Flint Mining in Prehistoric Europe
Interpreting the archaeological records

Edited by
Pierre Allard
Françoise Bostyn
François Giligny
Jacek Lech

BAR International Series 1891
2008
THE PREHISTORIC FLINT MINING COMPLEX
AT SPIENNES (BELGIUM)
ON THE OCCASION OF ITS DISCOVERY 140 YEARS AGO

Hélène Collet, Anne Hauzeur, Jacek Lech

Abstract: 140 years ago, the Neolithic flint mining complex at Spiennes, Hainaut province, became known to Europe and the world. That discovery spurred the dynamic development of research into prehistoric flint mining in European and world archaeology. This anniversary is an occasion to sum up what we know today about this mining complex which, in the year 2000, was placed on the UNESCO world heritage list.

Excavations of the Spiennes flint mine sites have been a long and rich tradition producing important results for European prehistory. These results are presented in the first part of the paper. In the second part, the authors sum up the current state of knowledge about the mining fields at Spiennes, about the various methods of flint exploitation, production trends and the chronology of mining activities. Particular attention has been paid to studies of old chipped inventories and to the most significant results of recent research led by H. Collet.

Keywords: Spiennes, Neolithic, prehistoric flint mining, methods of chipping floor research, flint cores and blades, flint axe, Michelsberg culture, history of archaeology.

INTRODUCTION

Spiennes is one of the most important names on the map of prehistoric flint mining. Today, the village lies on the outskirts of Mons, the capital of the Hainaut province in the region of Wallonia, Belgium (Fig. 1). For ages, the place has been known for the vast number of flints lying on the surface of the fields. Towards the end of the first half of the 19th century, collectors of antiquities became more and more interested in these flint pieces. While Spiennes’ fame was not equal to that of Grand-Pressigny in France, it was visited by Belgian and foreign antiquarians who collected ancient flint artefacts.

140 years ago, in 1867, a spectacular archaeological discovery was made at Spiennes. A railway cutting revealed the deep shafts of a Neolithic flint mine and its underground galleries. Spiennes became known to the world. The 1867 find was followed by others, so that in the second half of the 19th century and the first decades of the 20th, the Spiennes micro-region became famous as a place where many important discoveries connected with prehistoric flint mining had been made, influencing developments in the archaeology of prehistoric flint mining in Europe and North America.

When discussing the places where flint tools were made, John Evans (1872: 29-32) compared Spiennes to Grimes Graves and Cissbury in England, and to Grand-Pressigny in continental Europe. His views were in accordance with those of Albert Toilliez, who first studied Spiennes. Today, the prehistoric mining complex at Spiennes is considered one of the most important features of prehistoric flint mining in the world, next to Grimes Graves and Cissbury in England, Rijckholt-St Geertruid in the Dutch Limburg, and the Krzemionki Opatowskie in Poland. It has been on the UNESCO World Heritage list since November 30, 2000.
1. CONTEXT OF THE MINING FIELD AT SPIENNES

1.1. Geography and geology

The mining field at Spiennes is located in the district of Mons, about 5 km south-east of the city of Mons, in the Belgian Province of Hainaut. The centre is situated 123.26 N and 123.19 E by the Belgian Lambert coordinate system and 50° 25’ 11,01”N and 3° 59’ 29,99” E by the geographical coordinate system WGS84.

From a geographical and geological point of view (Fig. 2), the mining field belongs to the Mons basin, which is a west-east oriented sink where the river Haine flows, a tributary of the river Scheldt. To the north, it is surrounded by the low plateaus of Hainaut, that of Anderlues to the east and the Haut-Pays to the south. The mining site is located on the northern flank of the Harmignies cuesta, a crest with asymmetric slopes extending from east to west, which culminates at a height of 93 m. The cuesta is cut by the river La Trouille and the river La Wampe, tributaries on the left side of the river Haine. The substratum of this cuesta consists of Upper Cretaceous chalk covered by Tertiary glauconitic sands and Wechselian loess. From top to bottom, the chalk ‘formations’ are Craie de Spiennes, Craie de Nouvelles, and Craie d’Obourg. The Spiennes ‘formation’, of which the basal 10-12 m date from the upper part of the Upper Campanian (Robaszynski, CHRISTENSEN 1989), includes many thick black flint seams. The Neolithic miners exploited several of these.

1.2. The mining field

The site is located in fields south of the village of Spiennes (Hainaut, Belgium) occupying the slopes of La Trouille valley, parts of the two plateaus surrounding it and the slope toward the river La Wampe (Fig. 3). Flint mines and
Fig. 2: Geological map of the Spiennes flint mine. Design and drawing by O. Collette. a – extent of flint mine based on surface mined flint distribution plotted by F. Gosselin.

Fig. 3: The prehistoric mining complex at Spiennes. Map of the site with the most important places excavated so far. a - 1867 railway trench; b - shafts; c - workshops; d - geological anomalies; 1 - 1925 A. de Loë and E. Ruhr excavation; 2 - approximate location of a gallery found by L. De Pauw and E. Van Overloop in 1889-1890; 3 - 1912-1914 A. de Loë excavation of deep shafts 1 and 2; 4 - approximate location of 1930 J. Breuer excavation; 5 - 1953 J. Verheyleweghen excavation in the slope of the La Trouille river valley; 6 - SRPH excavation since 1953; 7 - 1965 F. Hubert excavation; 8 - interruption of the Michelsberg enclosure; 9 - shafts anterior to the Michelsberg enclosure; 10 - 1975 F. Hubert excavation of shafts and mining pits near the railway trench; 11 - 1990 F. Hubert and M. Sournay excavation of shallow shafts; 12 - 1997-2004 H. Collet excavation at Petit-Spiennes; 13 - 2005 H. Collet excavation of chipping floors on plot 51c; 14 - 2005 H. Collet excavation in the slope of the La Trouille river valley; 15 - shafts discovered by the scientific society Recherches et prospections archéologiques en Wallonie during the laying of a gas pipeline; 16 - 1962 J. Verheyleweghen excavation of a shaft; 17 - evidence of shafts discovered in 2004 by H. Collet on plot 169a east of Harmignies Street.
workshops cover about 100 hectares (Hubert 1980: 124). The mining site can be divided into three different mining areas. The largest one, called Camp-à-Cayaux (about 65 ha), is located on the plateau east of the river La Trouille. The second, known as Petit-Spiennes (about 14 ha), is situated on the plateau west of La Trouille and extends parallel to the river. A third one, named Versant de La Wampe, discovered later, is located on the plateau of Petit-Spiennes in the part surrounding the river La Wampe. This is also where an enclosure was built during the Neolithic period.

2. HISTORICAL BACKGROUND

2.1. The first discovery by Albert Toilliez

Albert Toilliez (1816-1865), a mining engineer in Mons, was the first important researcher at the Spiennes archaeological site (Fig. 4).

Before this 1850’s discovery, some shafts and galleries, most probably Neolithic, had been observed for the first time in the summer of 1842, near the southern and western rim of the plateau of Camp-à-Cayaux, at a place called Mont de Prêle. These extracting features were mentioned in local newspapers at the time, but their date was unknown.

As early as 1851, Albert Toilliez suspected the probable existence of an axe workshop at Spiennes. His cousin Désiré Toilliez reported that Toilliez had collected more than 60 flint axes, and roughouts, in the district of Harmignies and in the district of Spiennes, where these artefacts may have been manufactured (Toilliez 1851).

Shortly after, a date later than Palaeolithic was proposed for these workshops, despite the fact that some researchers at that time held to the older chronology. This conviction was not based on stratigraphic evidence but only on similar morphology between hand axes and axes roughouts from Spiennes (De Koninck 1860).

After A. Toilliez’s death in 1865, his collection seems to have been bought by the famous British antiquarian, field archaeologist and numismatist Sir John Evans (Hamal-Nandrin, Servais 1925: 75), and then sent to Oxford.

2.2. The railway trench in 1867

In 1867, the building of the railway from Mons to Chimay required the digging of a deep trench to cross the plateau of Petit-Spiennes (Fig. 5). Thus were discovered several spectacular cross sections of flint mine shafts in the wall of the trench.

In 1868, the controversy over the chronological position of the Spiennes’ artefacts came to an end with the publication of the report ‘sur les découvertes géologiques et archéologiques faites à Spiennes’ (Briart et al. 1868). The authors claimed that there had been two periods of human occupation at Spiennes, with the extensive workshop and the digging of shafts occurring during the later period. The numerous chipped flakes found in the surroundings of Spiennes had been made in situ with materials extracted in the vicinity.

The dating of the shafts was determined on the basis of polished axes, potsherds tempered with flint, and bones of recent fauna, including those of the domesticated dog. This referred to the workshops of Grand-Pressigny, and to the fact that a dagger was discovered at the surface at Spiennes. At that time, this artefact was thought to have

Fig. 4: Mons, Hainaut province. Grave of Albert Toilliez (1816-1865), the first important researcher of the Spiennes flint mining complex. Photograph by A. Hauzeur.
been made of Grand-Pressigny flint. For the authors, this demonstrated exchanges between both workshops (Briart et al. 1868: 379).

The results of the excavations were presented by Alphonse Briart (1825-1898), François-Léopold Cornet (1834-1887), and Auguste Houzeau de Lehaie (1832-1922) at the International Congress of Anthropology and prehistoric Archaeology held in Brussels in 1872. Publication in the proceedings gave the study and the site of Spiennes some celebrity.

1. Today this piece is surmised to be the dagger from the Houzeau de Lehaie’s collection. According to M. Delcourt-Vlaeminck, it was not made of Grand-Pressigny flint (pers. comm.).
In spite of its importance, the discovery was not followed up by a serious programme of research and excavation. The only subsequent investigations were the excavation of a mine shaft - not the galleries - undertaken in 1887 by Baron Alfred de Loë (1858-1947) and Emile de Munck (1861-1944). Those excavations are situated in the heart of Camp-à-Cayaux to the south west of the present Centre de Recherches archéologiques. The first, schematic, cross section of the shaft excavated shows that the flint seam exploited appears to be the sixth (Fig. 6). Moreover, excavations explored some upper parts of shafts, workshops and other pits. The results were presented at the International Congress of Prehistoric Anthropology and Archaeology held in Paris in 1889 (Loë, Munck 1891).

This was also the period of the first technological studies of the material, such as a suggested method of blade production by indirect percussion. These observations were supported by the discovery of bone punches (Cels, De Pauw 1885-1886). Louis De Pauw and Eugène Van Overloop (1889-1890) noted, for the first time, a gallery dug directly into the slope of the valley, below the western part of Camp-à-Cayaux.

2.3. The excavations of Baron Alfred de Loë

The excavation of two shafts at Camp-à-Cayaux by the National Excavation Service, based at the Musées du Cinquantenaire, began in July 1912 thanks to a grant from Count Louis Cavens. These truly ambitious excavations were conducted by Baron Alfred de Loë and continued in 1913 and 1914 (Loë 1925). Two shafts, 16 m deep, were excavated in 1912 (Loë 1925; Loë, Rahir 1929). Parts of the galleries were explored in 1913, as well as some workshops in the vicinity of the shafts. More than 1,500 picks were collected during these campaigns, as well as several hammers in Landenian or Devonian sandstone. Thin potsherds tempered with very fine flint chips were collected. They are part of the ‘chalice-shaped’ pots, attributed by François Hubert to the Michelsberg Culture (Hubert 1978).

Pictures of the galleries and simplified cross sections of the two shafts, with the drawing of some layers, were published. Unfortunately, only general information was given about the archaeological material (for example, Loë 1925).

More galleries were later explored by Maurice Lefort, in excavations headed by Jacques Breuer around the 1950’s. An area of about 250 m² was investigated. A very detailed and exhaustive study of these shafts was conducted by F. Hubert in 1978, with a detailed underground map, a fine stratigraphy of the geological background, and a description of the picks (Hubert 1978). New excavations were conducted in 1982 by F. Hubert (1983) who reported on his findings but did not offer a detailed study of the archaeological material.

2.4. Field research

Baron Alfred de Loë and Edmond Rahir also excavated in 1925 some 34 ‘sunken-floor huts’ as they called them (Loë, Rahir 1929); actually, these should be considered heads of shafts. Similar surface explorations of the site were conducted in 1924 by Jean Hamal-Nandrin, professor at the State University of Liège, and Jean Servais, curator of the Archaeological Museum of Liège (Hamal-Nandrin, Servais 1925). Others were made by Charles Stevens in the beginning of the 1920’s for Aimé Rutot, curator of the Museum of Natural History in Brussels. Charles Stevens, a local quarry worker, was active over a very long period (more or less between 1911 and 1953), and excavated on his own or on request. He himself chose the places to excavate. As he left no record of where exactly he had been digging, nor any drawings, we have hardly any information about the features he excavated, neither their morphology nor the nature of the fillings. His main purpose was to enlarge the collections of museums and collectors, with no concern for such details as contexts. His research has been published only partially, if at all.

In 1930, Jacques Breuer (1892-1971) applied new and improved techniques of excavation. He dug real archaeological test trenches to systematically determine the kind of structures. Breuer identified features such as temporary open air mining zones. He drew attention to the scarcity of artefacts, especially pottery and domestic remains (Breuer 1930).

2.5. Jean Verheyleweghen’s excavation and interpretation

This tradition of surface test trenches was also practised by Jean Verheyleweghen (1910-1965) who excavated
nearly 250 features between 1945 and 1958. These were interpreted as knapping and chipping places, funnels of shafts, some occasional pits of domestic waste, and one secondary burial. The structures were widespread over the whole surface of Camp-à-Cayaux, and along the slope of the right bank of river La Trouille (Verheyleweghen 1963).

These important field campaigns allowed him to propose an outline of the development of the mining field at Camp-à-Cayaux. This schematic evolution is divided into four periods. The first three developed from a simple excavation along the slope of the valley to the complex mining works of the deepest shafts. The fourth phase corresponds to the decline of the mining activities. The outline was taken as a model to interpret the flint mine site of Rijckholt St-Geer-truid (NL), and Cissbury (GB). Despite its importance, this work has never yet been critically discussed, mostly because of the lack of later large-scale excavations and accurate chronology. Verheyleweghen’s results and ideas were fully accepted by Siegfried J. De Laet, and published in his book La Belgique d’avant les Romains (1982).

2.6. The beginnings at Petit-Spiennes

The first excavations of the Petit-Spiennes plateau began in 1953. They were organised by several members of the society Les Amis du Musée de Mons which later became known as the Société de recherche préhistorique en Hainaut. The localisation of the excavation site was chosen by André Adam (1919-2005) who had noticed concentrations of flint flakes, waste, and fragments of chalk on the ground surface. A first shaft and the upper part of a second one were excavated at this site, until 1960. After a pause, research started again in 1979, at the same site exploring other shafts and underground galleries. Work here is still in progress, with 95 m² so far excavated.

Marcel Lefrancq (1916-1974) with the help of Paul-Henri Moisin (1927-2004), both members of the Society, led the excavations, supported by professionals archaeologists. Their work and publications were of excellent scientific quality, even if we deplore the absence of drawings of cross sections.

Between 1988 and 1992, excavations were carried out by Jean-Pierre Joris with the help of Françoise Gosselin, who published the first monograph of the Petit-Spiennes area, including all the results since the beginning of excavations in 1953 until the date of publication (Gosselin 1986).

2.7. François Hubert’s research and excavations

The next important step in the research at Spiennes was done by François Hubert, assistant in the Service national des Fouilles at that time. He undertook excavations both in the Camp-à-Cayaux area and on the Petit-Spiennes plateau.

In 1965, François Hubert excavated four workshops as well as the upper part of three shafts at Camp-à-Cayaux. His finds included some Michelsberg pottery (Hubert 1969). A field survey allowed him to determine more precisely the extent of the mining field. In 1975, he conducted a rescue excavation initiated by the construction of a gas pipeline crossing the railway at Petit-Spiennes (Hubert 1976a). All these excavations were highly professional and provided interesting data about material, stratigraphy and methods of exploitation.

Since January 1954, André Adam, one of the founders of the Société de recherche préhistorique en Hainaut, had suspected that a settlement existed on the plateau of Petit-Spiennes south of the railway. Indeed a Michelsberg enclosure was in fact discovered right at that spot (Adam 1959). The same year, Irwin Scollar (1955) noticed the presence of crop-marked fragments of two concentric circles when he examined aerial views. Between 1966 and 1979, F. Hu-
bert carried out annual excavations in the ditches, by making trenches at regular intervals. Only the first years of his investigations have been published (Hubert 1971), as well as the ceramic vessels (Vanmontfort 2004).

During the annual excavation of the ditches of the fortified camp in 1970 and 1974-1975, flint extraction features (shafts and gallery roof), earlier than the ditches, were discovered (Hubert 1971: 50-51; Hubert 1976b: 12-15). The inner area of the fortified camp is still almost completely unexplored. Only one trench 2 m wide and 108 m long was dug inside the camp.

3. THE LATEST DECADES OF RESEARCH AT PETIT-SPIENNES AND CAMP-À-CAYAUX

Several kinds of explorations took place at Camp-à-Cayaux during the 1990’s, giving us a better idea of the extension of the mining area. Preventive excavations around the Centre de recherches archéologiques yielded five shallow shafts (Hubert, Soumoy 1993; Bonenfant, 1993). Rescue excavations, prior to the laying of a gas pipeline, allowed for the detection of 20 more shafts located in the northern part of the mining site, and contributed to the extension of the known mining area in this direction. A small Neolithic workshop was excavated in the south-western part of the mining site, in the valley of La Trouille (Fechner et al. 1993).

Preventive excavations were also undertaken at the mining site of Petit-Spiennes, because there was a project to develop the archaeological site (Collet et al. 1997). Luckily the project was put aside, and the excavations turned into planned ones, led by Hélène Collet. Since there is no emergency in this area, and rescue work is needed much more urgently elsewhere, these excavations are still continuing.

Several features were identified, among which some mine shafts should be noted. A deep shaft was fully excavated, as well as half of another; there was also what was interpreted as an aborted shaft, as well as shallow pits. So far only provisional papers have been published regarding this research (Collet 2000; 2003b; Collet, Vander Linden 1998; Collet, Van Neer 2002; Collet, Woodbury 2000; 2001; 2002; Collet, Vankerkhoven 2004), but both features and material are being studied. At the same time the area investigated by the volunteers of the SRPH since 1953 continues to be explored. A new mine connected with the previous ones has been excavated and the filling of two shafts is currently being explored (Desterbecq 2004; Desterbecq, Joris 2006; Robert 2003).

3.1. Rescue excavations at Petit-Spiennes and research results

In the case of systematic excavations, it was decided to record the data as fully and carefully as possible. For this reason, the choice was made to draw very detailed cross sections of the filling of the shafts. In the case of rescue excavations, a strategy of recording of arbitrary 20 cm levels was adopted; later however, this was replaced by recording the real observed stratigraphic layers. Detailed stratigraphy of the extraction features made it possible to better establish the different stages of filling and to try to calculate the speed of the filling process. To confirm or to help understand this question of deposit speed, stratigraphic data were crossed with the paleoenvironmental data: palynological, archaeozoological (primarily microfauna and snail remains), and anthracological (Collet, Van Neer 2002; Dejagne, Collet 2003).

3.2. The discovery of a chipping floor at Camp-à-Cayaux

For some years now, rescue and survey excavations have been conducted in the surrounding area, in the vicinity of the village of Spiennes, prior to the building of a fence, house or renovation of the garden of the Centre de recherches archéologiques.

In early 2005, the archaeological team undertook a rescue excavation, prior to the building of a house, on lot 51c which lies just outside the part of the site under Cultural Heritage protection, but inside the archaeological site of Camp-à-Cayaux. During this investigation, 17 extraction features were discovered over an area of about 150 m², as well as remains of in situ workshops.

4. SPIENNES AND RESEARCH CONCERNING PREHISTORIC FLINT MINING IN EUROPE

The Spiennes mine offers one of the longest histories of archaeological excavations in Europe, indeed the world,
and has played a major role in research into prehistoric flint mining. It was presented at International Congresses of Anthropology and Prehistoric Archaeology in the 19th and early 20th century, and has always been discussed in archaeological textbooks (e.g. Mortillet 1885; Cartailhac 1896; Déchelette 1908; Childe 1925). Especially important was the famous Spiennes Section of a railway cutting, discovered in 1867, still a reference even in the 20th century, although archaeological methods and our knowledge of prehistory have progressed enormously since then (Clark, Piggott 1933; Clark 1952: Fig. 99; Piggott 1954: 39).

The discovery made by workmen engaged in railway construction in Spiennes had a direct influence on the correct interpretation of pits noted in the area of the English-hill fort at Cissbury, W. Greenwell’s excavations at Grimes Graves, and on the slightly later excavations at Rijckholt-St. Geertruid (Lech 1991: 557; 1997: 611-613). Also, in later years, the Spiennes excavations inspired systematic explorations of other mines. Work at Grimes Graves was undertaken in the spring of 1914, after the spectacular results of Baron A. de Loë’s excavations were made public (Loë 1913; 1914; Clarke 1915). In 1933 the Spiennes excavations were an important factor in dating the British flint mines (Clark, Piggott 1933).

With time, the systematic excavations at Grimes Graves came to play an increasingly important role in the characterizations of prehistoric flint mining in Western Europe. In Prehistoric Europe. The Economic Basis by Grahame Clark (1952: 174-178) Grimes Graves served as the basis for a description of prehistoric flint mining in Europe, though Spiennes continued to be much in evidence. For Gordon Childe (1957: 293), in his last edition of The Dawn of European Civilization, the Spiennes mine was an example of specialization of labour among the clans of Michelsberg villagers:

‘Secondary industry and trade played a recognizable part in the Michelsberg economy. Thus at Spiennes in Belgium lived a community of specialized flint-miners skilled at sinking shafts and digging out subterranean galleries. Indeed, the Michelsberg settlers there constituted a specialized industrial community, supplementing their livelihood by exporting the products of their mines and workshops - and Spiennes was no isolated phenomenon within the Western complex. It implies also the development of hunting expeditions and transhumance into something like regular commerce.’

In History of Mankind: cultural and scientific development, published under the auspices of UNESCO, in the very brief description of mining and trade during the Neolithic, only Spiennes, Grimes Graves and Grand-Pressigny are mentioned (Hawkes 1965: 431-433), while in World prehistory in new perspectives by G. Clark (1977: 134) we find only one mention of Grimes Graves.

During the second half of the 20th century, Grimes Graves gradually took over the place of Spiennes in the reflections on prehistoric flint mining in Europe. One of the reasons for this change was the publication, in the 1920s and 1930s, of A.L. Armstrong’s new findings concerning Grimes Graves and, in the 1970s, the new, extensive and very professional excavations of the site (e.g. Armstrong 1923; 1927; 1934; Mercer 1981; Longworth et al. 1991; Longworth, Varndell 1996). The stronger institutional position of British prehistory when compared to Belgian and its dominance over the field of archaeological syntheses also played a role. At the same time, progress was being made with excavations of other important sites of prehistoric mining, such as the ones at Krzemionki Opatawskie, Rijckholt-St. Geertrud, Defensola ‘A’ and Jablines (Weisgerber et al. 1980; Borkowski et al. 1991; Grooth 1991; Bostyn, Lanchon 1992; Di Lernia et al. 1995; Felder et al. 1998).

In Poland, for example, the first information about the discoveries at Spiennes appeared in reports from the International Congresses of Anthropology and Prehistoric Archaeology in Brussels, written in 1873 by Count J. Zawisza, the father of Polish prehistoric research. After the discovery of the mine at Krzemionki Opatawskie, Spiennes became a reference point for the Polish site (Krukowski 1939: 49 and 122) and for various descriptions of European mining (Tabaczyński 1970: 275-276; 1972: 68; Hensel, Tabaczyński 1978: 140; Jaźdżewski 1984: 165; Lech 1981: Fig. 2 and Table 2; 1991: 557-561; 1997: 611-623).

Consequently, Spiennes is now considered to be among the four or five most prominent sites of prehistoric mining in Europe, next to the mines at Grimes Graves, Cissbury, Rijckholt-St. Geertrud and Krzemionki Opatawskie (Lichardus et al. 1985: 37 and 441; Grooth 1991: 153; 1997;
Whittle 1996: 280; Lech, Lejidowicz 1998: 121 and 125; Lech, Longworth 2000: 19-20; Milisauskas, Kruk 2002: 214-215). As a result of many years of farming, as well as amateur digging and looting in the second half of the 19th and first decades of the 20th century, considerable damage has been done to the parts of the mine lying nearer the surface, so the Spiennes site is not as well preserved as the others just mentioned. However, shafts 1 and 2, excavated at the beginning of the 20th century by Baron A. de Loë, remain the deepest of all known European flint mine shafts and new excavations have shown the continued research potential of this complex site (e.g. Collet et al. 1997; Toussaint et al. 1997; Collet, Van Neer 2002; Defgnée, Collet 2003; Collet 2004).

5. THE TOPOGRAPHY OF THE MINING SITE

The extent of the exploited areas at Spiennes can be largely deduced from the mining waste present on the surface. Typical artefacts are flint nodules and their fragments, flakes and other flint waste, along with carbonated deposit, and chalk fragments. The latter material can only be taken into account in those parts of the site where the chalk is covered with a thick layer of silt. In some other parts of the site, this kind of evidence cannot be used, as the chalk naturally appears near the surface. In the northern part of Camp-à-Cayaux, prospecting for flint material on the surface was limited by the presence of meadows. The extent of flint extraction was also evidenced thanks to the numerous excavations and field observations made since the discovery of the site in the nineteenth century. It is worth noting that the investigations of the last decades have greatly increased our knowledge of flint extraction in Spiennes (Heim 2003; Fechner et al. 1993; Collet et al. 1997; Collet 2003a; Collet, Woodbury in press a, b and c). A systematic mapping of the scattered information as yet unpublished was recently undertaken and is still in progress. The documentation collected by F. Hubert and F. Gosselin and conserved at the Archaeological Service of the Walloon Region is helpful in this enterprise.

The present state of knowledge concerning the mining complex at Spiennes is shown on a map in figure 3. It must be clear that this is but a fragmentary view, merely reflecting the state of research in the different areas. However, this mapping generally confirms the physical extent of the mining field, on the basis of surface flint distribution. Shafts were noticed a long time ago in the area between the western and southern border of Camp-à-Cayaux and the Centre de recherches archéologiques, previously called the Museum (Fig. 3.1 and 3; Loë, Munch 1891; Loë, Rahir 1929). Indications are less numerous beyond Harmignies Street but several exist (Fig. 3. 16-17 and Lefort, Cody 1953; Lefort 1954; Verheyleweegen 1962; Collet, Woodbury in press b). Moreover, in the northern part of Camp-à-Cayaux where meadows hide evidence of flint waste, investigations show a wider extension of flint extraction than was expected. For instance, about 20 shafts were discovered during the laying of a gas pipeline in 1992 (Fig. 3.15; Fechner et al. 1993). In the northwest sector 17 new shafts were identified during a rescue excavation in 2005 (Fig. 3.13). Flint exploitation is now confirmed as far as the first houses of the village along Harmignies Street, around the 57 m contour line. The presence of mines can be expected along the west border of Camp-à-Cayaux up to the 52 m contour line, where flint exploitation was noticed (Fig. 3.14). On the other hand, in other parts of the site, there is no reliable indication of flint extraction. Such is the case in the east and northeast part of the mining area of Camp-à-Cayaux, where only workshops were noticed by F. Hubert. In the same way, only the presence of workshops has been determined in the southeast part of Camp-à-Cayaux. In the same area however, some anomalies were reported during the digging of geological trial borings (Fig. 3.d). The geologists thought that they might have dug through flint shafts (Centre archéologique de recherche minière 1990: 4.17-4.19).

In Petit-Spiennes, north of the railway, flint extraction is confirmed by several excavations and some field observations (Fig. 3.6 and 3.12; Gosselin 1986; Heim 2003; Collet et al. 1997; Vandevalde, Hubert 1987; Collet 2003a). South of the railway, only some workshop areas have been found. In this case it seems highly probable that the absence of evidence is due only to the lack of investigation.

In the mining area called Versant de la Wampe, several mining features are known in the south western part of the Petit-Spiennes plateau, on the upper part of the slope surrounding the river La Wampe near the 70 m contour line (Fig. 3.9; Hubert 1976b). One isolated shaft was also identified near the top of the plateau on the same slope between the 72.5 and 75 m contour lines (Hubert 1971: 50-51).
6. MINING METHODS

Different mining methods were used at Spiennes, depending on the geological conditions of the deposits, as noted at other similar sites, such as Grimes Graves, Rijckholt-St.Geertruid and Krzemionki Opatowskie. The simpler exploitation units are poorly documented. Few are known and only one was the object of systematic excavations (Verheyleweghen 1953). Others were just explored by chance during the various campaigns (De Pauw, Van Overloop 1889-1890; Hubert 1976a; Collet, Woodbury in press c) or only partially excavated (Hubert 1969). Moreover the published data about the methods are only fragmentary (Verheyleweghen 1953).

On the western border of Camp-à-Cayaux, remains of extraction and production were excavated on the escarpment surmounting the river La Trouille. The remains showed horizontal niches dug straight into the slope. Each one was filled with a first layer composed of flint waste described as workshop, topped by a layer of yellow sediment mixed with blocks and chalk powder without any flint remains, either natural or knapped (Fig. 3.5 and 7). J. Verheyleweghen (1953) interpreted the system of exploitation as follows. The miners first dug short galleries about 2.5 m long and 0.7 m high into the slope. When this first extraction and production was exhausted, the roof of the first exploitation unit was pulled down to start a new one. A gallery dug directly into the slope was discovered in the vicinity during building work at the end of the 19th century (Fig. 3.2). Unfortunately L. De Pauw and E. Van Overloop (1889-1890) focused more on the chronological succession of the workshops connected with this gallery than on the exploitation method. This discovery may have suggested his model to J. Verheyleweghen. In 2005, a structure with a similar feature was observed in the northern part of the same escarpment (Fig. 3.14; Collet, Woodbury in press c). It is certain that this feature was dug to extract flint, as the chalk was left behind. The successive stages of the exploitation units are covered with layers of chalk in blocks separated by several layers of powdery chalk hardened by the circulation of the miners. The summit shows a collapse of natural chalk (Fig. 8).

Unfortunately, dating was impossible, because no fragment of worked flint or other archaeological artefact appeared. Therefore the dating of these flint mines remains uncertain.

Open shafts mining pits are known near the rims of the two plateaus, where the silt layer is thin (Briart et al. 1868; Breuer 1930; Hubert 1969; 1976a). Some have been observed in the cross section of the railway trench, where the sediment covering the chalk is only 1 m thick (Fig. 3.a; Briart et al. 1868). Exploitation by trenches or large pits up to 3 m deep was also described at Camp-à-Cayaux (Fig. 3.4; Breuer 1930). In the 1965 excavation, where the chalk appears 1.2 m below the surface, two features were also considered as simple pits (Fig. 3.7). One was excavated down to 2.5 m, apparently without reaching the bottom of the shaft. In the 1975 excavation in Petit-Spiennes, three simple pits of 3.5 to 3.9 m depth were discovered (Fig. 3.10 and 9). They were dug in a place where the chalk is about 2.5 m deep. One of them has a preserved side exploitation (niche) 1.3 m long and high. The other
also shows such a lateral niche but the roof had collapsed and the original state could not be described.

Underground galleries are more fully documented. At Spiennes the shafts with underground galleries are between 3 to 16 m deep. Twelve mines were fully excavated and some more are currently being explored. For the rest, only the mouths of numerous access shafts are known. Underground mine galleries are located mainly in the centre of the plateau, where this is the only technique appropriate to exploit the flint seams. However, they also occur in areas where flint was exploited by other methods, like the digging of simple pits, as was recorded by some previous investigations (Fig. 9; Hubert 1969; 1976a), and as can be seen in the cross section of the railway trench (Fig. 5).

At Petit-Spiennes, two zones with underground galleries have been excavated: the first, since 1953 by the SRPH (Fig. 3. 6; Gosselin 1986), and the second in 1997-2004 (Fig. 3. 12; Collet, Van Neer 2002). Both areas reveal shafts from 8 m to 10 m deep depending on the thickness of the sediment. The miners had to dig down to 4.3 m, and 5.6 m respectively, before they could reach the geological layers of chalk, due to the natural sloping of the seams. A first flint seam usually appears around one meter below the chalk.

In these two areas, mines are known in which only the first flint seams struck upon during the digging were exploited. In shafts 53.2, 79.3 and 86.8.2 (area 1953), the first seam was occasionally extracted, while the second and the third were worked systematically. In shaft 11, explored between 1997 and 1999, only the first was worked. The ongoing investigation of shaft 20 also shows a shaft 10 m deep, with an exploitation of the first flint seams.

On the surface, shafts 80.4 and 53.2 are 1.7 m and 2.4 m wide in diameter. Deeper, the same shafts are slightly oval, measuring 0.7 m x 0.8 m in the case of shaft 80.4, and 1.1 m x 1.3 m across in the case of shaft 53.2. Shaft 11 is different, remaining wide right down to the exploitation level (Fig. 10). Its cross section is irregular with breadth varying from 3 m in surface to 2 m at 2 m below and then again 3 m wide at 3.8 m below and finally 2 m at 5.6 m below. Shaft 20 is even wider. At the surface it is oval shaped, with a diameter of 6.2 m x 5.2 m. At a depth of 3.4 m, it is 2.6 x 2.2 m wide then at 5.6 m depth it enlarges again to 3.7 x 3.1 m wide. In these two cases, the widening results from a deterioration of the shaft walls after the exploitation ended. In the case of shaft 20, it seems that the original diameter of the shaft was only a little more than 1 m across.

In the 1953 area, the shaft usually widens one meter below the top of the chalk level and forms a bell shaped room which can reach 3 m high (Fig. 11). From there, the galleries radiate outwards in several directions up to 4 m, or even to 5.5 m from the centre of the shaft. The height of the galleries varies from 1 m to 2 m. This is due to the fact
Fig. 10: Spiennes, Hainaut province. *Petit-Spiennes*. Shaft 11, excavated in 1997-1999. SW-NE cross section. a: clayey silt; b: loess; c: grey-blue sand; d: flint gravel, chalk, and sand; e: glauconiferous sand; f: chalk, and glauconiferous sand; g: chalk. Drawing by M. Woodbury.
that in these mines two different flint seams, separated by 1 m of chalk, were extracted from the walls at the same time. Excavations of shaft 11 in 1997-1999 (Fig. 3.12) showed short galleries (niches), at times only 0.7 m high (Fig. 10). Here only one flint seam was exploited. In the different units investigated, the surface worked covers 21 to 25 m². In both areas, the extracted flint consists of irregular nodules from 2.5 cm up to 34 cm long. They were mainly taken from the walls, and much more rarely from the bottom. The only mining tools found so far in the 1953 SRPH area and shaft 20 (area 1997, Fig. 12) are flint picks. The most common are bifacial, thin, with an almond shape. Much less numerous are the irregular and massive multifacial picks (see below). In the 1997 area, shaft 11 has yielded a mixed assortment of implements comprising a rich set of red deer antler tools and massive flint mining tools (Fig. 13).

In the area excavated by the SRPH since 1953, at least two different periods of mining were identified. The first dates from between 4400 and 3700 cal BC and the second from a period between 3500 to 2900 cal BC. Shaft 11, in the area excavated since 1997, is connected with the second period of exploitation. In shaft 53.2, dating from the first period, Michelsberg sherds from a bottle-shaped vessel were discovered in the shaft filling (Gosselin 1986).

In the centre of Camp-à-Cayaux, beneath the Centre de recherches archéologiques, there are shafts 15 m to 16 m deep (Fig. 3.3, 14 and 15). The explored underground area covers about 250 m². Like elsewhere at Spiennes, the two access mouths of the excavated shafts 1 and 2 are about 1 m wide. The miners had to dig 5 m to reach the chalk but here they did not exploit the first flint seams and passed through 15 flint layers before reaching the flint they were seeking (Fig. 15; Hubert 1978: 8, 12). At that depth, a twin flint seam occurs, consisting of large slabs 1 m wide and up to 1-2 m long and about 20 cm thick. Only the lower level was extracted, while the other was left in situ, apparently in order to protect the galleries. As at Petit-Spiennes, the bottom of the shaft forms a room surrounded by chalk pillars. The mine workings radiate outwards in several directions for a distance of up to 4 m. These measurements are estimations, as it is sometimes difficult to know which shaft is connected with the galleries. Some may have even been
Fig. 13: Spiennes, Hainaut province. Petit-Spiennes. Shaft 11. Mining tools: 309 - a-b: wear marks, c - undefined parallel notches; 318 a, b, c - wear marks; 320 and 342: drawings by E. Gumińska; 309 and 318: drawings by P.-Ph. Sartieaux.
Fig. 14: Spiennes, Hainaut province. Camp-à-Cayaux. Shafts 1 and 2. Plan of the shafts base with galleries. After F. Hubert (1978).

Fig. 15: Spiennes, Hainaut province. Camp-à-Cayaux. Shaft 2. Cross section. After F. Hubert (1978).
8-9 m long. The height of the levels exploited varies from 0.7 m to 1 m. Flint was extracted from the roof by digging the chalk under the twin slabs. The area exploited in each of the two, probably fully investigated, mines can be estimated at around 45 m². The mining tools used to dig these galleries comprise only flint picks of various shapes. No radiocarbon date is available for these mines. The only element of dating is given by fragments of a Michelsberg ceramic vessel found near the bottom of an unexplored shaft located near shaft 1 (Hubert 1978: 38). It is generally accepted that these mines were exploited by the Michelsberg communities between 4300 and 3700 cal BC.

In the same area, only 20 m from the limits of the underground galleries belonging to shafts 1 and 2 described above, five shallow shafts were explored (Fig. 3.11; excavation 1990: shafts 2, 4, 5, 6 and 7) over an area of 100 m². From centre to centre, the distance between these shafts was 3 to 5 m. Their depth was only 3 to 3.5 m (Bonenfant, Auzou 1993; Bonenfant 1993). They were 1 to 2 m wide at the mouth and 1 m or less at a depth of 1 m. The flint was exploited from niches 1 m long and 1.2 m high. Flint picks were the basic mining tool, though fragments of red deer antler were also found (Bonenfant, Auzou 1993). No radiocarbon date is available but from the discovery in shaft 7, at a depth of 1 to 1.3 m, of a Michelsberg bottle-shaped vessel broken in situ, we may conclude that these mines also date from the Michelsberg period.

So far, the underground exploitation of the mining area of the Versant de la Wanpe has only been partly excavated (Fig. 3.9). Only some of the mine workings were explored during the excavation of three trenches which had been dug to establish the layout of the ditches of the Michelsberg enclosure. The excavation of the ditches went down to 2 m. This was enough to identify the remains of mining features: two shafts little more than 1 m wide and two galleries with roofs located only 1.3 to 1.7 m under the surface.

7. DATING

The few available radiocarbon dates indicate that the mining field was exploited between 5510 to 4230 BP, then from 4400/4200 to 3350/2900 cal BC (Fig. 16). We don’t know
if exploitation was continuous or not. The mining activities were thus contemporaneous with the Middle Neolithic period in Belgium but continued long after. The pottery discovered in the mining areas shows that the site was mainly in use during the Michelsberg period (4300-3700 cal BC). The context of the find shows that this pottery was, at times, strictly connected with mining exploitation or at least contemporaneous with it (Colman 1957; Hubert 1978; Gosselin 1986; Hubert, Soumoy 1993). Some Michelsberg potsherds were recently discovered in the close context of the chipping floor excavated at Spiennes - Lot 51c. The remains of earlier periods are very scarce and not connected with mines. Those of later periods are also poorly documented. Most potsherds from these later occupations are not assigned to specific culture and can date from the Late Neolithic to the Bronze Age. Some Late Bronze Age and Iron Age finds were clearly identified at the mining sites at Camp-à-Cayaux and Petit-Spiennes (Mariën 1961). It remains unclear whether a direct or indirect relationship with mining exploitation can be established. Nevertheless, according to F. Hubert (1976c), one of the Late Bronze Age features is connected with flint processing. So far however, incontrovertible evidence is lacking for mining later than the end of the 4th millennium cal BC.

8. STUDY OF FLINT WORKING AT THE SPIENNES MINING FIELD

Not much is known about flint working in the Neolithic Spiennes, as compared to such prehistoric flint mining sites as Grimes Graves in England, several of the Polish mines or Jablines in France. Although the first articles devoted, to some extent, to flint working at Spiennes were written as early as the 19th century, in connection with the research done by L. De Pauw and E. Van Overloop (1889-1890), archaeologists of later periods showed little interest in the flint workshops before the middle of the 1960s.

F. Hubert was the first archaeologist to display more interest in the flint finds at Spiennes. In 1965, he excavated four workshops, but published only their general characteristics, paying greater attention only to the typology of the basic categories of artefacts: cores, blades, axes, chisels, picks and tranchets (Hubert 1969). Compared to earlier works, F. Hubert’s article (1971) on the excavations of a Michelsberg enclosure on the Petit-Spiennes upland devoted considerable attention to flint material. But it was only from 1981 on, with the excavations at Petit-Spiennes carried out by SRPH, that all the waste flint material obtained during the excavations was collected. A significant part of the material from Petit-Spiennes was then analysed by F. Gosselin (1986). The published results of her studies, constitute, so far, the best presentation of flint material from the mining complex at Spiennes, though they include only material obtained during excavations of shaft fillings 53.2 and 80.4 and of underground extraction areas of these and several neighbouring shafts at Petit-Spiennes.

In 1997, H. Collet began excavations at Spiennes, paying particular attention to the flint material. From 1997 to 2004 she concentrated on the Petit-Spiennes shafts, but in 2005, while doing some short-term rescue work, she excavated large areas of flint workshops at the north edge of the Camp-à-Cayaux mining field (Collet, Woodbury in press a).

8.1. Flint finds from Spiennes

The results of the Spiennes mining complex excavations completed so far make certain generalisations possible regarding the basic trends of flint production and the categories of artefacts. However, little can be said about the flint workshops and the techniques or technology of flint working, which left behind a great mass of flakes and flint waste. We have at our disposal only some very modest data on the flint inventories, obtained from F. Hubert’s (1969; 1971) excavations, and the recent SRPH research at Petit-Spiennes.

The flint mined at Spiennes served to make blade blanks from cores, and a small number of flake blanks. The production of axe blades is especially well substantiated and, to a much lesser degree, that of other core tools, of which chisels – ciseau – though very rare, are a typologically distinct category (see Brézillon 1971: 195, 196). Mining tools form a separate group. Picks predominate, while other mining tools consist of various failed specimens obtained in the process of producing various implements, such as axe blades, and then adapted for the job of flint extraction as the need arose (Lech 1982-1983: 24-26; 1991: 560-569).
Cores and blades

Single platform blade cores are among the most important categories of finds from the mining complex at Spiennes (Fig. 17). Many of them have standardised features and could be associated with those workshops which exploited flint from the deepest shafts. The largest regular standardised cores would have been prepared from fragments of flint blocks extracted from the deep shafts at Camp-à-Cayaux. They are similar to the famous ‘livres de beurre’ from Grand-Pressigny. Compared to the classic ‘livres de beurre’, the regular cores from Spiennes are smaller and less carefully prepared; also the variety and range of flint knapping techniques was more limited. It seems that more blades were obtained in the process. After extraction some of the cores were immediately converted into axes. Core knapping was preceded by preparation of the pre-core. During this process, much attention was paid to the preparation of the blade’s striking surface. The trimming technique was generally used. The core exploitation methods used at Spiennes were the same as at Grand-Pressigny, and at workshops 1 and 3/1960 in Sąspów (Dzieduszycka-Machnikowa, Lech 1976). Blades were struck off from the partly rounded striking surface until it became flat, at which point it had to be partly rounded again.

At the Spiennes mine complex there were areas where blade cores were prepared and worked, for instance near shafts 1 and 2; and also in the southwest part of Camp-à-Cayaux, and at Petit-Spiennes, near shafts 20, 28 and 53.2. We also know of areas where no cores were found, such as the north-northwest part of Camp-à-Cayaux, where rescue excavations were carried out in 2005.

Flake cores seem to be a rarer category at Spiennes than blade cores. The specimens are varied and difficult to attribute to standardised categories. Excavations so far have turned up flake cores more often at Petit-Spiennes than at Camp-à-Cayaux (Gosselin 1986: 90-91, 114-115).

Blades and blade fragments occurred frequently at Camp-à-Cayaux and much more rarely at Petit-Spiennes. The longest regularly shaped blades were obtained from cores prepared from flint extracted from the deep shafts of Camp-à-Cayaux. Both regular and failed specimens occur.

Measuring a sample of blade scars on such cores from Ch. Stevens’ collection at the RBINS (Fig. 18), it was determined that most of the blades were between 15-21 cm in length, 25-35 mm wide and 7-10 mm thick. The flint material at Camp-à-Cayaux was also characterised by large core trimming blades and further blades with traces of core preparation (see also Vanmontfort et al in press).

In the Petit-Spiennes area, regular blades like the ones from Camp-à-Cayaux are rare. Drawings of cores from F. Gosselin’s publication (1986: 92, Fig. 31) confirm the production of blade blanks of up to 20 cm in length.

Axe blades and chisels

Among specimens that underwent preliminary working, early roughouts, and roughouts axe blades were the most common. All axe blades were bifacial. An analysis of the
roughouts’ earliest steps and of the roughouts themselves indicates large variations in the group, both in morphology and size. The largest known roughout of an axe blade from Spiennes comes from Camp-à-Cayaux; it was published by A. de Loë (1914). This unusual specimen is 28 cm long and was carefully prepared to the stage which precedes polishing. It was found in or just next to a flint knapping workshop excavated in 1913, located near shafts 1 and 2. Two finished roughouts of axe blades of about 20 cm (Fig. 19) were also recovered in the same area in 2006. Both specimens were made of massive flakes struck off from large flint nodules which had been extracted from deep shafts in this area of the mining field.

During excavations of the southwest part of Camp-à-Cayaux carried out in 1965, F. Hubert (1969) found 62 early roughouts and roughouts of axe blades and fragments (he also found 118 blade cores and 17 flake cores). The biggest is nearly 22 cm long. Large axe blades were also produced at Petit-Spiennes (Fig. 20). Because of the difference in the character of the raw material exploited here, they were smaller than the largest specimens at Camp-à-Cayaux.

Among the flint tools from Spiennes we also distinguish chisels or ciseaux. Generally speaking, these are tools prepared using the same technique as with axes but slimmer in shape (Brézillon 1971: 195 and 196). Chisels were probably among the tools used during activities carried out within the mining field area, and altogether they comprise only a small part of the artefacts produced at the Spiennes workshops. Another very rare tool at Spiennes is the tranche, a more typical tool in Middle Neolithic domestic context.

Mining tools: picks and others
The most important mining tool at Spiennes was the pick, used primarily for digging chalk. Excavations have yield-
ed many tools belonging to this category; most of them found in shafts 1 and 2 at Camp-à-Cayaux during excavations carried out by Baron A. de Loë. In his first campaign, about one thousand picks were found (Fig. 21) and in the second another 500 (Loë 1913: 45; 1914: 35).

F. Hubert (1978: 24-31) analysed 117 picks found during the excavation of underground galleries between shafts 1 and 2 conducted by M. Lefort in 1948-1954. He divided them into 7 different types. The most common were fusiform picks (Pics fuseles typiques) – 45 specimens, that is 48.9%. F. Gosselin (1986: 54-87) examined 289 picks from three shafts in the Petit-Spiennes area: 53.2, 79.3 and 80.4. She divided them into two main categories: the multifacial (multifacial) including 48 specimens, and the bifacial (bifacial) comprising 241 artefacts. The latter is the most common in this area. In shaft 20, whose exploitation level was partially excavated, about one hundred almost-whole picks, 35 large fragments, and several hundreds small chips were distinguished. Almost all of them, following F. Gosselin’s typology, were classified as bifacial. Some of them were only ‘functional’ picks, i.e. failed early rough-outs and roughouts of axe blades used in mining work.

The large numbers of picks recovered from the mine pits and shaft fillings show how important this tool was for the flint miners at Spiennes. These numbers also suggest that picks wore off relatively quickly and had to be frequently replaced by new ones. For example, a broken pick and fragments were found at the bottom of the backfill in shaft 20. The refitting of these artefacts gives a good idea of how tools were progressively worn away during work. It shows that the fragments came off bit by bit, and not all at once in one strike (Fig. 22).
Other flint tools were also used in the process of mining. Usually these were previously-discarded roughouts of axe blades. They were adapted ad hoc for the job of mining in chalk. Evidence of transforming exhausted blade cores into ad hoc ‘functional’ picks must also be noticed.

8.2. Flint knapping workshops

Among the tools used for flint knapping at Spiennes were sandstone and quartzite hammers, though flint hammers are equally numerous. This group of tools is extremely variable in size and weight, with two specimens exceeding 0.5 kg and many considerably lighter ones.

Another characteristic category of finds connected with the final phase of making axe blades and chisels are polishing stones or polissoirs. 49 such objects have been reported, not counting the specimens noted in the Michelsberg enclosure excavations and in the recent excavations (Collet 2000). Most come from the Camp-à-Cayaux mining field. Polissoirs are present - mostly in fragments - but we don’t know about their proportional representation. The largest comes from Camp-à-Cayaux and was found in the 19th century during some unidentified ‘digging’. It measures 41 cm long, 24.3 cm wide, 29.9 cm thick and offers four surfaces for axe polishing (Delvaux 1885-1886: 197).

Another tool connected with flint workshops are retouchers. They are a rare find and it is not always possible to determine whether specific traces of utilisation may not be the result of the incidental use, as a makeshift hammer.

Nevertheless, their occurrence at Spiennes is certain. Another unusual category of finds connected with flint knapping are bone punchers, used for indirect percussion to remove blades from cores. They are known from older excavations, and F. Hubert (1969: 28) also found a deer antler puncher when excavating in 1965 workshop II. F. Hubert’s excavations in 1965 represent the only extended studies of flint workshops in the history of the Spiennes excavations. He completely excavated workshops I and III, as well as parts of workshops II and IV, and published the general results of his work (Hubert 1969). In workshops I, II, and III he found sherds of Michelsberg culture pottery. Only flint tools and objects made from other raw materials were published from these excavations. Large samples of archaeological material from several other workshops were obtained recently by H. Collet.

8.3. Initial analysis of flake samples from Lot 51C, feature 5

Towards the end of January and during February, 2005, rescue excavations were carried out on a building lot lying in the north-northwest part of Camp-à-Cayaux. The digging of the 150 m² trench lasted three weeks, during which time nearly 50 percent only of the features and materials were explored (Collet, Woodbury in press a). This revealed the presence of in situ workshop places. Under emergency conditions, all the flint from the excavated areas was removed ‘en bloc’, packed with the sediment to be sieved later. After it had been collected, 21 features were located, of which 17 were definitely shafts (Fig. 23).
An initial study of 1233 flakes and flake fragments was carried out with preserved butts > 20 mm, together weighing 4985 g (Fig. 24). The sample was organized into dimensional classes, taking into consideration the maximum size of flakes (Fig. 25), following the divisions adopted in the classification of workshop material from Sąspów and Grimes Graves (Lech, Longworth 2000; 2006). Independently, the specimens were also divided according to thickness (Fig. 26), as proposed by A. Augereau (1995). This is the first, preliminary comparison of the results of two classifications carried out on the same, small sample. A comparison of diagrams from Fig. 25 and 26 shows much greater variations in the frequency of specimens in the three size categories of large, ≥ 80 mm, medium, 50-80 mm, and small 20-50 mm flakes than in the three thickness categories, i.e. very thick, > 15 mm, thick, 5-15 mm and thin, < 5 mm flakes. As mentioned earlier, from Lot 51c we only know of workshops preparing flint axe blades and there are no indications that blade cores were prepared there. Flake cores, if they occurred, seem rare.

![Fig. 24: Spiennes, Hainaut province. Camp-à-Cayaux. Plot 51c. Sample of the material explored during the 2005 excavation. Differentiation of size. A - flakes; B - sieved chips. Photograph by M. Woodbury.](image)

![Fig. 25: Spiennes, Hainaut province. Camp-à-Cayaux. Plot 51c. A sample of flint material from workshop 5/2005. Differentiation of basic attributes of flakes > 20 mm on basis of the size (large > 8 cm, middle 5-8 cm, small 2-5 cm) and upper surface of specimens; A – total cortical flakes; B – secondary flakes (partially cortical); C – non-cortical flakes.](image)
The sample is notable for the predominance of small flakes of 2 to 5 cm from each category (N=1138), totalling 92.3% of all flakes (Fig. 25). However, with regard to weight their share is much more modest – 52.4%. At the same time, though not as evidently, there is a predominance of thin flakes when it comes to numbers - 76.5% of the total -, though they constitute only 32.6% in regard to weight. It is the opposite case with large flakes, only 13 (1%) in number but they constitute 17% in terms of weight, and very thick flakes, altogether 21 (1.7%) in number but they constitute 18.7% in terms of weight (Fig. 26). The predominance of the whole non-cortical flakes (N=1005) when compared with the total of cortical flakes (N=91) is only slightly smaller in number - 81.5% for 7.4% - and still clear, though lesser in the case of weight – 64.6% for 9.6%. Generally, the number and weight analyses confirm the relations determined earlier for the Grimes Graves mine. The analysed sample was too small to warrant an evaluation and comparison with the other weight averages of large, and medium sized flakes, and the very thick flakes. Moreover, studies to determine how both these features are correlated (Fig. 25-28) have still to be conducted. However, it should be noted that the average weight of a specimen from the group of partially cortical flakes (9.4 g) is nearly twice the average weight of a totally cortical flake (5.3 g) and even larger...
than the average weight of a non-cortical flake (3.4 g). Given these preliminary considerations, it would seem that the first flakes detached from the blank (nodules or large flakes) were intended to peel off the surface rather than to check its quality, and to prepare it for the basic procedures of the following shaping process. Therefore, these flakes were neither the largest nor the heaviest.

When the nodules, or their large fragments were being shaped, the flakes removed were larger than in the first phase. These are secondary flakes, with partially cortical surfaces. During the last phase, when the early rough-outs, and the roughouts of axe blades, were being formed, many small flakes and micro-flakes (with a maximum size of 10 to 15 mm) were produced; the last two categories were produced in large numbers during the final shaping of the edges of the axe roughout.

The sample examined here remains very small but seems to support the argument just presented, which is based mainly on an analysis of material from workshop complexes at the Grimes Graves mine (Lech, Longworth 2000; 2006).

8.4. Organisation of the flint working process

Studies of the mine complex at Spiennes and of flint working in communities of the Michelsberg culture in the Spiennes region and neighbouring areas, allow us to draw only a preliminary sketch and some general conclusions about the organisation of flint working here, conclusions much more modest than those deriving from the Grimes Graves mine. At Spiennes, flint nodules were extracted from various levels and differed in size and quality. In the case of the recently excavated shafts at Petit-Spiennes, which provide fresh observations, it was determined that the extracted nodules were cleared roughly of chalk, checked for quality by removing the largest protuberances and simple flakes (Fig. 29). The good nodules were transported to the surface; the rejected ones were left underground. Among the latter were all the small nodules (Fig. 30). The analysed sample of flint material comes from the exploration of a 15m³ waste dump left at the bottom of shaft 20 at

Fig. 29: Spiennes, Hainaut province. Petit-Spiennes. Shaft 20. A sample of flint nodules abandoned by miners in the exploitation level. Note traces of removed flakes on some nodules. Photograph by J. Lech.

Fig. 30: Spiennes, Hainaut province. Petit-Spiennes. Shaft 20. Size and weight of flint nodules abandoned by miners in the exploitation level.
Fig. 31: Spiennes, Hainaut province. Petit-Spiennes. Shaft 20. Differentiation of basic categories of flint waste abandoned in the exploitation level, according to frequency and weight of specimens.

Fig. 32: Spiennes, Hainaut province. Petit-Spiennes. Shaft 20. Differentiation of basic categories of flakes abandoned in the exploitation level, according to thickness and upper surface of specimens.
Petit-Spiennes, constituting about 25 per cent of the total mass of dumps. The sample seems accurately to reflect the structure of the whole dump (Fig. 30-31). However, the analysis disregards microflakes and chips < 15 mm, together weighing 18.73 kg, and numerous flint picks which will be analysed in the future.

Interestingly, the sample did not contain flint hammers and only two sandstone hammers were found in the whole area explored in the shaft. Most of the hammers were probably removed from the shaft by the miners.

It is worth noting that many of the flint nodules extracted did not meet the miners’ requirements, because of their size or shape, and were discarded straight away and left underground. A large number of such nodules were recovered – 763 specimens, constituting in weight over two thirds of all the flint left at the bottom (Fig. 30). The nodules were widespread throughout the dump, indicating that the nodule was assessed for suitability and, if needed, was disqualified immediately after extraction from the chalk. Over half of these discarded nodules weighed less than 1 kg. 38% were 10-15 cm in size and it is obvious that small specimens did not interest the miners; the same is probably true for the slightly bigger ones, of 15-20 cm (24%).

We can assume that most of the nodules which were taken above ground were larger than 20 cm and weighed more than 2.5 kg (Fig. 30). The relatively high percentage of defective nodules means that the quality checks and the selection carried out at the bottom of the shaft were accurate. The relatively large percentage of nodule fragments - beside natural ones - indicates that damage also occurred during the extraction and the checking process.

At the same time as they were checked for quality, any kind of irregular protuberance was removed from the nodules. These ‘horns’ (418 pieces – 3.64%) were probably also perceived by the miners as diminishing the piece’s worth (Fig. 30 and 32). Both procedures were complementary. Quality was also checked by striking off simple flakes, mainly cortical and secondary, and these two categories together predominate in number (66% of all flakes) and in weight (88.9%) (Fig. 33). Among the flint workshops from various European mines which have been studied so far, similar proportions have been determined at Sąspów, in the mine workshops located on the surface (Dzieduszycka-Machnikowa, Lech 1976: 92-100; Lech 1983: 52-64).

The occurrence of non-cortical flakes resulting from the processing of the extracted nodules is in fact much lower than suggested by the diagram (Fig. 33: C and F), as part of the flakes in this category are the result of damage to and repair of picks. In the dump at the bottom of shaft 20, there is a large number of waste pieces.

To describe the flakes from the waste dump at the bottom of shaft 20, H. Collet used the method proposed by A. Augereau (1995) but supplemented it by counting the classified flakes (Fig. 33: A-C), though not the specimens in the chip category (<15 mm), which were only weighed. This allows the interesting possibility of comparing the number of pieces in the different categories of flakes with their weight and of evaluating the significance of the criterion of thickness, its correlation with the features of the dorsal face of the specimens and their weight (Fig. 33).

The numbers of totally cortical, partially-cortical and non-cortical flakes in the dump at the bottom of shaft 20 were similar – 31.95%, 34.21% and 33.84% respectively, but in terms of weight, they were respectively: 43.35%, 45.54%, and 11.11% - so we see a clear difference in the mass of non-cortical flakes when compared with the other two groups. The differences in the thickness of flakes are even more interesting. Here the relation between the discrete categories of thickness shows clear differences and, moreover, the ratio of number to mass of flakes is inverse-
ly proportional. In number, flakes > 15 mm thick made up 12.06% of those found at the bottom of the shaft, flakes between 5 and 15 mm made up 38.84%, and flakes < 5 mm, 49.1%. In terms of mass the same categories constituted: 61.03%, 30.52% and 8.45%, so the infrequent very thick flakes were heaviest, while the most numerous category of thin flakes was the lightest. Thus we can regard the thickness of flakes as an important criterion for classification, in accordance with the postulates of A. Augereau (1995: 146) and J. Pelegrin (1995: 162), and in accordance with their place in the chaîne opératoire.

If we consider the differences in the flakes from the dump at the bottom of shaft 20 according to their connection with successive elements of the chaîne opératoire, 25.83% of the specimens, in regard to numbers, and 71.06%, in regard to weight, should be attributed to the stage of preparation of the nodule when very thick, and thick cortical flakes and very thick partially-cortical flakes, were detached by means of a hard hammer. This is an acceptable conclusion.

According to A. Augereau, flakes of medium thickness (5 to 15 mm), partially-cortical and non-cortical should be attributed to the stage when the nodule was being shaped using a hard or soft hammer. This would apply to 24.16% of the specimens with regard to number and 18.3% with regard to weight. The problem is that there are no indications that axes were prepared at the bottom of the shaft. It seems more likely that some of the flakes in this group are the result of incidental damage to the nodules when they were being extracted from the deposit with the use of picks. They could also have been the result of removal of flint protuberances from the nodule, the testing of the quality of the raw material and the forming and repairing of picks, or of damage to the picks sustained during work.

In contrast, most of the 25.14% of thin non-cortical flakes of ≤ 5 mm (probably small, considering their weight which was only 3.40% of all the flakes) and part of the uncounted small fraction of microflakes and chips of ≤ 15 mm and mass of 18.730 kg, were most probably the result of the final stage of preparing picks and other mining tools, of repairing them, and most certainly also of damage done them during work.

All in all, the criteria of thickness and weight proposed by A. Augereau seem pertinent, but there is no support for the assumption that in the case of flakes these criteria function more effectively than the criterion of size.

Concerning flint mining from the deepest shafts, such as shafts 1 and 2 at Camp-à-Cayaux, the organisation of work was completely different. The largest nodules were extracted there, from 1 to 2 m long, about 1 m wide and 15 to 30 cm thick. The nodules were split up underground and the raw material was brought up in the form of smaller blocks which were small and light enough to be transported from a considerable depth to the surface through narrow shafts. Probably part of the waste material was removed – natural pieces of the flint nodule, flint breccia, sparse detached flakes, etc.

Unfortunately, there are no observations which would help describe the behaviour of miners in the direct vicinity of the shafts. This is due to the fact that, at Spiennes, at no time were the dumps next to the mine shafts, or rather their modest remains preserved in some cases by the shafts, studied. Nor was there any research directed towards excavating the surface area surrounding the shafts which, in some cases, may have survived.

The raw materials were transported from the shafts to workshops located within the mining field. In workshops of the Michelsberg culture, blade cores were prepared and exploited, while part of the raw materials were directly transformed into flint axe blades; in some cases, (if suitable), used blade cores were turned into axes. At times, the numerous Spiennes picks were produced at the same time and in the same workshops as manufactured blade blanks and axe blades. This is true in the case of workshops II, III and IV, excavated by F. Hubert in 1965. Picks were prepared there from used blade cores (Hubert 1969: 27, 28 and 31). We know that in the Spiennes area there were also workshops where only axes were made, while no blades were produced.

Workshop productivity is difficult to determine. Only on the basis of F. Hubert’s excavation from 1965 can we venture a guess that in the case of workshops I – IV the scale of production was not large. It probably comprised blades procured from about 100 cores, a similar number of axes and a substantially smaller number of picks. There is a large margin of error here. We cannot exclude the pos-
sibility that the same workshops also produced advanced pre-cores and prepared cores which, together with selected blades and flakes, roughouts of axe blades and initially prepared flint blocks, as raw material, were transported to the miners’ own settlements or became goods for exchange with other communities. This possibility is indicated by the results of excavations at the settlement of a Michelsberg culture community in Thieusies (Vermeersch et al. 1990) at less than 15 km from the flint mines. Four flint picks found at the settlement suggest that the Thieusies community was directly engaged in exploiting the Spiennes flint. The large number of cores in Spiennes flint, as well as the presence of axe roughouts, also supports this hypothesis. Unfortunately, our great ignorance regarding settlements of the Michelsberg culture communities in Hainaut province, in all of Belgium and the neighbouring regions of France, makes further surmises as to the connections between the Spiennes mine complex and its settlement quite pointless.

9. THE PETIT-SPINNES ENCLOSURE AND REMAINS OF DAILY LIFE

The Spiennes mining complex also included a settlement surrounded by a system of ditches and banks, considered by some authors as to have been a place serving some ceremonial function.

Discovered in the fifties, the enclosure is located on the Petit-Spiennes plateau south of the railway trench, on a site where some mining features were discovered, and in the immediate vicinity of the mining area of Petit-Spiennes. The enclosed area, labelled Camp Michelsberg, is situated near the top of the plateau and looks down upon the surrounding countryside. Archaeological excavations determined the location of ditches and only one related pit was excavated inside. As a result, a lot of flint flakes and some burnt daub, sandstone fragments, potsherds, burnt bones as well as charcoal were found.

The layout of the ditches and the approximate size of the enclosure were determined only after some thirty trenches had been dug, though this was not enough to confirm whether the ditches were continuous or not. Only one attested interruption was discovered on the eastern part of the enclosure. For this reason, the drawing set out here (Fig. 34) gives only a general outline, based on an aerial view and on the excavation data published up to 1976 (Hubert 1971; 1976a).

The feature is composed of two parallel ditches 2.55 to 8 m wide and 1.3 to 2.45 m deep beneath the present day surface and enclosing an area of about 14 ha. The distance between the two ditches varies from 5 to 10 m. The presence, originally, of two banks on the inner side of each ditch was suggested by F. Hubert (1971), based on the distance between the two ditches and an examination of their fills.

Among the flint material from small excavation trenches, F. Hubert (1971: 42) distinguished flake and blade cores – the former in greater numbers. The most frequent tools were flake end-scrapers and axe roughouts; the latter were three times more numerous than polished axes. There were also chisels, side-scrapers, flint arrowheads, and a single burin and borer. The connection of the settlement with the mining and knapping of flint is supported by the presence of picks, hammers, polishing stones (polissoirs).

The pollen spectrum obtained from three samples taken in one profile, located in the deepest level of the inner ditch, shows that the enclosure was situated in an area which was probably largely cleared of forest. The arboreal pollen represents only 19 to 25% of the total number of the pollen spectrum. It contrasts significantly with the results obtained for the mining field itself, which shows a greater quantity of trees and mainly bushes - from 42 to 95% (Defgnée, Collet 2003; Heim 2003). The human activity is also attested by the presence of cereals and ruderal plants which clearly indicate the presence of fields and grazing in the immediate vicinity (Heim 1971).

Unfortunately, no radiocarbon dates are, as yet, available. The archaeological material suggesting a date for the enclosure comes mainly from the ditches, especially from the entrance and the inner ditch. The pottery from the Middle Neolithic layers (it should be pointed out that material of later periods was found in the upper part of the ditches) was first studied by F. Hubert (1971), and recently by B. Vanmontfort (2004). The archaeological material can be attributed to the Michelsberg culture (Hubert 1971) and, specifically, to the ‘Central Scheldt basin group’ (Vanmontfort 2004: 342). This group is connected with the Michelsberg culture groups from the Paris basin, the Middle Meuse and the Rhine basin. This material shows no real difference when compared with the pottery found in the mining areas: the same temper, same treatment, same shapes (Vanmontfort 2004: 214)… For this reason the settlement looks contemporaneous with at least a part of the mining activity at Spiennes.

Elsewhere, the Spiennes mining fields were dotted with structures connected with the exploitation and working of the flint. Excavations revealed Michelsberg potsherds, bones of consumed animals and ‘domestic’ flint tools, generally rare at Spiennes. End-scrapers, burins, blades and polished axes were found (Fig. 35). Unfortunately, again no clear interpretation can be given of these discoveries, which are generally old and insufficiently recorded.

10. HUMAN BONES REMAINS

It seems that most of the human bones discovered at Spiennes and in its vicinity give evidence of funerary practices from the Middle Neolithic period, other than those found during the same period in cave or rock-shelters in the Meuse basin (Cauwe et al. 2001).

Human remains are known from Obourg, Strépy and Spiennes. Some of these have been attributed to miners acci-
dentally killed during their work, like the famous ‘Obourg’ miner. Some 15 years ago, most of these human bones were studied in detail, also in the historical context of their discovery, and partly dated (Heinzelin et al. 1993). In fact, some of these human remains turned out to be forgeries, dating from the turn of the 20th century. The forgers used human remains from the Merovingian period as well as protohistoric bones, as in the case of the ‘miners’ of Obourg and Strépy.

Nevertheless, the results of different analyses provided some information about the presence of human remains in a mining context. $^{14}C$ dates indicate that a skeleton from Spiennes has been correctly dated to the Middle Neolithic (Spiennes C; OxA-3196; Fig. 16). The most complete and certain find is a female adult with a perinatal child placed in the middle part of the filling sequence of shaft 11 at Petit-Spiennes (Toussaint et al. 1997; Collet, Toussaint 1998; Collet, Van Neer 2002). A $^{14}C$ date gives 4500 ± 50 BP (Beta-110683), which is within the range of dates for the flint mining at Spiennes (Fig. 16).

**FINAL REMARKS**

On the basis of the excavations carried out so far, it is difficult to determine how much mining and flint working was done overall in the Spiennes mining fields (Collet 2004: 132). We do not know the exact borders of the mining fields and therefore cannot calculate the number of mining features. There is also no precise dating for the various types of mining activities. Moreover, it is not known whether the flint mining at Spiennes was continuous, or whether the different phases of exploitation of the flint deposits were divided by time intervals when mining activity ceased.

The size of the Spiennes site complex and the advanced technology of the extraction process led some authors to infer that the mining and working of the flint there was highly specialised (Verheyleneghen 1966). Such conclusions need to be verified. For reasons mentioned earlier, we know little about the scale and extent of distribution of products from the workshops located next to the mines. According to available data and literature, there is no doubt that the blades and axe blades made in the mine workshops were distributed within a radius of 70 km from the mine, but this seems an exceedingly modest estimate.

As to the intriguing problem of labour specialisation, it seems much more likely that flint mining was just one of the spheres of activity of farming communities who exploited the mines and at the same time worked the land and bred animals (Gautier, Biondi 1993; Collet 2004: 132). These modest conclusions show the crucial problems which archaeology encounters to interpret such sites as Spiennes and other nearby mines. The key to solving them seems to lie in comparative studies of mining fields, flint workshops and flint material from settlements (Dzieduszycka-Machnikowa, Lech 1976; Saville 1981; Lech 1983; 1997: 624-628; 2004: 70-76; Augereau 1995; Cupillard et al. 1995; Jeudy et al. 1995; Pelegrin 1995; Lech, Longworth 2006).
REFERENCES


Collet, H., Deramaix, I., Sartieaux, P. and Vander Linden, M. 1997. Fouille préventive de puits d’extraction de silex à Petit-Spiennes (Hainaut). Notae Praehistoricae 17, 203-212.


Hubert, F. and Soumoy, M. 1993. Mons/Spiennes: fouille de prévention avant l’aménagement de la Station de Recherches, Chronique de l’Archéologie en Wallonie 1, 22.


ACKNOWLEDGMENTS

The study of the material from the Stevens collection kept at the Royal Belgian Institute of Natural Sciences was granted by the Synthesys BE-TAF programme under the reference 1055.