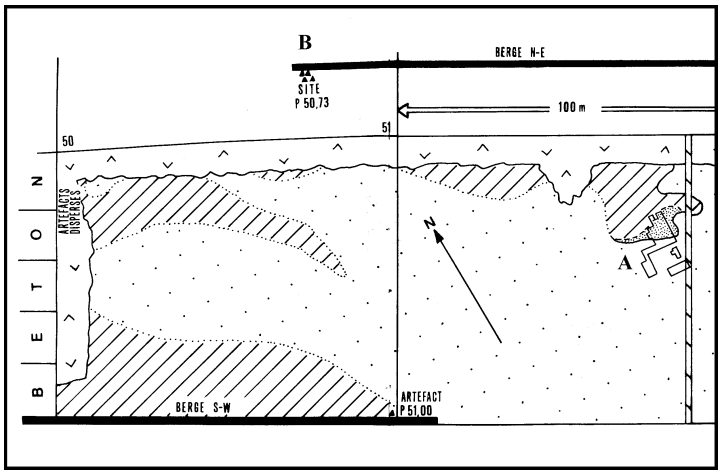

Figure 3. Maisières-Canal. Location of excavation zones. A: Champ de Fouilles. B: Atelier de Taille de la Berge Nord-Est. (after Haesaerts and de Heinzelin 1979: Planche I).

The main area – the Champ de Fouilles – covered an area of 95 m² and is now inaccessible beneath the canal. The occupation horizon (sedimentary units M.G.-M.J.) yielded an abundant *in situ* lithic assemblage of approximately 34,000 artifacts (de Heinzelin 1973:26), as well as well-preserved fauna and objects made of bone, ivory and antler. The majority of the material came from unit M.H., with associated material from units below (M.G.) and above (M.I., M.J.). Above the occupation layer, units M.M.-M.P. were disturbed but also contained some archaeological material. A smaller concentration (630 lithic artifacts) – the Atelier de Taille de la Berge Nord-Est – was found in unit N.D.C., during geological analysis of a more than 300-meter profile parallel to the northeast bank of the canal. Based on pollen analysis and stratigraphic evidence (Haesaerts 1978; Haesaerts and de Heinzelin 1979), the two areas are contemporaneous.

Given the large size of the assemblage, only a sample of the collection was analyzed. Only artifacts found in rows G through K, 6 through 16, of the Champ de Fouilles zone (Fig. 4), and the entire Atelier de Taille assemblage, were analyzed. This yielded a sample size of 6,662 stone artifacts, or 20% of the entire assemblage.

Abundant, very good quality flint is found locally at Maisières-Canal: Obourg flint within 1 km and Spiennes flint within 7 km in Cretaceous formations. In fact, as P. Haesaerts recently mentioned (pers. comm.), a chalk flow containing Obourg flint, eroding from the cliffs to the north, was observable in the profile just a few meters from the Atelier de Taille concentration, and thus the site was literally on top of easily accessible, excellent quality flint.

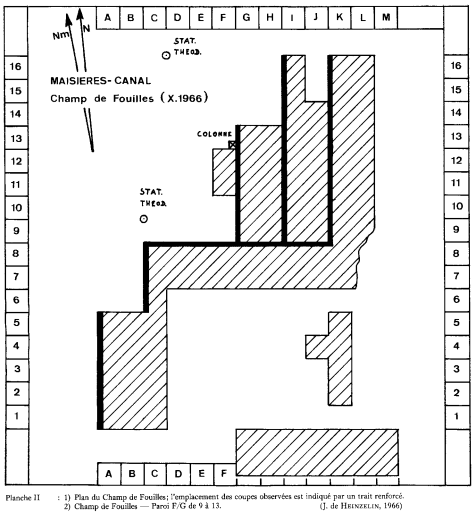

Figure 4. Maisières-Canal, Champ de Fouilles. Plan of excavations.
(after Haesaerts and de Heinzelin 1979, Planche II)

DATES

Table 1 summarizes climatic phases identified by Haesaerts and de Heinzelin at Maisières-Canal (Haesaerts and de Heinzelin 1979) in conjunction with the series of dates obtained at Huccorgne and Maisières-Canal. Rigorous phases (IVa-b, d, f, h-p) are characterized by tundra and/or steppe vegetation with the presence of an active pergelisol. Cold phases are also characterized by tundra and/or steppe, with rare stands of trees and shrubs, but an active pergelisol is absent. Medium cold phases are characterized by tundra or wooded steppe (Haesaerts and de Heinzelin 1979:12) and are the more temperate, humid Denekamp (Arcy); Maisières and Tursac oscillations.

At Maisières-Canal, two dates from the archaeological unit (M.G.-M.H.) and one from the underlying unit M.D. cluster around 30,000 years BP. However, only the Gröningen date of the unit underlying the archaeological level should be considered reliable (Haesaerts, pers. comm.). A younger date (27965±260 BP) was also obtained and was recently supported by new (unpublished) AMS and conventional C-14 dates from Gröningen on mammoth and reindeer bones from the same unit (Haesaerts, pers. comm.). They support an occupation (or occupations) during the relatively warmer Maisières oscillation.

At Huccorgne, two separate, and younger, occupations appear to be attested by a series of three dates clustering around 26-28,000 years BP and a pair of dates at 23-24,000 years BP. Both clusters occur within warmer oscillations – Maisières and Tursac, respectively. The first cluster suggests possible pene-contemporaneity with Maisières-Canal, corresponding to the GrN-5523 date, although stratigraphic data suggest more strongly that the Huccorgne occupation(s) were more recent, around 26,000 years ago in comparison to 28,000 years ago for Maisières (see Haesaerts, this volume).

Other dates obtained have been rejected due to contamination (Huccorgne: 284±52 BP, GX-17016 [Noiret *et al.* 1994:51], 16900±230, CAMS-10365), disturbance of the sediment and the presence of limestone (Maisières-Canal: 35970 +3140/-2250 BP, Lv.305/1, and 24100

Climatic phase		Huccorgne				Maisières-Canal			
		Stratum	Date (BP)	Lab No.	Material	Stratum	Date (BP)	Lab No.	Material
IVh-IVp	rigorous								
IVg	cold-medium cold - Tursac oscillation	4	23160±160	GrN-9234	bone collagen				
		4	24170±250	CAMS-5893	mammoth bone collagen*				
		4	26300±460	OxA-3886	mammoth bone collagen				
	beginning of Tursac oscillation	4	26670±350	CAMS-5895	mammoth bone collagen				
IVf	rigorous								
IVe	medium cold – Maisières-oscillation	4	28390±430	CAMS-5891	mammoth bone gelatin*	Unit M.G.	27965±260	GrN-5523	sediment
IVd	rigorous								
IVc	medium cold – Denekamp (Arcy) oscillation					Unit M.G.-M.H.	31080 +2040/-1620	Lv.304/1†	sediment
						Unit M.G.-M.H.	30150 +1890/-1540	Lv.304/2†	sediment
						Unit M.D.	30780±400	GrN-5690	sediment
IVa-b	rigorous								

Table 1. Comparison of radiometric dates at Huccorgne and Maisières-Canal (references cited in text). * same bone sample † same sediment sample.

+650/-650 BP, Lv.305/2, both from the same sample, and 25280 +1040/-920 BP, Lv.353) (see Gilot 1971, 1984:120; Otte 1976:335, footnote 3).

Interestingly, all of the dates obtained at these open-air sites are found during the warmer oscillations (Table 1). The existence of such sites appear to reflect shifts in land-use in response to climate change, with expansion to the unprotected plateau areas during warmer periods and retraction to occupation in the better protected caves along the Meuse river basin and its tributaries.

RAW MATERIAL STRUCTURE

The following tables summarize the raw material structure and ranking for the assemblages studied.

HUCCORGNE	**Straus/Otte**				**Haesaerts**			
	Count		**Weight**		**Count**		**Weight**	
Type	**n**	**%**	**wt in g**	**%**	**n**	**%**	**wt in g**	**%**
3 - Hesbaye flint	2342	92.2	4459	90.4	5750	99.9	10041	99.6
4 – phtanite	3	0.1	3	0.06				
7 - black flint	49	1.9	47	1.0				
10 – chert	13	0.5	21	0.43				
11 – quartzite	3	0.1	6	0.12	2	0.04	13	0.1
12 - Brussels sandstone	67	2.6	51	1.0	3	0.05	24	0.3
13 – limestone	37	1.5	268	5.4				
100-ochre/other	26	1.0	76	1.5				
Total	**2540**	**100%**	**4931 g (n=1266)**	**99.89**	**5755**	**100.0**	**10077 (n=2172)**	**100.0**

Table 2. Frequencies of raw material types by count and weight (Huccorgne). Note: The category ochre/other was excluded from analysis but was used to calculate the percentage of the entire assemblage for the other raw material types.

MAISIERES-CANAL	**Champ de Fouilles**				**Atelier de Taille**			
	Count		**Weight**		**Count**		**Weight**	
Type	**n**	**%**	**wt in g**	**%**	**n**	**%**	**n**	**%**
1 - Obourg	6113	91.8	57230	79	630	100	4923	100
2 - Spiennes	373	5.6	10723	14.8				
4 - phtanite	9	0.1	104	0.1				
8 - gray flints	104	1.6	849	1.2				
9 - brown flints	11	0.2	28	0.04				
10 - cherts	2	0.0	3	0.004				
17 - olive-green flint	50	0.8	3483	4.8				
Total	**6662**	**100.0**	**72420 (n=2251)**	**100.0**	**630**	**100.0**	**4923**	**100.0**

Table 3. Frequencies of raw material types by count and weight (Maisières-Canal).

Huccorgne				
Rank	**No(s).**	**Type(s)**	**Count %**	**Weight %**
1	3	Hesbaye flint	>90	>90
2	12, 7, 13	Brussels sandstone, black flint, limestone	1-3	1-5
3	10, 11, 4	chert, quartzite, phtanite	< 1	< 1
Maisières-Canal				
Rank	**No(s).**	**Type(s)**	**Count %**	**Weight %**
1	1	Obourg flint	>90	>75
2	2, 8, 17	Spiennes, gray, olive-green flint	1-6	1-15
3	9, 4, 10	brown flint, phtanite, chert	< 1	< 1

Table 4. Collapsed ranking of material types (Maisières-Canal).

The raw materials at both sites can be ranked, by count and weight, in three tiers which are nearly identical in their percentage distribution (Table 4). The local flints – Hesbaye flint at Huccorgne and Obourg flint at Maisières-Canal – are overwhelmingly dominant (greater than 90% of the assemblage). Rank 2 consists of non-local materials is small percentages (1-6%), while Rank 3 consists of only very rare artifacts.

From the structure of the ranking, it can be assumed that only very small active toolkits and curated tools (Ranks 2 and 3) were transported to each site. However, at other sites where flint is not available locally (e.g., Aurignacian levels at Spy, Grottes de Goyet, Trou Magrite [Miller 2000]), Rank 2 materials account for larger percentages of the assemblages (10-30%). It is likely that since the presence of local material at Huccorgne and Maisières-Canal was known, one of the main functions of the sites was to procure lithic raw material, and therefore, it was not necessary to import significant quantities of artifacts for use at these sites.

TECHNOLOGICAL STRUCTURE

General assemblage structure

Technological analyses of the assemblages reveal the use of different strategies according to raw material type (Table 5). Rank 1 material - at both sites local, good quality flint – was transported to the site as partially prepared cores or cortical nodules and all stages of reduction are present. Rank 2 material was transported as nearly exhausted cores and blanks. Rank 3 material was transported as curated blanks and tools.

While the ranking and general assemblage structure is similar for both Huccorgne and Maisières-Canal, there are some important differences in technological structure that suggest differences in intensity of activity (or duration of site occupation) at the two sites. At Huccorgne, cores are much rarer than at Maisières-Canal (13 versus 143), although there are many more chunks (429 versus 19), which appear to be core fragments. This suggests that cores were more intensely used at Huccorgne, resulting in the discard of not readily identifiable core fragments, while cores at Maisières were discarded while still clearly recognizable as cores. The ratio (cores + chunks) / (tools + blanks) for Huccorgne and Maisières-Canal respectively is 0.115 and 0.044, using counts from Table 5.

Two points can be made from the comparison of core and chunk frequencies. First, a much greater degree of reduction activity occurred at Maisières-Canal than at Huccorgne. Second, the greater number of chunks at Huccorgne may reflect a greater intensity of reduction of the cores reduced. This can perhaps be explained by the difference in availability or quantity of the local flint. At Maisières-Canal, the material was found in primary context or on erosion slopes in near primary context. With material readily available, a greater number of cores could be reduced and abandoned before exhaustion. At Huccorgne, local flint may have been less accessible, and the material procured would have been much more intensely reduced, resulting in the discard of exhausted cores and core fragments.

The number of tools present also suggests that the occupation(s) at Maisières-Canal was more substantial or longer-term than those at Huccorgne. Huccorgne contains 176 tools versus 1556 in the entire Champ de Fouilles assemblage (de Heinzelin 1973:23, Table VI). It should be noted, however, that the data for Huccorgne comes from peripheral zones of the site excavated by Straus, Otte and Haesaerts. The lack of assemblage data from the Destexhe excavations in the central zone of Huccorgne, apart from the fact that the assemblage totals around 4000 artifacts, limits interpretation of Huccorgne as a whole.

HUCCORGNE						
Rank 1 material						
Material type	**Cores**	**Chunks**	**Tools**	**Unretouched removals**	**Reduction debris**	**Total**
3-Hesbaye flint (Straus/Otte)	4	198	32	1154	953	**2341**
3-Hesbaye flint (Haesaerts)	8	219	142	2428	2953	**5750**
Rank 2 material						
12-sandstone (Straus/Otte)		4		36	27	**67**
7-black flint	1			17	31	**49**
13-limestone		4		29	4	**37**
Rank 3 material						
10-chert		3	1	6	3	**13**
11-quartzite (Straus/Otte)				1	2	**3**
11-quartzite (Haesaerts)				2		**2**
4-phtanite		1		2		**3**
12-sandstone (Haesaerts)			1	2		**3**
Total	**13**	**429**	**176**	**3677**	**3973**	**8268**

Table 5a. Huccorgne: general assemblage structure.

MAISIERES-CANAL						
Rank 1 material						
Material type	**Cores**	**Chunks**	**Tools**	**Unretouched removals**	**Reduction debris**	**Total**
1-Obourg flint (CDF)	102	7	444	2357	3203	**6113**
1-Obourg flint (ATD)	6	9	13	495	107	**630**
Rank 2 material						
2-Spiennes flint	22	2	7	238	104	**373**
8-gray flint	1	1		67	35	**104**
17-olive-green flint	12		2	27	9	**50**
Rank 3 material						
9-brown flint			1	6	4	**11**
4-phtanite			6	1		**7**
10-chert					2	**2**
Total	**143**	**19**	**473**	**3191**	**3464**	**7290**

Table 5b. Maisières-Canal, general assemblage structure.

Blank production by material type

The set of tools and unretouched knapping removals includes all reduction products which could have potentially been retouched into tools, i.e., the *blank pool*. Table 6 shows the kinds of blanks (flakes, blades and bladelets; reduction debris excluded) produced for each material type, for Ranks 1 and 2, for the assemblages at Huccorgne. Many of these products, however, may have been unsuitable for tools, in terms of shape and size, or were produced during core preparation stages, and were not selected for tool retouch (Table 7).

In the Haesaerts collection, flakes and blades exist in similar quantities (n=1120 versus 1007), with significant bladelet production as well (n=432). 60 crested blades and 47 platform renewal flakes are present in the Haesaerts collection, indicating core preparation and renewal during secondary reduction. In contrast, only one crested blade and one platform renewal flake were found in the Straus and Otte excavations. This may be a result of the relative sizes of the areas excavated or intra-site activity differences. The Straus and Otte collection also shows the dominance of flakes produced on all material types.

Material	**blank pool**	**flakes**		**blades**		**bladelets**	
		n	**%***	**n**	**%**	**n**	**%**
Straus and Otte							
3 – Hesbaye flint	1184	821	69.3	256	21.6	107	9.0
12 – Brussels sandstone	36	18	50.0	10	28.0	8	22.0
7 – black flint	17	9	52.9	6	35.3	2	11.8
13 – limestone	29	19	65.5	8	27.6	2	6.9
10 – chert	7	4	57	3	43	0	0
Haesaerts							
3 – Hesbaye flint	2559	1120	44	1007	39	432	17

Table 6. Blank production by material type (Huccorgne). *Percent of blank pool.

Material	n tools	flakes	blades	bladelets	chunks	PRF*	debris
Straus and Otte							
3 – Hesbaye flint	32	6	22	2			1
12 - Brussels sandstone	0						
7 – black flint	0						
13 – limestone	0						
10 – chert	1		1				
11 – quartzite	0						
4 – phtanite	0						
Haesaerts							
3 - Hesbaye flint	142	41	74	16	7	3	1
12 – sandstone	1	1					

Table 7. Blank selection for tool production by material type (Huccorgne). *Platform renewal flake.

At Maisières-Canal (Champ de Fouilles), a similar pattern of flake-dominant production is observed (Table 8), with the majority of tools made on blades (Table 9). Blades are fairly common for Obourg and Spiennes flint, but only Obourg flint was used to produce a series of bladelets.

Material	blank pool	flakes		blades		crested blade		bladelets	
		n	%*	n	%	n	%	n	%
1 – Obourg flint	2791	2063	74	635	23	56	2	37	1
2 – Spiennes flint	245	167	68	73	30	5	2	0	0
8 – gray flint	67	65	97	2	3	0	0	0	0
17 – olive-green flint	29	11	38	13	45	5	17	0	0

Table 8. Blank production by material type (Maisières-Canal, Champ de Fouilles).
*Percent of blank pool.

Material	Total n tools	Tools on flakes	Tools on blades	Tools on crested blades	Tools on bladelets	Tools on cores/ chunks	Tools on debris
1 – Obourg flint	444	141	283	8	3	3	5
2 – Spiennes flint	7	4	3				
8 – gray flint	0						
17 - olive-green flint	2	2					

Table 9. Blank selection for tool production by material type (Maisières-Canal, Champ de Fouilles).

Briefly then, at both sites, the assemblages are flake-dominated, but tools were preferentially made on blades. The majority of flakes, although considered *potential* blanks, are probably just reduction by-products. The relative lack of blades in the assemblages may also be related to the possible export of blades to other sites (such as the caves of the Ardennes). At both sites as well, nearly all tools were produced on local flint (Hesbaye or Obourg).

Tool size

A comparison of tool sizes between Huccorgne and Maisières-Canal reveals an importance similarity between the two sites (Table 10). While tools at Maisières-Canal are larger than unretouched blanks in all dimensions (length, width, thickness), and tools at Huccorgne are similar in size to blanks, tools at both sites are of similar dimensions (average length ~64 mm, width 25-28 mm, thickness 9-11 mm). This suggests that a minimum size threshold was in effect, that blanks falling below this threshold were rejected as being too small. Considering that both sites are at sources of good quality flint, where it would be expected that there are no constraints on the lithic economy, and that there is no pressure to maximize the number of blanks produced per core, this size minimum can be considered as the preferred size for tool production during the Gravettian. At other sites, more distant from flint sources, this size minimum would be expected to be lower, as intensity of core reduction and tool production increases to maximize the number of blanks produced per core.

In other words, when the raw material context is ideal, as at Huccorgne and Maisières-Canal, only the larger blanks are selected for tool retouch and smaller blanks are rejected. When it is not ideal, when there are constraints on the lithic economy, smaller blanks become more important and are selected for retouch.

a) Huccorgne, Hesbaye flint, Straus/Otte collection.

Variable	Number of Cases	Mean	SD	SE of Mean
LENGTH Length			**p=.098**	
Blanks (unretouch	18	49.7778	20.724	4.885
Tools (retouched)	7	64.5714	14.397	5.442
WIDTH Width			**p=.061**	
Blanks (unretouch	18	22.6667	6.903	1.627
Tools (retouched)	7	28.8571	7.426	2.807
THICK Thickness			**p=.173**	
Blanks (unretouch	18	7.4444	3.899	.919
Tools (retouched)	7	11.4286	6.579	2.487

b) Maisières-Canal, Obourg flint, Champ de Fouilles.

Variable	Number of Cases	Mean	SD	SE of Mean
LENGTH Length (mm)			**p=.000**	
Blanks (unretouch	326	55.2331	21.093	1.168
Tools (retouched)	283	63.6254	25.183	1.497
WIDTH Width (mm)			**p=.000**	
Blanks (unretouch	326	18.5307	9.681	.536
Tools (retouched)	283	25.4523	9.722	.578
THICK Thickness (mm)			**p=.000**	
Blanks (unretouch	326	6.6933	4.275	.237
Tools (retouched)	282	9.0674	4.456	.265

Table 10. Size comparisons of whole blade and whole blade tools.

TYPOLOGICAL STRUCTURE

The differences in frequency of tools present in the different assemblages prevents statistical comparison, but some general comments can be made about differences in typological structure of the assemblages. Such differences may be related to the presence of activity areas in different zones of Huccorgne (excavated separately by Straus/Otte and Haesaerts), differences in duration of occupation at Huccorgne and Maisières-Canal and therefore the quantity and range of tools discarded onsite, or to changes occurring during the Gravettian.

Table 11 (following the bibliography) summarizes the classification for the toolkits for each assemblages. This data is summarized in Table 12, which groups tool types into general classes and is represented graphically in Figure 5. The various zones excavated by Straus/Otte and Haesaerts at Huccorgne show some important similarities and differences. Burins are the most common tool class in both zones, and account for about 25% of each toolkit. However, bladelet tools and backed blades, both absent in the zones excavated by Straus and Otte, account, respectively, for 14.0 and 18.9% of the toolkit in the zones excavated by Haesaerts. Continuously retouched pieces are more common in the Straus/Otte toolkit (28.1 vs. 16.1%). These differences suggest the possibility of the presence of different activity areas. Other tool classes are rare or absent in both zones.

When Huccorgne is compared with the Champ de Fouilles toolkit at Maisières-Canal, it is obvious that there is a significantly greater quantity of tools at Maisières-Canal, eight times as many as at Huccorgne. This clearly suggests greater intensity of occupation, resulting either from a longer occupation than at Huccorgne or from the accumulation from multiple occupations. Burins remain the most common tool class (24.1%, similar to the percentage at Huccorgne). The presence of 143 Font-Robert points at Maisières-Canal makes this site exceptional in northwest Europe. None were found in the Straus/Otte or Haesaerts excavations at Huccorgne, but several were found during the 1970 Destexhe excavations as well as in the 1880s Tihon excavations. In contrast to Huccorgne, bladelets, backed blades and continuously retouched pieces are rare at Maisières-Canal. Perhaps some of these were alternate weapon tips, functionally replacing the Font-Robert points.

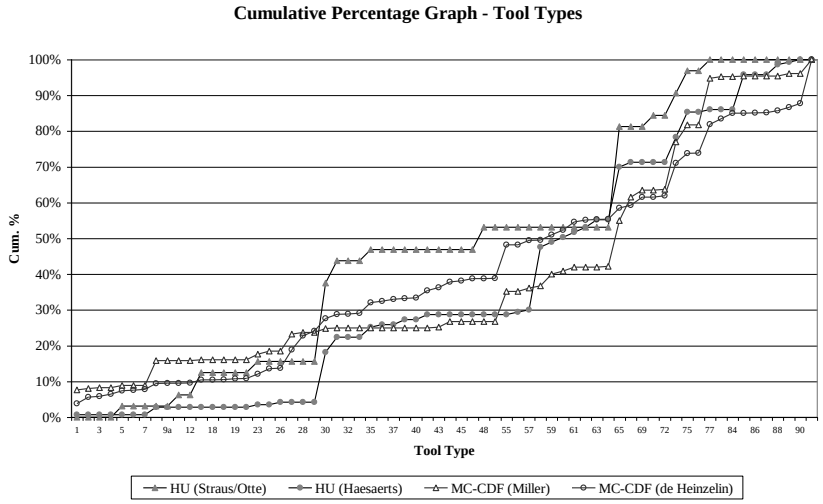

Figure 5. Cumulative percentage graph comparing the toolkits from the different collections. Huccorgne: HU Straus/Otte, HU Haesaerts. Maisières-Canal: MC-CDF (Miller 2000), MC-CDF (de Heinzelin 1973).

Grouped tool classes	HU (Straus/Otte)		HU (Haesaerts classified by Straus)		MC-CDF (de Heinzelin classified by Miller)		MC-CDF (de Heinzelin)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Endscrapers (1-18)	4	12,5%	4	2,8%	74	16,1%	159	10,4%
Composite on truncation	0	0,0%	0	0,0%	0	0,0%	4	0,3%
Perçoirs/becs	1	3,1%	2	1,4%	11	2,4%	45	3,0%
Burins	10	31,3%	35	24,5%	38	8,3%	368	24,1%
Knives and backed points	2	6,3%	0	0,0%	0	0,0%	16	1,0%
Font Robert points	0	0,0%	0	0,0%	39	8,5%	143	9,4%
Shouldered points and pieces	0	0,0%	2	1,4%	5	1,1%	25	1,6%
Backed blades	0	0,0%	27	18,9%	18	3,9%	24	1,6%
Truncated pieces	0	0,0%	9	6,3%	10	2,2%	66	4,3%
Continuous retouch	9	28,1%	23	16,1%	89	19,3%	60	3,9%
Solutrean points	1	3,1%	0	0,0%	9	2,0%	34	2,2%
Notches/denticulates	4	12,5%	20	14,0%	83	18,0%	181	11,9%
Splintered pieces	0	0,0%	0	0,0%	0	0,0%	1	0,1%
Sidescrapers/raclettes	1	3,1%	1	0,7%	62	13,5%	147	9,6%
Bladelets	0	0,0%	20	14,0%	4	0,9%	65	4,3%
Diverse	0	0,0%	0	0,0%	18	3,9%	187	12,3%
Total	**32**	**100,0%**	**143**	**100,0%**	**460**	**100,0%**	**1525**	**100,0%**

Table 12. Comparison of toolkits by grouped tool class.

CONCLUSIONS

In sum, the following comments can be made concerning Gravettian lithic raw material procurement and the nature of open-air sites such as Huccorgne and Maisières-Canal.

Early Upper Paleolithic open-air sites are rare - absent during the Aurignacian in Belgium, apart from surface finds near Braine-le-Comte some 20 km from Maisières-Canal (Fourny and Van Assche 1992), - and only Huccorgne and Maisières-Canal are known for the Gravettian. Both sites are found near local, good quality, source of flint and both evidence a high degree of reduction activity. The occupations at Huccorgne and Maisières-Canal occur only during relatively warmer oscillations of the Early Upper Paleolithic, at 30,000 years, 26-28,000 years, and 23-24,000 years BP.

This suggests, first, that climate played a role in restricting occupation to caves in the protected river valleys of the Ardenne region, with perhaps ephemeral, short-term camps to obtain flint. Estimation of distances from Maisières-Canal and Huccorgne to the known Gravettian-age cave site are summarized in Table 13. Second, phases of ameliorating climate

permitted longer-term occupation of open-air sites, at least for flint procurement, as evidenced by Huccorgne and Maisières-Canal, but possibly also for subsistence procurement. During the Gravettian then, during such oscillations, longer-term occupation led to the accumulation of material, making such sites visible today in the archaeological record. During rigorous phases, lithic procurement strategies reverted to those practiced during the Aurignacian, with short-term occupations that left no permanent trace for us to observe. Alternatively, Belgium was abandoned during such periods.

	Huccorgne	**Maisières-Canal**
Grotte de Spy	40 km	50 km
Grottes de Goyet	20	75
Trou Magrite	80	75
Fond de Fôret	40	130
Grotte Walou	40	130

Table 13. Estimated distances between open-air sites of Huccorgne and Maisières-Canal and Gravettian-age cave sites.

Both sites are located in places where both lithic and varied subsistence resources were available. Huccorgne is on a butte overlooking a river valley and Maisières-Canal is located near a ford, both locations which would attract game. Subsistence resources would have been found in varied ecological contexts, in river valleys and on the plateaux. Flint is local, abundant and readily accessible. The combined benefits found at each site suggest that these sites would likely have been re-used, perhaps on a seasonal basis, over a period of time. While separate occupations are not clearly discernible via radiometric dating, lithic refitting has demonstrated at least two occupations at Huccorgne.

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TOOL CLASSIFICATION		Huccorgne		Maisières-Canal	
	Tool type	**Straus/Otte**	**Haesaerts**	**Champ de Fouilles (20% sample)**	**Champ de Fouilles (complete)**
1	single endscraper		1	35	58
2	atypical endscraper			2	28
3	double endscraper			1	3
4	ogival endscraper				10
5	endscraper on retouched blade	1		3	14
6a	Solutrean-type endscraper				3
7	fan endscraper				3
8	endscraper on flake		3	32	25
9a	pedonculated circular endscraper				1
10	thumbnail endscraper	1			
12	atypical carinated endscraper				1
17	endscraper-burin	2		1	13
18	endscraper-truncated piece				1
18a	denticulate-truncated piece				1
19	burin-truncated piece				3
22	perçoir-burin				2
23	perçoir	1	1	7	19
24	bec			4	22
26	microperçoir		1		2
27	straight dihedral burin			22	79
28	déjeté dihedral burin			2	60
29	angle dihedral burin				20
30	angle burin on break	7	20	5	53
31	multiple dihedral burin	2	6	1	18
32	busked burin				1
34	burin on straight retouched truncation				4
35	burin on oblique retouched truncation	1	4		45
36	burin on concave truncation		1		6
37	burin on convex truncation				9
38	transverse burin on lateral truncation		2		3
40	multiple burin on truncation				3
41	multiple mixed burin		2		31
43	core burin			1	13

Table 11. Classification of toolkits. (Huccorgne: Straus/Otte and Haesaerts collections – classified by L.G. Straus. Maisières-Canal, Champ de Fouilles: 20% sample – classified by R. Miller, entire toolkit – classified by J. de Heinzelin [1973])

44	plan burin			7	23
45	audi knife				5
47	atypical Chatelperron point				9
48	gravette point	2			
54	flechette				2
55	Font Robert point			39	143
56	atypical Perigordian shouldered point		1		
57	shouldered piece		1	4	19
58	completely backed blade		25	3	1
59	partially backed blade		2	15	23
60	straight truncated piece		2	4	20
61	oblique truncated piece		2	5	34
62	concave truncated piece		2		9
63	convex truncated piece		3		2
64	bitruncated piece			1	1
65	piece with continuous retouch – 1 edge	9	21	59	48
66	piece with continuous retouch –2 edges		2	30	12
69	pointes à face plane			9	34
70	Solutrean foliate point (laurel leaf or willow)	1			
72	Solutrean type pieces (shouldered point)			1	6
74	notch	2	10	61	139
75	denticulate	2	10	22	42
76	splintered piece				1
77	sidescraper	1	1	60	123
78	raclette			2	24
84	truncated bladelet				23
85	backed bladelet		14	1	1
86	truncated backed bladelet				1
87	denticulated backed bladelet				1
88	denticulate bladelet		4		8
89	notched bladelet		1	3	14
90	retouched (Dufour) bladelet		1		17
92	diverse			18	187
	TOTAL	**32**	**143**	**460**	**1526**

Table 11 (continued). Classification of toolkits. (Huccorgne: Straus/Otte and Haesaerts collections – classified by L.G. Straus. Maisières-Canal, Champ de Fouilles: 20% sample – classified by R. Miller, entire toolkit – classified by J. de Heinzelin [1973])