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Archaeological sequences, framework and lithic overview of the late Middle Pleistocene of northern France

*David Hérisson, Jean-Luc Locht,
Émilie Goval, Pierre Antoine and Sylvie Coutard*

Interdisciplinary investigations conducted over the last 30 years ahead of development and infrastructure projects across northern France have enabled the discovery and interpretation of numerous Palaeolithic sites, the reconstruction of the environments in which humans were present, and the correlation of these to precise chrono-stratigraphic intervals. Drawing together a variety of approaches, including stratigraphy, palaeopedology, sedimentology, magnetic susceptibility, palynology, TL, ESR, U/Th, and OSL dating, as well as study of faunal remains and archaeological material, it is possible to relate human presence and absence to specific climatic regimes. Generally, the prehistoric settlement of the north of France seems discontinuous throughout the Pleistocene (Antoine & Locht 2015). Although the data come from rare, excavated sites so far, the first Acheulean occupations took place in temperate to moderately cold environments (during late glacial, interglacial, or early glacial

phases). More numerous, the Saalian data (late Middle Pleistocene, MIS 10–6; Elhers *et al.* 2011) nevertheless comprise a restricted number of well-preserved sites. The main occurrences are situated in the following contexts: late glacial (Cagny Garenne II; Tuffreau *et al.* 2008), interglacial (Biache-Saint-Vaast; Tuffreau & Sommé 1988), or early glacial (Therdonne; Locht *et al.* 2010a). In this chapter, we provide an overview of the excavated sites of the northern France Saalian record and present a reconstruction of settlement dynamics during late Middle Pleistocene climatic cycles, how the landscapes were used, and discuss the existence or the absence of persistent places and their social and spatial implications.

Problems and methods

The geographical space investigated in the framework of this chapter is limited to the

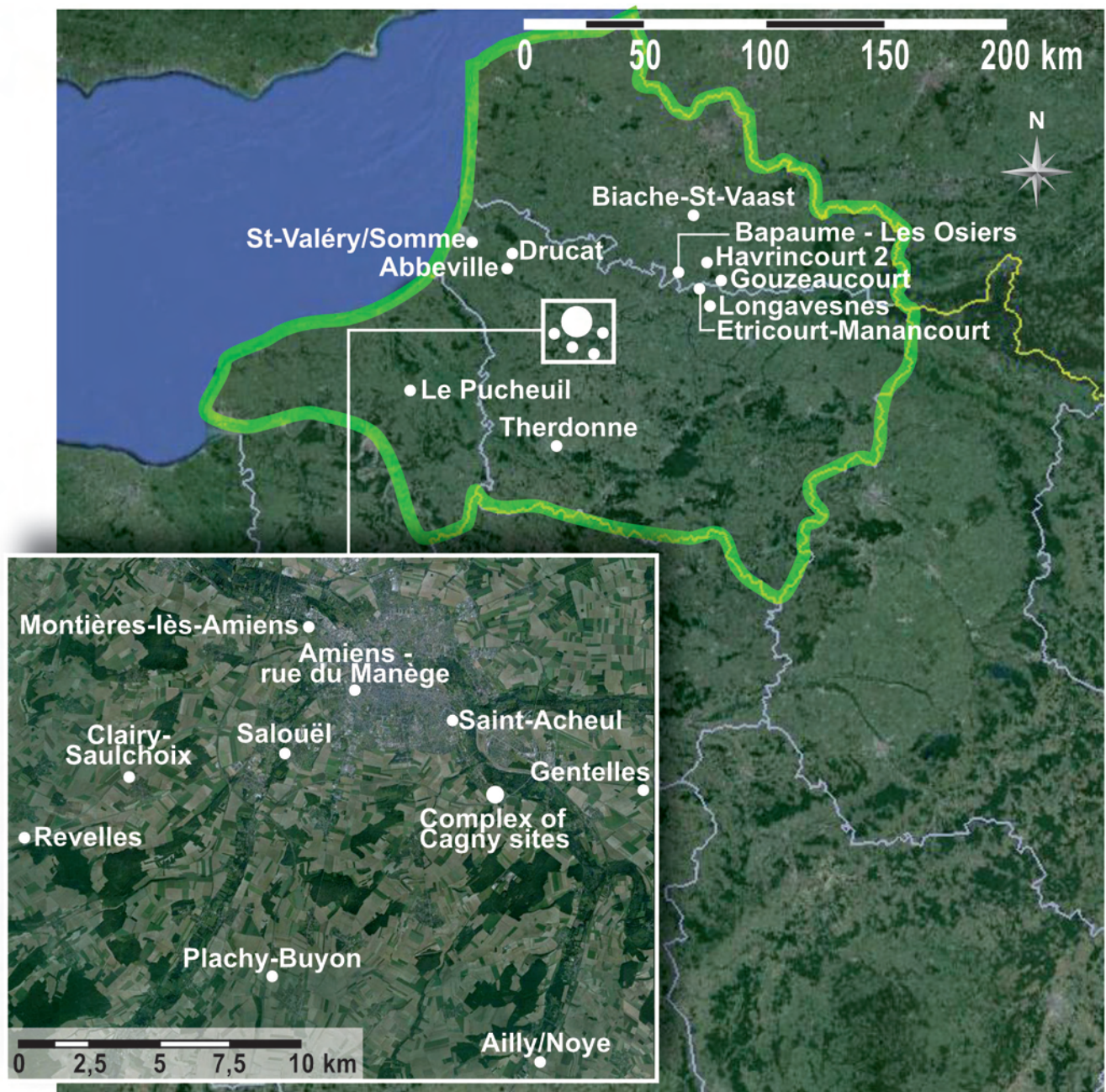


Figure 9.1: Location of the study area (northern France), showing position of sites discussed in this chapter. 'Abbeville' includes three sites: Menbecourt, Moulin Quignon, & Carpentier quarry. 'Complex of Cagny sites' includes four sites: Cagny-la Garenne I, Cagny-la Garenne II, Cagny-Ferme de l'Épinette, & Cagny-l'Épinette

north of France (Fig. 9.1). It covers the area to the north of the River Seine and the valley of the Marne, bordered by the present-day frontier with Belgium and the natural limits of the English Channel and North Sea. Restricted to the margins of the European continent, this geographical space from the outset occupies a particular position not only in France but also in North-west Europe (Depaepe *et al.* 2008).

The chrono-stratigraphic and palaeo-

environmental framework for the Weichselian (MIS 5d–2: 115–14 kya) has been considerably refined as a result of the preliminary evaluations and excavations undertaken since the 1990s ahead of development and infrastructure projects. The Palaeolithic occupations of the Weichselian are now well characterised and the problems addressed are currently the subject of detailed syntheses (Locht *et al.* 2010b; 2014; 2016). The situation is appreciably different for the end of

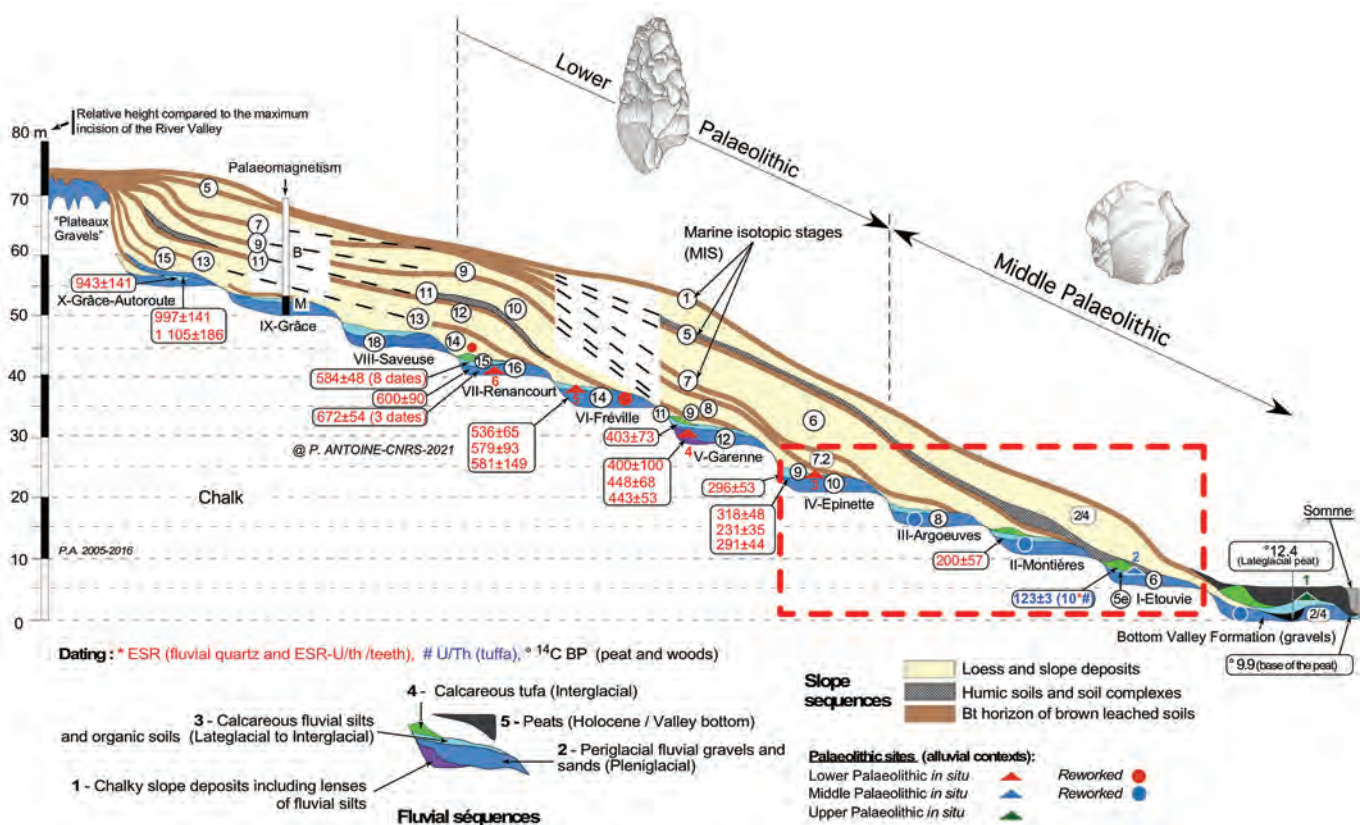
Middle Pleistocene. Indeed, although much research over the last few years has focused on MIS 10–6, the data collected for the Saalian remain somewhat patchy in comparison to the data acquired for the Last Glacial. The currently available corpus of data has the advantage of resulting from targeted research excavation, preventive excavation within a development control context, and more rarely, deep test-pit investigations. While excavation ahead of infrastructure projects involves the investigation of large areas (sometimes several thousands of square metres), targeted research excavations have the advantage of allowing observations over several years, thus refining the problems through the course of time. Although deep test-pit investigations often only lead to the discovery of a very restricted number of artefacts, these acquire their full significance when found in a clearly defined and precise stratigraphic position.

The north of France comprises the following reference sites for MIS 10–6: Cagny-l’Epinette, Biache-Saint-Vaast,

Therdonne, and Etricourt-Manancourt. The well documented and, in some cases, recent studies carried out on these sites allow us to refine the observations from a chronostratigraphic and behavioural point of view. On the contrary, certain sites are deliberately excluded from our analysis due to their unreliable chrono-stratigraphic calibration and/or excessive taphonomic bias; mainly Gouzeaucourt (Tuffreau & Bouchet 1985), Longavesnes (Tuffreau 1987), and Bapaume ‘les Osiers’ (Tuffreau 1978). The current regional inventory comprises 13 sites representing 26 separate archaeological layers, correlated with MIS 10–6 (374–130 kya; after Lisiecki & Raymo 2005). All these occurrences are open-air sites. Particular capture points have trapped and preserved sediments and the archaeological levels associated with them, which vary in terms of the human behaviours that they reflect.

The subject matter discussed here is focused on advances in geological and chrono-stratigraphic research in the north of France but also on the associated lithic

Figure 9.2: Global transect of the stepped terrace system of the Somme basin with location of Palaeolithic levels in the fluvial sequences (according to Antoine et al. 2021, modified). The red dashed rectangle shows the location of the Saalian archaeological levels in fluvial context (MIS 10–6) discussed here. 1) Late Upper Palaeolithic and Mesolithic sites; 2) Caours, Ailly-sur-Noye (N3); 3) Cagny-l’Epinette (H, I); 4) Cagny-la Garenne; 5) Amiens Rue du Manège; 6) Abbeville Moulin Quignon (GRS-j, GRS-n)



industries. It is a question of establishing a brief summary of the *chaînes opératoires* inferred at each level of occupation in order to discuss their diachronic and synchronic evolution. The difficulty of this synthesis stems from the heterogeneous nature of the information at our disposal, since the detail and evidence collected vary according to the type and date of investigation. The different layers are presented by MIS, from the oldest to the most recent. For each level of occupation, we give the type, surface-area covered, and year of the archaeological operation as well as the *chaînes opératoires* involved and the presence or absence of associated faunal remains.

Sedimentary contexts

Archaeological investigations have focused on two main types of sedimentary context: fluvial formations, mainly located in the catchment area of the Somme, and the loess which overlies these terraces. These two systems are superimposed which allows a reciprocal control of their sedimentary context (Locht 2018). Generally, palaeo-environmental information is mainly acquired from sites in an alluvial context where, notably, faunal remains have been preserved.

Fluviatile formations of the Somme basin

The area around Amiens belongs to the Paris basin and is generally made up of white chalk containing flint (Coniacian and Santonian). Relics of clay-with-flints and Eocene formations can persist on the high ground (clays, chalk). The geological map also shows zones mapped with the symbols Fu and Fy (more-or-less altered alluvial deposits), C (colluvium), and LP (loess).

Amiens and its adjoining communes are notable because of the presence of stepped alluvial terraces resulting from the progressive incision of the valleys of the Avre and Somme (Fig. 9.2). The relief created by this fluvial activity is covered by slope deposits, in particular the loess sequences which make up the cover formations. These terraces were studied during the 19th and 20th centuries, in particular by V. Commont (1909), who benefitted from the existence at that time of many quarries in the alluvial deposits (gravel pits) and superficial formations (brickyards). The majority of stratigraphic descriptions

published at that time relate to the sector lying between the Grâce valley and the River Somme (Ferme de Grâce, Montières), the district of Saint-Acheul (Bultel-Tellier quarry), and the brickyards of Cagny.

Recent work has largely permitted the precise mapping of these terraces, which are today mainly concealed by urbanisation, distinguishing ten stepped terraces at relative elevations of between +5/6 m and +55 m compared to the maximum incision of the modern valley (high, middle, and low terraces; Antoine 1990). Dating of the alluvial deposits and the loessic cover has made it possible to establish a reference sequence for the development of the Pleistocene river system (Antoine *et al.* 2007; Fig. 9.2).

The system of fossil alluvial terraces of the Somme is particularly well represented in the middle valley between Amiens and Abbeville, where it consists of a series of stepped alluvial sheets with well-developed loamy covering (Sommé *et al.* 1984; Haesaerts & Dupuis 1986; Antoine 1989; 1990; Antoine *et al.* 1998; 2021). Various preserved alluvial deposits are strongly asymmetrical and are mainly located at the confluences, linked with the preferential accumulation of gravelly alluvium and the lateral displacement dynamics of the river system. A synthesis of the data shows that each alluvial sheet corresponds to the morpho-sedimentary record of a glacial–interglacial cycle characterised by the following sequence (Fig. 9.2).

At the base, slope deposits with fluvial intercalations correspond to an early glacial phase (which are rarely preserved); coarse fluvial gravels are then emplaced in a system of braided channels during the pleniglacial; finally, some silts, locally capped by small patches of organic soils and/or lenses of calcareous tufa, are deposited at the top of the fluvial sequence at the margins of a meandering river system during the late glacial and interglacial. This calcareous silty sedimentation tends to occur at the beginning and end of the interglacials in connection with periods of intensification of floods. The interglacial optimum is recorded in a much more localised way by calcareous tufa formations, such as those of Longpréles-Corps-Saints and Caours (Antoine *et al.* 2006; Limondin-Lozouet & Antoine 2006). These deposits and the associated human

occupations are seldom preserved because of their sensitivity to the processes of erosion.

In agreement with data from the valley bottom, this model implies that we should stress the discontinuous nature of the fluvial sedimentary record of the terraces. Indeed, at the level of a single glacial–interglacial cycle, the various fluvial units preserved represent a few thousand years and the period covered by the sedimentary record thus spans some major hiatuses.

Chrono-stratigraphy of the loess formations

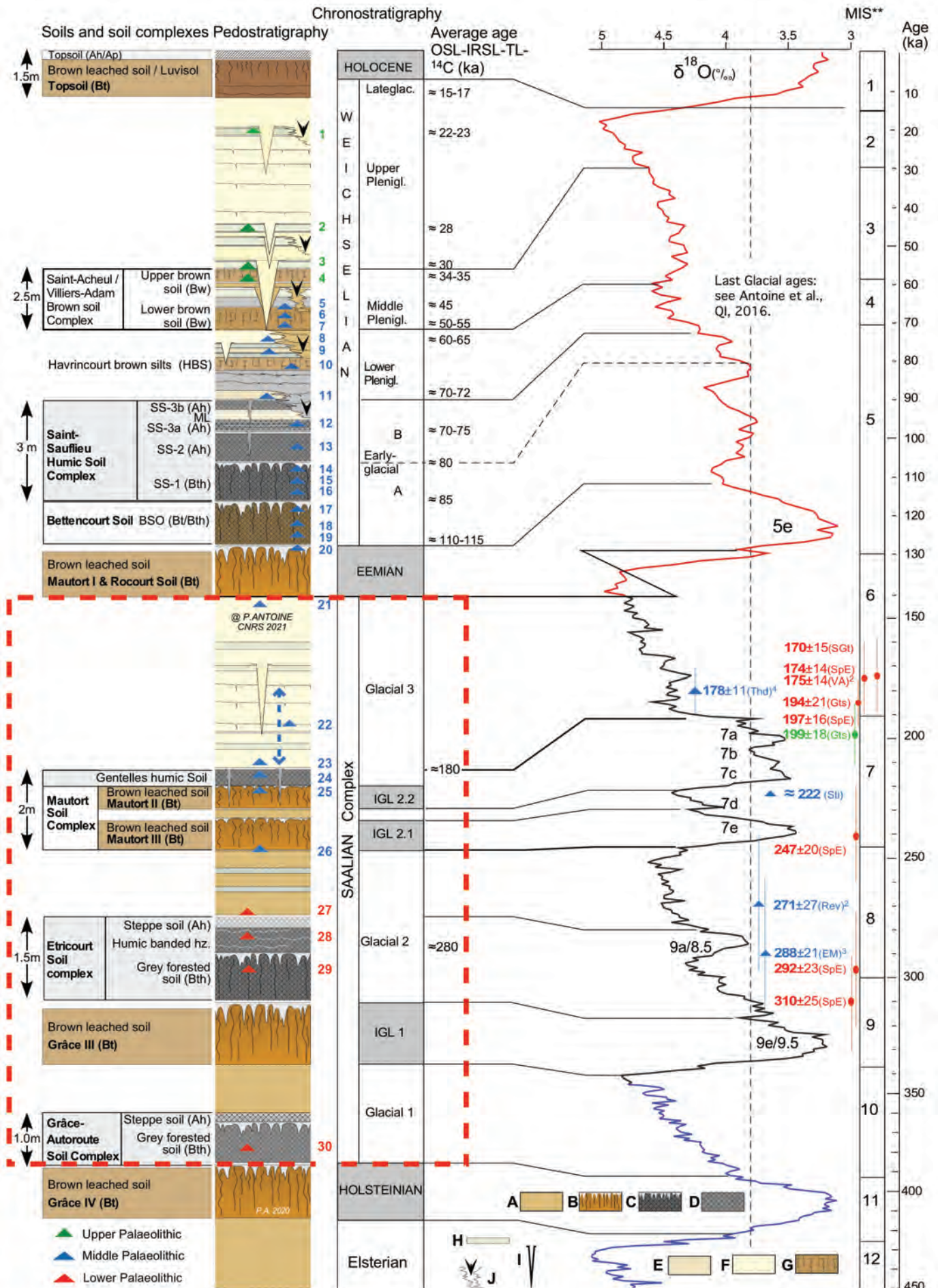
The older loess formations (pre-Weichselian) are rare in the north of France. The reference sequence of Saint-Pierre-lès-Elbeuf (Upper Normandy), preserved as the result of a particular topographic position, covers four glacial–interglacial cycles (Lautridou *et al.* 1985; Cliquet *et al.* 2009; Coutard *et al.* 2019). The Somme valley also provides some rare examples of thick loess sequences (Antoine *et al.* 2003c). Middle Pleistocene loess deposits have been described at the Cagny-la Garenne site, where three loess units are preserved under the Eemian soil (Rocourt soil), separated by the la Garenne Soil Complex belonging to MIS 7 (Haesaerts & Dupuis 1986; Balescu 1988). A more complete record of the Middle Pleistocene has been described from a motorway section at Grâce near Amiens (Grâce-Motorway section) by Antoine (1994) and Antoine and colleagues (2000). A thick sequence of loess and paleosols including seven glacial–interglacial cycles overlies a gravelly alluvial sheet attributable to the end of the Early Pleistocene and also lies against a chalky slope (Antoine 1994; Antoine *et al.* 1998; 2000; 2021). Each cycle includes a Bt horizon of leached brown soil of which only the deeper part is generally preserved. In addition, the middle part of this slope formation contains a pedocomplex (Bt succession/degraded grey forest soil/greyish humus bearing horizon) which appears as a marker of the interglacial correlated with MIS 11 (Grâce IV soil; Antoine *et al.* 1998). Finally, a sequence covering the last four glacial–interglacial cycles was recently excavated at the site of Etrécourt-Manancourt (Hérisson *et al.* 2016b). These observations have permitted the proposal of a summary pedo-lithostratigraphic sequence for the late Middle Pleistocene and Upper

Pleistocene of northern France (Locht *et al.* 2016; Antoine *et al.* 2021; Fig. 9.3).

Before the late Middle Pleistocene: the first evidences of human occupation in northern France

The oldest traces of human occupation currently known are those from the famous site of Moulin Quignon in Abbeville formerly explored by Boucher de Perthes at the end of the 19th century in the High terrace of the Somme River and recently rediscovered (Antoine *et al.* 2019; Bahain & Antoine 2019). Two test-pit campaigns and an archaeological excavation undertaken in 2017 led to evidence of a full assemblage of flint artefacts including five handaxes. ESR on fluvial quartz grains indicate an early MIS 16 date (*c.* 670–650 kya) for these artefacts. This site thus represents the earliest known Acheulian occupation ever dated in the Somme basin and, more generally, in north-western Europe. Some 300 m to the north, in the Carpentier Quarry, two reworked handaxes found in a karstic depression may be attributed to the end of MIS 15 or possibly MIS 14 (Antoine *et al.* 2014a). Finally, the 19 artefacts from the Rue du Manège in Amiens represent the oldest assemblage with thick flake production and without handaxes found *in situ* in northern France (Locht *et al.* 2013; see Fig. 9.1).

The data become clearer and more abundant from MIS 12 onwards. The human occupation at Cagny-la Garenne I is correlated with the beginning of MIS 12 at around 450–430 kya (Tuffreau *et al.* 1997; Fig. 9.1). The palaeo-environmental evidence indicates an early-glacial landscape (temperate wooded steppe, as favoured by large herbivores such as bovids and cervids). Moreover, the palaeo-topographic reconstruction shows the choice of a precise setting in the landscape, between the chalky slope and the alluvial plain of the time, thus giving access to siliceous raw materials and food resources (Antoine *et al.* 2003c). On the contrary, the occupation of la Garenne II could be placed in a late glacial context. Indeed, the presence of bone remains belonging to temperate species in the upper part of the gravels of the alluvial sheet leads us to suppose that these remains could have been emplaced in a late glacial context, as observed in the Thames basin (Bridgland 1994; Tuffreau *et al.* 2008).



MIS 11/10 human occupation

An Acheulean occupation has been identified in a slope context, in loess deposits overlying the alluvial sheet at Cagny-Ferme de l'Épinette (Fig. 9.1). This excavation was led by Tuffreau in 1994 and 1995 ahead of construction of the Amiens bypass over an area of 2500 m². A stratigraphic study allows us to assign the archaeological level MS to the end of MIS 11 and the early glacial to the beginning of MIS 10 (Tuffreau *et al.* 1997). The assemblage consists of bifaces, predominantly refits showing the production of thick flakes from short unipolar sequences. Preserved in a doline, the level C0 at Gentelles could be contemporary with MIS 10 (Tuffreau *et al.* 2008; Fig. 9.1). This excavation was led by Tuffreau in 1998 and 1999, when an area of 6177 m² was investigated ahead of the construction of highway A29. The industry contains bifaces and flakes produced using secant, short, unipolar sequences described by authors (Tuffreau *et al.* 2001) as SSDA (following the definition of 'Clactonian' flaking algorithms by Forestier (1993) as a 'system by alternated debitage surface').

MIS 9 human occupation

Fluviatile context

In this region, the known occupations and sequences become increasingly numerous from MIS 9 onwards, especially around Amiens. At Cagny-l'Épinette, abundant lithic and faunal material (*Bos primigenius*, *Vulpes*, *Crocuta*, *Cervus elaphus*, and *Dama*) was found in calcareous silts

(level I sequence), in the fluvial deposits of the Avre, a tributary of the Somme (Tuffreau *et al.* 2008). The deposit is located at the edge of an old channel skirting a chalky slope. The botanical and faunal data provide evidence of interglacial conditions and a continental temperate climate (Tuffreau *et al.* 2008). The Cagny-l'Épinette site was excavated between 1991 and 2010 as part of a programme directed by Tuffreau. Seven lithic series attributed to the Acheulean were identified over a total surface-area of 459 m² (Tuffreau *et al.* 2008). The last synthesis reports the discovery of 716 artefacts in the I0 level, 1967 in the I1 level, and 167 in level I2, which were respectively excavated from areas of 40 m², 144 m², and 23 m². The site is characterised by the presence of handaxes and a *chaîne opératoire* of flakes produced by unipolar and opposed bipolar sequences (Tuffreau *et al.* 2008).

Loess context

A loess sequence covering the last four glacial–interglacial cycles was excavated at Etrécourt-Manancourt (Hérisson *et al.* 2016b; Fig. 9.1). The site is in the north of the department of the Somme on the southern slope of a dry valley. It was excavated in 2012 by a team led by D. Hérisson over a large area (over 4000 m² excavated at the base of the excavation), in the framework of the building of the Canal Seine-Nord Europe (Hérisson & Goval 2013). Two levels representing the end of the Acheulean culture have been identified within a humic soil complex (Fig. 9.3). No faunal remains were found.

Figure 9.3: (opposite page) Global loess-palaeosol sequence in northern France from MIS 12 with pedo-sedimentary record, dating, location of Palaeolithic levels (1–30), and correlation with the generalised curve of Oceanic $\delta^{18}O$ variations. The red dashed rectangle indicates the targeted archaeological corpus for the present Chapter (after Antoine *et al.* 2021, modified). For Weichselian sites from 1–20, see Antoine *et al.* (2021); Saalian sites: 21) Havrincourt 2-N0; 22) Menbecourt-brownish sandy loess layer, Plachy-Buyon N1 and N2; 23) Biache-Saint-Vaast D and D1; 24) Etrécourt-Manancourt LGS, Therdonne N3, Le Pucheuil B; 25) Etrécourt-Manancourt LRS; 26) Saint-Valéry-sur-Somme; 27) Plachy-Buyon N3, 28) Etrécourt-Manancourt HUD, Clairly-Saulchoix, Revelles Les Terres Sellier N3; 29) Etrécourt-Manancourt HUZ; 30) Cagny Ferme-de-l'Épinette (Cagny-Rocade) MS.

Soils and sediments: A) Non-calcareous sandy loess; B) Bt horizon of brown leached soil with upper greyish leached glossic horizon; C) Bth horizon of grey forest soil with strong prismatic to lamellar structure and upper whitish leached glossic horizon; D) Ah horizon of isohumic steppe soil; E) Local aeolian loam and non-calcareous loess; F) typical calcareous loess (laminated or homogeneous); G) Bw horizons of interstadial brown soils (boreal to arctic brown soils); H) greyish tundra gley horizon with periglacial deformations and oxidised root tracks (Gelic Gleysol). Features: I) Ice-wedge casts with loess infilling (permafrost); J) deep and localised erosion gullies (thermokarst features). Dates: according to Antoine *et al.* (2018) and Coutard *et al.* (2016; 2021) (exponent: number of individual dating results used for the calculation of the averaged age). $\delta^{18}O$: data according to Lisiecki & Raymo (2005). Various chronological scales: red: 0–140 *ky*a, black: 140–340 *ky*a, blue: 340–450 *ky*a

Level HUZ developed in the upper part of a grey forest soil which can be correlated with MIS 9c, around 310 kya. Level HUZ was excavated over an area of 300 m² within two distinct dolines and included 190 artefacts. Two *chaînes opératoires* can be distinguished within this level: cortical backed flakes (naturally backed knives) produced by short secant unipolar sequences and handaxe shaping.

Level HUD, which is contained in a steppe soil, can be correlated with MIS 9a, around 290–280 kya, supported by TL dates (average: 288±21 kyr), IRSL dates obtained from the loess units and the lithostratigraphy. Etrécourt-Manancourt is the only Lower Palaeolithic occurrence to have allowed direct dating by thermoluminescence on burnt flints in northern France. The excavation of level HUD is characterised by 2416 artefacts excavated from an area of 4200 m². Four distinct *chaînes opératoires* are recognised within this level: cortical backed flakes (naturally backed knives) produced by short, secant, unipolar sequences; handaxe shaping; and two less common lithic *chaînes opératoires*, the fashioning of a cleaver (n = 1) and the debitage of flakes with a peripheral cutting edge. This last *chaîne opératoire* is attested by two refit groups reflecting prepared core reduction, similar to the Levallois concept, and by some cores being reconfigured to produce typo-Levallois flakes during the final sequence of exploitation.

South-west of Amiens, the site of Plachy-Buyon is located on the slope of an asymmetric dry valley adjoining the valley of the Selle (Fig. 9.1). It was excavated by Jean-Luc Locht in 1992 as part of a preventive excavation ahead of building work over an area of 525 m² (Locht *et al.* 1995). The Acheulean level (N3) dates to MIS 9 and contains 206 knapped flints. It is characterised by bifacial shaping with most products being discarded on site.

Karstic features context

MIS 9 is also characterised by the formation of a significant number of dolines on the Picardie plateau. This phenomenon of dissolution of the chalky sub-stratum could be related to the association of acid humus bearing soil horizons (boreal forest dominated by pine) with pronounced snow melting processes which characterise the onset of glacial periods. It remains difficult to reconstruct a fine

scale chronology or palaeo-environmental framework for occupations associated with dolines. The occupations of Revelles and Clairly-Saulchoix were found in units attributed to the early glacial of the MIS 9 (d–a), mainly based on the moment of the formation of the dolines in the climatic cycle and the TL dating on burnt flint at Revelles (291.6±28 kya and 263.6±26.2 kya; Coutard *et al.* 2019).

The commune of Revelles lies on the south side of the Picardie plateau, incised by dry valleys connected to the Somme river basin (Fig. 9.1). ‘Les Terres Sellier’ site at Revelles lies in the middle part of a loess deposit, facing north-east, on the slope of an asymmetric dry valley (Guerlin *et al.* 2008). In 2003, an Acheulean occupation level was excavated as part of a preventive phase of excavation ahead of construction of the A29. An area of 30 m² preserved within a doline was investigated and 5116 worked flints excavated. No faunal remains were found. Two *chaînes opératoires* are attested: handaxe shaping and cortical backed-flake production using short, secant, unipolar sequences.

The archaeological layer of Clairly-Saulchoix is located a few kilometres to the east of the Revelles site (Fig. 9.1). An archaeological evaluation was carried out in 2002 under the direction of Vincent Lhomme before the construction of the A29 highway (Lhomme *et al.* 2002; Sellier 2002). An area of over 122 m² was excavated, with the doline yielding over 440 artefacts (Rocca 2005), 30% of which were handaxe shaping elements, 30% result from flaking (cortical backed-knives produced using short, secant, unipolar sequences), and 40% of elements coming from an undefined *chaîne opératoire*.

MIS 8 human occupation

Fluvial context

Located to the west of Amiens, the site of Salouël was first excavated in 1974 and again in 1976 by Dupuis (Fig. 9.1). The lithic industry found in the alluvial sheet gravels (nappe d’Argoeuves; Antoine 1990) may be attributed to MIS 8 (Ameloot-Van der Heijden *et al.* 1996). The last examination of this collection was carried out in the early 1990s and interpreted the lithic material as belonging to a Mousterian industry with Levallois debitage (Ameloot-Van der Heijden *et al.* 1996). The lithic industry

contained in the gravels is in a secondary position, which implies it is at least as old as the gravels. It demonstrates that Levallois flaking was employed in northern France as soon as MIS 8 or slightly earlier.

Loess context

Situated in the Somme Bay at 20 km north-west of Abbeville, Saint-Valéry-sur-Somme is one of the best known Saalian sites in the literature (De Heinzelin & Haesaerts 1983). It was discovered during clearing of a stratigraphic section. The lithic industry was concentrated over an area of 3 m². According to Haesaerts, the archaeological layer appears to be attributable to MIS 8 and has produced remarkable refits of blade core reduction sequences. It represents the oldest known evidence for blade production in Western Europe.

There is very little evidence from within loess deposits and the infill of karstic features in this region that allows sedimentary and archaeological assessment of this pleniglacial phase. Some archaeological levels, such as Gouzeaucourt and Longavesnes, are sometimes attributed to MIS 8 in the literature. However, a return to the original papers (Tuffreau & Bouchet 1985; Ameloot-Van Der Heijden 1993) shows that it is not possible to specify the age of these pre-Eemian occupations. MIS 8 must be considered in these cases as a minimal age and not as a strict correlation.

MIS 7 human occupation

Fluvial context

The Middle Palaeolithic site of Biache-Saint-Vaast is in the department of Pas-de-Calais, 15 km to the east of Arras (Fig. 9.1). The investigation of this site involved a rescue excavation carried out in 1976 by Tuffreau, supplemented afterwards by a series of programmed excavation campaigns between 1977 and 1982 (Tuffreau & Sommé 1988). On the whole, the excavation of c. 1500 m² led to the discovery of seven levels of occupation divided between two distinct sectors (*chantier nord* and *chantier sud*). Each level of occupation has yielded abundant faunal remains, amounting to an overall total of 214,000 pieces (Auguste 1988; 1990; 1994; 1995a; 1995b; 2003; 2012; Hérissou 2012). Only level IIA at Biache-Saint-Vaast has yielded human remains which,

in fact, correspond to the cranial fragments of two young 'Early Neanderthal' individuals (Vandermeersch 1978; Dean *et al.* 1998; Hublin 1998; Rougier 2003; Guipert 2005). All the assemblages from the site are dominated by the Levallois *chaîne opératoire*, which is the only prepared core technology employed on this site. Levallois flakes are therefore the most common artefact of these industries, rather than a discriminating element. Levallois flaking is systematically associated with less controlled or pre-determined flake production. Excavated over an area of 45 m², level H produced 1117 artefacts and 313 faunal remains. A date of 245±28 kya was obtained on a bone by ESR, which agrees with the proposed correlation with the beginning of MIS 7 (Bahain *et al.* 2015). The Levallois concept accounts for 28% of cores (Hérissou 2012), exploited following four different schemas (preferential, bipolar recurrent, centripetal recurrent, and unipolar recurrent).

Level IIA has yielded 47,155 artefacts and 189,760 faunal remains, which were excavated over an area of 150 m². Level IIA is correlated with MIS 7c, in agreement with a series of ESR dates obtained on bones and dental enamel giving an average age around 240 kya (Bahain *et al.* 2015). In a very similar way to level H, the Levallois concept accounts for 29% of cores (Hérissou 2012) which are exploited according to four schemas (preferential, bipolar recurrent, centripetal recurrent, and unipolar recurrent).

The excavation of level Iibase over an area of 340 m² allowed the collection of 4826 artefacts and 3710 faunal remains. Level Iibase is correlated with MIS 7c, in agreement with an ESR date obtained on bones giving an age of 222±27 kya (Bahain *et al.* 2015). The Levallois concept accounts for 19% of cores (Hérissou 2012) which are exploited according to three different schemas (preferential, bipolar recurrent, and unipolar recurrent).

Excavated over an area of 114 m², level E comprises 7483 artefacts and 1442 faunal remains. Level E can be correlated to MIS 7 (probably MIS 7c). The Levallois concept accounts for 29% of cores (Hérissou 2012) and the production is oriented towards the same schemas as levels H and IIA. Excavated over an area of 107 m², level D0 led to the discovery of 1407 artefacts and 539 faunal remains. Level D0 can be correlated to MIS 7. The Levallois concept accounts for 24% of cores (Hérissou

2012), according to two schemas (preferential and centripetal recurrent).

The traces of occupation discovered at Drucat and Abbeville (route de l'Abreuvoir/route de Paris) are a little more difficult to place in a precise chrono-stratigraphic framework at present. According to their position in the system of stepped terraces of the Somme they could be assigned to MIS 7 in its broadest sense.

The village of Drucat is in the catchment area of the Somme, 6 km north-east of Abbeville, more precisely in the valley of Drucat, upstream of its confluence with the Scardon (a direct tributary of the Somme; Fig. 9.1). A deep test-pit campaign was carried out in 2009 by J.-L. Locht and a small collection of Middle Palaeolithic-type artefacts was recovered (Locht *et al.* 2013). Five artefacts resulting from Levallois production and two artefacts resulting from a weakly pre-determined *chaîne opératoire* were discovered in primary position in a deep test-pit.

At Abbeville, two deep test-pit campaigns were carried out in the south of the city in 2003 (route de l'Abreuvoir) and 2008 (route de Paris; Locht *et al.* 2013; Fig. 9.1). No faunal remains were recovered. A Levallois flake was found in one of the deep test-pits during the route de l'Abreuvoir project. The deep test-pits dug during the 'route de Paris' campaign yielded a core, reflecting polyhedral management during the final phase of exploitation, and a Levallois flake resulting from a unipolar recurrent schema.

The operation carried out at Montières-lès-Amiens, in the eastern outskirts of Amiens, took place during monitoring of a quarry by V. Commont (Fig. 9.1). The antiquity of this discovery has meant that it has been re-interpreted many times, being considered variously as 'warm Mousterian' (Commont, 1912), 'Upper Acheulean with laminar tendency' (Bordes & Fitte 1953), or 'Epi-Acheulean with laminar tendency' (Tuffreau 1983). Today, at least three *chaînes opératoires* appear to be present: handaxe shaping, Levallois flakes, and 'laminar' flake production, which would allow attribution to the Middle Palaeolithic. However, the position of the lithic industry in the gravels and the absence of particular elements lead us to consider the taphonomic processes affecting the assemblage and indicates that the site

should be disregarded in terms of producing a reliable, general picture of Saalian industries.

Loess context

The site of Etricourt-Manancourt is presented above in the context of MIS 9 (Fig. 9.1). The two Lower Palaeolithic levels are overlain by two early Middle Palaeolithic occupations which can be correlated with MIS 7. A date of 220 ± 20 kya was obtained by thermoluminescence on a reworked burnt flint found in a gravel bed probably stemming from a lateral erosion of the layer LRS (Hérisson *et al.* 2016b).

The *in situ* level LRS includes 141 artefacts from an excavated area of 2100 m². Three *chaînes opératoires* can be distinguished within this level, all geared towards flake production (Levallois preferential flakes, Levallois uni- and bipolar recurrent, and weakly pre-determined flakes).

Level LGS is characterised by 59 artefacts excavated from an area of 1500 m². In spite of the low number of artefacts recovered there is evidence for five separate *chaînes opératoires*, some represented only by a single artefact (Levallois preferential flakes, Levallois recurrent flakes, weakly pre-determined flakes, Levallois points, handaxe shaping).

The site of Therdonne lies in the department of Oise, to the east of Beauvais, at the foot of a Tertiary hill (Fig. 9.1). Level N3, dated by thermoluminescence on burnt flints (average age: 178 ± 11 kya) and preserved in a steppe-type soil, appears to have been emplaced during the early glacial phase, at the transition between MIS 7 and 6 (Locht *et al.* 2010a). This occupation was excavated during a preventive operation carried out by J.-L. Locht in 1999, which made it possible to retrieve 46,163 artefacts from an area of 305 m². Several *chaînes opératoires* were identified: Levallois flakes (preferential and recurrent; unipolar, bipolar, and centripetal), Levallois points, discoidal flaking, blades, Pucheuil-type flakes, and weakly pre-determined flakes. Three bovidae teeth are the only preserved faunal remains associated with the N3 level. A series of at least five hearths has been discovered and attests to the use of fire at Therdonne for cooking the meat of bovinds (Hérisson *et al.* 2013).

Located in the Pas-de-Calais (Fig. 9.1), two archaeological layers at the site of Bapaume-Les Osiers were excavated in 1972 by Tuffreau (1976). In recent papers, these were correlated with MIS 7a/6 (Balescu & Tuffreau 2004;

Koehler 2008; 2011). On the basis of available data (Tuffreau 1976; Balescu & Tuffreau 2004), the layers at Bapaume-Les Osiers cannot be unequivocally attributed to a precise Saalian MIS. In fact, level A was contained in a cryoturbated erosion gravel and level B was recovered from a reworked paleosol, preventing precise chronological correlation. This secondary position also indicates a probable mix of assemblages from layers of different dates.

MIS 6 human occupation

Fluviatile context

The site of Ailly-sur-Noye is located to the south of Amiens, on the eastern slope of the Noye valley (Fig. 9.1). In 2009 it was investigated using deep test-pits and a deep trench during a preventive investigation ahead of development led by J.-L. Locht (Locht *et al.* 2013). A late Saalian archaeological layer (N3) was discovered which can be correlated with the very end of MIS 6 or the beginning of MIS 5e, associated with a late glacial context. The Level N3 assemblage is composed of 316 artefacts collected from an area of 14 m². The lithic industry is primarily oriented towards the production of huge, preferential Levallois flakes. Ten fragments of large mammal fauna were found associated with the lithic material, including a fragment of radius and an upper molar of aurochs and a fragment of tibia of a large bovid.

Loess context

The site of Biache-Saint-Vaast is presented above in the context of MIS 7 (Fig. 9.1). The site delivers two archaeological levels which can be correlated to the end of MIS 7 and the beginning of MIS 6 during the early glacial phase.

The D1 level is contained in a chalk gravels bed at the bottom of a loess. This gravel is the result of the partial erosion of the underlying tufa (unit 3). This implies that level D1 could result from the erosion of a part of earlier archaeological levels or comprise a mixed assemblage including reworked pieces from earlier levels. Level D1 includes 3184 artefacts which were excavated from an area of 260 m². Levallois flaking accounts for 18% of cores, which are produced according to four different systems: preferential, bipolar

recurrent, centripetal recurrent, and unipolar recurrent.

Level D is contained in a loess affected later by a humic pedogenesis marking a climatic degradation and produced 506 artefacts excavated from an area of 260 m². The Levallois concept is well represented (20% of cores), being mainly expressed through to two schemas: centripetal recurrent and bipolar recurrent.

At Abbeville, the famous Menchecourt locality has been investigated by a preventive, deep test-pit campaign in 2014 (Bahain *et al.* 2019). An archaeological layer delivered a large flint assemblage (N=765 artefacts) and faunal remains (N=44 remains) at the base of the covering sequence in a brownish, sandy loess unit. This layer has a minimum age of 150 kya (>146±9 kya, due to uranium leaching for ESR/U-Th dates) and could be attributed to the first part of the MIS 6. The layer is *in situ* as shown by the high refitting rate (47%) of the lithic assemblage. Lithic sequences attest the selection of pointed and backed flakes mainly following discoid schemes. Faunal remains show anthropic traces and four faunal species have been identified: bison, woolly rhinoceros, horse, and wolf.

In 1992, the Plachy-Buyon site, located south-west of Amiens, was investigated as part of a preventive excavation ahead of development, extending over an area of 525 m² (Fig. 9.1). The two Middle Palaeolithic levels of Plachy-Buyon represent the only evidence in the regional record for occupation during the pleniglacial phase of MIS 6 (Locht *et al.* 1995). However, these human occupations could have taken place during more favourable short events of the pleniglacial phase, as we observed for the Weichselian pleniglacial phases (Goval & Hérison 2017). Levels N1 and N2 yielded 2456 artefacts. The flaking concepts identified are unipolar, Levallois, and discoidal. No faunal remains were found.

The Havrincourt site is in the south of the department of Pas-de-Calais (Fig. 9.1). It was investigated in the framework of a preventive excavation in 2011 covering an area of 2000 m² (Goval & Hérison 2017). Level N0 is contained in a loess which can be correlated with the end of MIS 6. It has yielded very few lithic artefacts (N = 3: two flakes, one of which is elongated, and a double convergent scraper), but their stratigraphic position is clear and

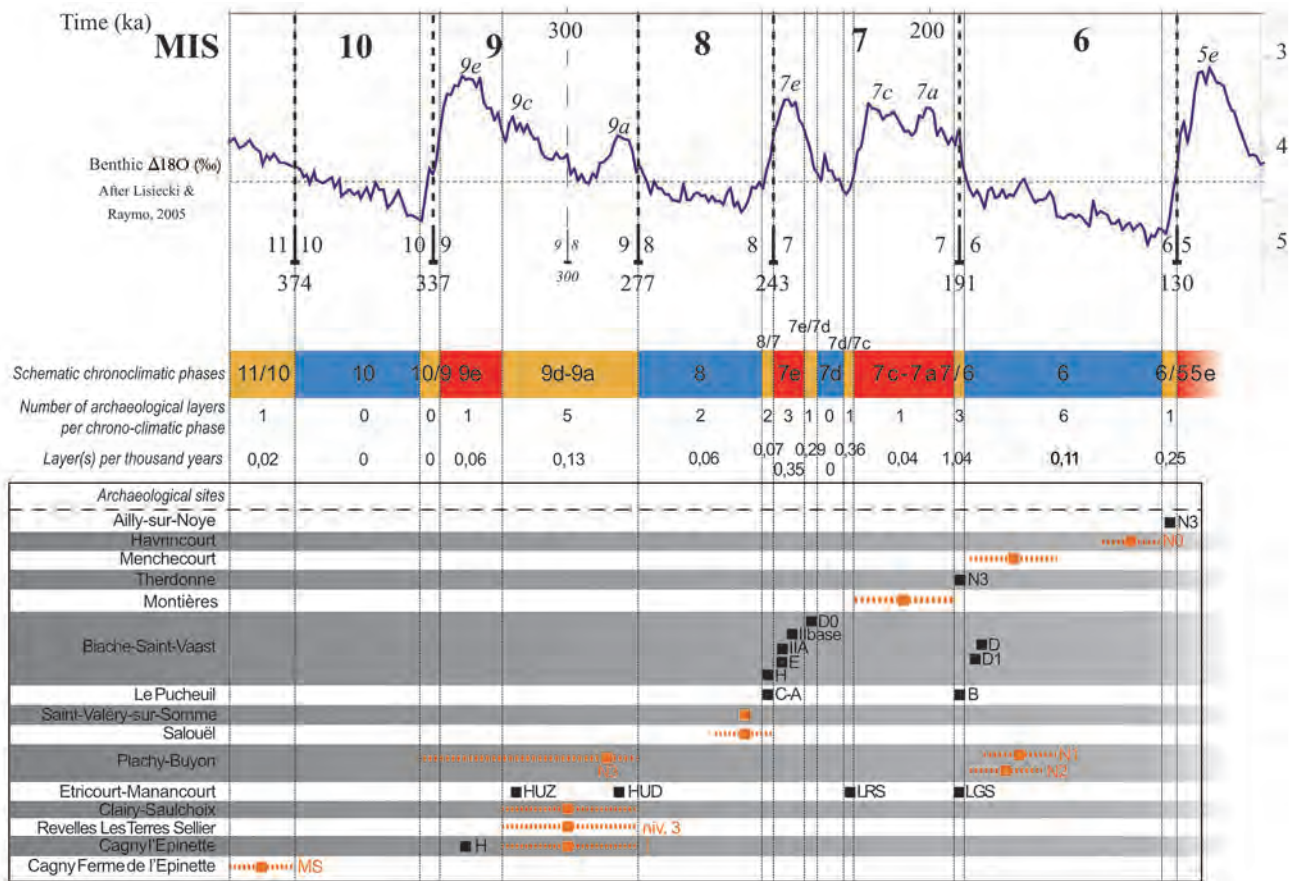


Figure 9.4: Distribution of the Saalian archaeological layers of northern France according to the LR04 benthic stack (Lisiecki & Raymo 2005) and a schematic division of chrono-climatic periods (interglacial in red; early and late glacial in orange; pleniglacial in blue). The archaeological layers in black represent good, precise, and secure correlation with particular chrono-climatic phases. The archaeological layers in orange represent good but not precise or totally secure correlation with particular chrono-climatic phases (for more details, see Hérisson *et al.* 2016a; Hérisson & Soriano 2020)

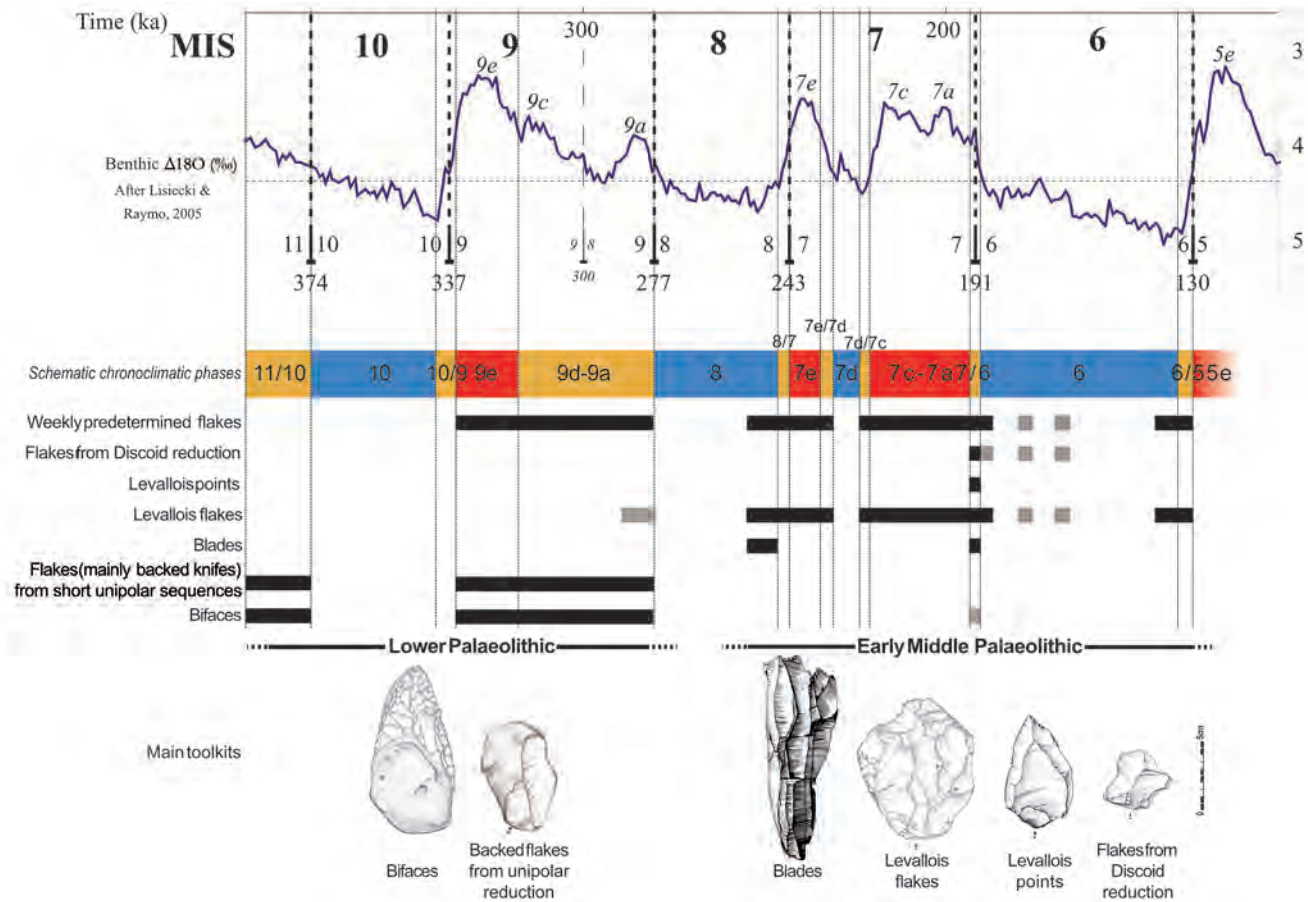
indisputable. Some faunal remains were found associated with these artefacts, including a diaphysis and patella of horse and a fragment of bison rib.

Settlement dynamics of the late Middle Pleistocene cycles in northern France

The chrono-stratigraphic framework of the human occupations of the Middle Pleistocene of northern France is well established, thanks to a reciprocal control system; the stepped terraces system acts as a control upon associated loess pedostratigraphy as well as the inverse. This allows a reliable and precise correlation between human occupation, the LR04 benthic stack, and chrono-climatic phases to be proposed (Fig. 9.4).

The Saalian occupations clearly seem to have been discontinuous according to the model established for the Last

Glacial/interglacial cycle, as recently proposed for most of the Pleistocene (Antoine & Locht 2015; Locht *et al.* 2016). Human occupations took place during interglacial phases or phases of transition (early or late glacial). During the Weichselian, this binary model must be adjusted in the light of recent work on the lower and middle pleniglacial (Antoine *et al.* 2014b; 2016). The current archaeological record for the Saalian settlement of the region also appears discontinuous (Fig. 9.4). Only the pleniglacial phases appear to have been less favourable for human settlement. In particular, no archaeological layers can be securely correlated with full pleniglacial conditions during MIS 8. During MIS 6, the two archaeological layers from Plachy-Buyon demonstrate that, by this point, humans were able to settle northern France during pleniglacial phases. These occupations probably



took place during short phases of climatic amelioration, rather than when full pleniglacial conditions were present. This implies that settlement was discontinuous during the Saalian, as it was during the Weichselian. Moreover, this discontinuous settlement is definitely not a simple binary division but demonstrates a punctuated human presence during pleniglacial periods. This model must be tested and demonstrated through future discoveries and new dating and correlation of old excavation records.

Technological trajectories of the northern France Saalian record

Pre-Saalian Palaeolithic sites are very rare in northern France compared with the British record. A human presence is attested but it is not yet possible to propose a detailed description of the lithic industries

and the ways in which they evolved regionally. The beginning of the Saalian is marked by a series of sites correlated to MIS 9 (Cagny-l’Epinette, Etricourt-Manancourt, Plachy-Buyon, Revelles, and Clairly-Saulchoix). They represent the final Lower Palaeolithic, culturally designated as Acheulean, and historically characterised by an iconic artefact – the handaxe (Fig. 9.5). Most previous studies have only focused on how handaxes were shaped, ignoring the central role played within such industries by flaking strategies, and over-emphasising the role played by handaxes in the technical systems. The recent study of two layers (HUZ and HUD) at Etricourt-Manancourt shows how important were the tools produced through flaking (Hérisson *et al.* 2016b). In layer HUD, cortical backed-knives were produced using short, secant, unipolar sequences and

Figure 9.5: Distribution of the main chaînes opératoires recognised for the northern French Saalian record according to the LR04 benthic stack (Lisiecki & Raymo 2005) and a schematic division of chrono-climatic periods (interglacial in red; early and late glacial in orange; pleniglacial in blue). This schematic and synthetic distribution is based on the chaînes opératoires present in the archaeological layers of Fig. 9.4. The line in black represents good, precise, and secure correlation and presence of a chaînes opératoires. The line in grey represents the possible presence of a chaînes opératoires, with a good but not precise or totally secure correlation or, not enough testimonies for definitively and securely attesting the presence in the considered time span

such flakes dominate the assemblage; 391 flakes have a potential working edge and 111 of these flakes retain traces of use-wear attested by traceological analysis. Conversely, only 25 completely functional handaxes were recovered, of which only 12 exhibit use-wear. Even if the relative proportion of tools produced from flaking versus those produced through shaping vary by site (depending, for instance, upon function, or position in the landscape), it is worth emphasising that handaxes rarely represent more than 1% of any complete assemblage.

Some technical innovations leading to Levallois flake production seem to emerge within the Lower Palaeolithic industries of MIS 9, and perhaps before MIS 9. Some authors proposed that Levallois flaking originated from the production of preferential flakes from the face of handaxes (Tuffreau 1995). Others perceived the emergence of Levallois flaking as resulting from a long development from simple prepared core technologies (White & Ashton 2003). Currently, the oldest convincing case of the use of the emerging Levallois concept in northern France comes from level HUD of Etrécourt-Manancourt, which would have been labelled as a typical Upper Acheulean assemblage if it was discovered during the 20th century, but now dated to 280 kya (Hérisson *et al.* 2016b). There does seem to be a real link between Lower Palaeolithic and Middle Palaeolithic lithic technologies. If this link is confirmed, it implies that the Lower to Middle Palaeolithic technological shift would come from local/regional innovations and evolutions and not the arrival of new technologies developed elsewhere.

The Saalian assemblages have been summarised recently in several studies (Hérisson 2012; Hérisson & Locht 2014; Locht *et al.* 2016; Hérisson *et al.* 2016a; Hérisson & Soriano 2020) highlighting that early Middle Palaeolithic sites are characterised by an association of several *chaînes opératoires* for producing flakes, blades, and points. Thus far, five different main *chaînes opératoires* have been identified within lithic series attributed to the early Middle Palaeolithic. These are not systematically represented together and their co-existence and representation vary across the assemblages. The fact that such flaking methods are associated within individual levels

reveals a new facet of technological practice not observed during the Lower Palaeolithic: the choice between complementary flaking *chaînes opératoires* and the variety of end products they offer. Only at Saint-Valéry-sur-Somme is production exclusively directed towards blades (De Heinzelin & Haesaerts 1983). In contrast to the other sites considered here, the lithic material from Saint-Valéry-sur-Somme was only retrieved during the cleaning of a section and not during an extensive excavation. It may, therefore, reflect only one of the technological strategies practised at the site.

In summary, the technological trajectories documented within the northern French Saalian (Fig. 9.5) record a clear shift in the technological strategies used and the resultant lithic toolkits that took place between the end of MIS 9 and the beginning of MIS 7. These changes can reveal and accompany the shifting from one social world to another, a world already changing from at least MIS 9. Unfortunately, the lack of sites correlated to MIS 8 does not yet allow the precise timing, nature, and processes involved in this shift to be interrogated and understood on a regional scale.

Persistent or punctuated places in the Saalian record of northern France

The region contains a number of key reference sites for the end of the Lower and beginning of the Middle Palaeolithic (ie, the complex of Cagny, Biache-Saint-Vaast, Therdonne, and Etrécourt-Manancourt). Many of these sites possess several archaeological layers (Fig. 9.4). This implies recurrent occupation of the same places over time, at different timescales, with different social implications. In fact, at some sites, multiple annual or decennial recurrent independent occupations can be observed, creating a palimpsest in a relatively short time, excavated as a single archaeological layer. In such cases, like layer IIA at Biache-Saint-Vaast, we can suggest that this repeated use of a single location could be linked to a direct (generational) transmission of knowledge of the landscape and, in this example, of particular hunting hotspots. The various archaeological layers of Biache-Saint-Vaast also show that a location can be occupied again following a millennial or ten-millennial hiatus. In such cases, the recurrence probably does not come from generational transmission about the affordances of a particular place. It reveals

that human groups used similar criteria for extensive periods to organise their activities, including hunting, collecting raw materials, and knapping.

The Saalian record of northern France has not produced evidence of any places which were continually occupied all year round. Most sites reflect short, or even very short, occupations. The most that can be suggested is a few weeks or monthly occupation of the same place, as for Layer N3 at Therdonne. The current record suggests that Saalian human groups were highly mobile in the landscape, not in terms of long-distance movement but in the frequency of moves made, separated by only short-term occupations. Perhaps this high mobility is explained by the open landscape of the northern French plains which lack rock-shelters.

Conclusions and perspectives

Because of these reference sites, which permit

a high degree of chronological resolution, the north French record documents in detail the end of the Lower Palaeolithic and beginning of the Middle Palaeolithic, not only in terms of technological change but broader shifts in how people exploited their landscapes and the resources that they contained. As this overview has shown, further research has enormous potential to expand our understanding beyond simply what lithic production techniques were used at a particular site, to how adaptation occurred across the region as a whole. At present, the broader regional picture and our interpretations are obscured by the fact that there are so few sites, especially for the crucial pleniglacial phase of MIS 8. To understand the Saalian techno-complexes and the behaviour of the human groups settling northern France, it is absolutely essential to work on different time and geographic scales (from local to continental, British 'Isles' included!) in order to grasp the overall phenomena involved.

