The late Middle Paleolithic and earliest Upper Paleolithic in Central Europe and their relevance for the Out of Africa hypothesis

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Abstract

The available data from Central Europe is consistent with the hypothesis that Homo sapiens sapiens evolved initially outside Europe and colonized the different regions of the continent previously occupied by Neanderthals between roughly 50 and 30 kyr BP. Different transitional industries in Central Europe, which show both Middle and Upper Paleolithic features, appear to root in the local Middle Paleolithic assemblages. At present it is uncertain which hominids produced the transitional industries. While organic artifacts, objects of personal ornamentation, and art objects are generally absent in these transitional assemblages, they become abundant in the Aurignacian, which represents the first fully evolved Upper Paleolithic technocomplex spread over larger parts of Europe. Both radiocarbon and TL dates indicate that the Aurignacian was present in Central Europe, including Germany, as early as about 40 kyr ago. This means that coexistence of Neanderthals and anatomically modern hominids endured for a time span of some 10 kyr, since with the appearance of the Aurignacian we first encounter the cultural remains of Homo sapiens sapiens with fully developed artistic and symbolic representations, ornaments, and abundant organic tools, while the last Neanderthals appear to have lived some 30 kyr ago.

1. Introduction

While it is generally accepted that the earliest hominids have their roots in Africa and from there colonized the low and middle latitudes of the Old World, no consensus exists regarding the evolution and spread of anatomically modern hominids. Scholars continue to debate whether this evolution took place simultaneously on different continents or whether Homo sapiens sapiens, after evolving initially in Africa, replaced existing archaic populations including the Neanderthals in western Eurasia (Mellars and Stringer, 1989; Trinkaus, 1989; Bräuer and Smith, 1992).

This paper cannot present the full story of the transition from Middle to Upper Paleolithic for the whole of Central Europe. The cultural manifestations during the period in question — approximately between 50,000 and 30,000 BP — are too diverse and uncertain in their interrelations. By focusing on key aspects of the archaeological record in Germany as well as in Eastern and Southeastern Central Europe, we can provide evidence relevant to the Out of Africa hypothesis, and conclude that this hypothesis is supported by the archaeological data.

2. The archaeological record in Eastern and Southeastern Central Europe

In Eastern Central Europe, especially in Moravia, there are two main transitional industries. The Bohunician and the Szeletian both root in the local Middle Paleolithic. The Bohunician has its geographic center in the region of Brno. The radiocarbon dates for the important sites of Brno-Bohunice and Stránska skála (Fig. 1: 7 and 9) lie between 36 and 43 kyr BP and show relatively high statistical uncertainties ranging from 1.1 to 3.1 kyr (Svoboda et al., 1996: Table 5.2). Noteworthy, is the abundance of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages. This characteristic has led Svoboda et al. (1996, p. 108) to postulate the existence of Levallois elements in these lithic assemblages.
developed out of the Mousterian and would thus seem to have been produced by Neanderthals.

The Szeletian, in contrast to the Bohunician, shows a broader distribution with a far greater number of sites. Karel Valoch has argued that the Szeletian may have evolved from earlier central European Micoquian and Keilmesser industries as typified by the finds from Kulna 7 and 6a (Valoch, 1993, pp. 57–67). Szeletian assemblages lack Levallois cores and debitage, but bifacial forms including leaf points are abundant. Laminar debitage is less common than in Bohunician assemblages. The best-dated site is Vedrovice V (Fig. 1: 8), which has been radiocarbon dated to between 35.15 ± 0.65 and 39.5 ± 1.1 kyr BP (Svoboda et al., 1996, Table 5.3).

Both of these assemblage types include a tool spectrum that is characterized by both Middle and Upper Paleolithic elements. The Bohunician is particularly dominated by Upper Paleolithic forms, including end scrapers, carinated scrapers, and burins. Less abundant within the Bohunician are Middle Paleolithic forms including scrapers and denticulates, and Levallois points. Although leaf points or Blattspitzen are common in the Szeletian, they occur only rarely in the Bohunician. Organic artifacts, which are often seen as characteristic of the Upper Paleolithic, including bone, antler and ivory tools, ornaments, and artworks are entirely unknown in both the Bohunician and the Szeletian. While no human skeletal material has been found in unambiguous association with these assemblages, it is at least plausible that these assemblages were manufactured by Neanderthals.

Turning to the Aurignacian, the densest concentration of sites from this period outside France is found in Moravia, where numerous surface sites are well documented, but remain undated. In Lower Austria, stratified open-air sites are well known from Willendorf II, Galgenberg-Stratzing (Fig. 1: 5 and 6), Krems-Hundsteig, and Langmannersdorf (Hahn, 1977, pp. 104–109; Neugebauer-Maresch, 1996). Based on the available chronostratigraphic data, it appears that the Aurignacian in these parts of Central Europe covers a broad temporal span between ca. 38 kyr radiocarbon years at Willendorf II, Kulturschicht 3 (Haesaerts et al., 1996), to around 29 kyr at Milovice (Svoboda et al., 1996, Table 5.4). Intermediate radiocarbon dates are known from sites including Pod hradem at 33.3 ± 1.1 kyr BP (Svoboda et al., 1996, Table 5.4). These Aurignacian assemblages are dominated by end scrapers, carinated and nosed end scrapers, and burins; but side scrapers, notches, and denticulates are also present. Unidirectional blade cores usually dominate the assemblages (Hahn, 1977, p. 194) and, as Bon (1996) has demonstrated for the Aurignacian of the Grotte des Hynes near Brassempouy in France, a number of the carinated scrapers may well have served as blade cores. With the appearance of the Aurignacian in Moravia, the systematic production of bone and antler tools is documented, among which Mladec points are noteworthy (Hahn, 1977, pp. 222–225). Additionally, among others, ivory pendants and perforated teeth are present and demonstrate the first use of ornaments in the region. Both in terms of the technology and typology of
the lithic artifacts and with the presence of numerous organic artifacts, the Aurignacian seems to appear relatively suddenly in this part of Central Europe, and suggests a cultural development that arises independently of the earlier Bohunician and Szeletian assemblage types.

When considering the connection between human skeletal morphology and artifact assemblages, the important human fossils from Mladec (Fig. 1: 10) are of only marginal help since they cannot be attributed with certainty to a particular assemblage type. The reexamination of these fossils by Bräuer and Broeg (1998) did not identify any evidence for hybridization, as had been argued earlier (e.g. Frayer, 1986, 1992) and suggests that they can be classified as *Homo sapiens sapiens*.

In southeastern Europe, assemblages that belong to the period of the transition from the Middle to the Upper Paleolithic are also known. These assemblages can be seen as analogous to the Bohunician in Moravia. In Bulgaria, Temnata Cave (Fig. 1: 13) provides a transitional industry of Layer VI, Sector TD-II, radiocarbon dated to at least 38.7 kyr (Ginter et al., 1996, Table 1). The early Aurignacian from a different part of the same cave has yielded AMS radiocarbon ages in excess of 40 kyr. The transitional assemblage from Temnata is characterized by a temporal shift from Levallois cores toward bi-directional Upper Paleolithic cores. Ginter and colleagues see this assemblage as a continuation of the Mousterian-Levalloisian tradition (Ginter et al., 1996, p. 190). Noteworthy, is an engraved stone from the transitional assemblage that represents one of the very few finds that could perhaps be seen as an indication that artworks are present before the Aurignacian (Crémadès et al., 1995). The earliest Aurignacian from Temnata has to be referred to as the Early Balkan Aurignacian or the Bachokirian (Ginter et al., 1996, pp. 195–198).

Also in Bulgaria, the cave of Bacho Kiro (Fig. 1: 14) has played a central role in the discourse about the origins of the Aurignacian and modern humans in Europe. Here, Cultural Horizon I of Level 11 has yielded an early Upper Paleolithic assemblage, which Kozlowski and colleagues have referred to as the Bachokirian or as the Early Balkan Aurignacian (Kozlowski, 1982). This horizon was originally dated to in excess of 43 kyr with conventional radiocarbon in Groningen (Mook, 1982). Newer AMS dates from Oxford for Level 11/11a are younger, with ages of $38.5 \pm 1.1$, $37.7 \pm 1.5$ and $34.8 \pm 1.2$ and $33.8 \pm 0.9$ kyr BP (Hedges et al., 1994, pp. 347–348). A clear explanation for these diverse dates is not yet available. This assemblage lacks bone points and other organic artifacts of the Aurignacian, and both side-scrapers and Levallois points are very rare. The blade production is of Upper Paleolithic character. Kozlowski and colleagues see no connection between the Bachokirian assemblage and lower lying Middle Paleolithic assemblages, and emphasize the Upper Paleolithic nature of this industry (Kozlowski, 1982, p. 163).

In Croatia and Slovenia there seems to be a relatively continuous cultural development between 45 and 30 kyr BP from late Middle Paleolithic to early Upper Paleolithic industries which in most cases cannot be classified as Aurignacian (Karavanic and Smith, 1998).

The exact stratigraphic positions and cultural attributions, as well as the dates of the hominid remains from Southwestern Central Europe belonging to this period, have been questioned (Mellars et al., 1999; Zilhão and d’Errico, 1999a,b). Among others, this is true for the Neanderthals from the early Upper Paleolithic level G1 of Vindija cave in Croatia (Fig. 1: 11) which yielded AMS radiocarbon ages of $33 \pm 0.4$ kyr BP (Karavanic and Smith, 1998, Fig. 2) and 28–29 kyr BP (Smith et al., 1999) respectively. These results suggest the presence of Neanderthals in the region significantly after the appearance of Aurignacian assemblages and modern *Homo sapiens* in other parts of Central Europe. The lithic artifacts from Vindija are dominated by quartz, with lesser amounts of graywacke, chert, and radiolarite. The abundance of raw materials with irregular chipping characteristics contributes to the non-standardized nature of the Vindija lithic assemblages. Both Middle and Upper Paleolithic tools are present. The stratigraphic integrity of the site has been questioned (see Karavanic and Smith, 1998, pp. 233–236; Zilhão and d’Errico, 1999b, pp. 355–357) and given the rich bone assemblages from the overlying layers, there is still uncertainty about whether or not the Neanderthal remains from Layer G1 are associated with the worked bone industry.

Apart from the cranial fragment of *Homo sapiens sapiens* from Layer j at Velika Pecina cave (Fig. 1: 12; Malez, 1974, pp. 8–13; Karavanic and Smith, 1998, pp. 239–241), this deposit yielded only one stone tool. The lower lying Layer k contained what appears to be a Middle Paleolithic assemblage. The overlying Layer i yielded only seven lithic tools, including both Middle and Upper Paleolithic forms. The latter deposit also produced three bone points, which have led to the assumption that this layer should be attributed to the Upper Paleolithic (Karavanic and Smith, 1998, pp. 238–239).

It must be stressed that all the dates mentioned so far are radiocarbon dates, many of them lying outside the reliable range of the method.

### 3. The archaeological record in Germany

In Germany, the entirety of the Middle Paleolithic appears to have been accompanied by the evolution of Neanderthals out of earlier *Homo heidelbergensis* populations. The fossil hominids start with Mauer (Wagner and Beinhauer, 1997), include those from Bilzingsleben (Mania et al., 1980), Steinheim (Adam, 1988), and Reilingen (Czarnetzki, 1989, 1991; Condemi, 1996), and
finally reach classical Neanderthals like those from Neandertal itself (Krings et al., 1997). Recent finds from Ochtendung, dated to the penultimate glaciation (Berg, 1997; Condemi, 1997), and Warendorf-Neuwarendorf (Czarnetzki, in press) fit well into this lineage, which seems to represent a continuous line of evolution. However, there is no direct link between the Neanderthals and early *Homo sapiens sapiens* fossils such as the one from Vogelherd cave (Riek, 1932).

This conclusion is highlighted both by DNA analyses conducted by a Tübingen team comparing the Stetten I fossil from Vogelherd cave with Neanderthals like Warendorf and Krapina (Scholz et al., 1999; Pusch, pers. comm.), and by DNA analyses conducted by a team in
Munich, using the type specimen itself (Krings et al., 1997). In both cases the data support the hypothesis that Neanderthals were not direct ancestors of anatomically modern hominids.

The latest Middle Paleolithic of Germany is characterized by Blattspitzen assemblages which are, however, less numerous than in Eastern Central Europe (Bolus and Rück, 2000; Conard and Fischer, in press). These German assemblages with Blattspitzen do not appear to have evolved out of the local Middle Paleolithic. Autochthonous transitional industries without or nearly without Blattspitzen comparable to the Bohunician seem to be absent in Germany, perhaps with the exception of the small assemblage from Schwalbenberg in the Rhineland (Fig. 1: 1), excavated by Joachim Hahn (App et al., 1995). This site yielded both a discoidal core (Fig. 2: 10) and a blade core (Fig. 2: 11); the number of blades is small. Amongst the tools, side-scrapers (Fig. 2: 1–4) predominate, but there is one end-scaper (Fig. 2: 6) as well; splintered pieces (Fig. 2: 5 and 8) are relatively numerous. It is noteworthy that splintered pieces also frequently appear in Blattspitzen assemblages (e.g., Zeitlarn: Heinen and Beck, 1997, and Vedrovice V: Valoch, 1993). Another feature linking the Schwalbenberg assemblage with Blattspitzen assemblages is the morphology of the end-scaper with heavily retouched edges (Fig. 2: 6) which was produced out of a thick flake rather than out of a blade. Thus, it can be stated that not a single genuine Upper Paleolithic tool type can be found within the Schwalbenberg assemblage. Two pre-forms of bifacially retouched artifacts (Fig. 2: 7 and 9) also provide links to assemblages with Blattspitzen such as the Szeletian. In contrast to the Middle Paleolithic tool types and blank production, the patterns of raw material procurement resemble those of Upper Paleolithic sites in the Middle Rhine region. About 60% of the raw material used at the Schwalbenberg site was obtained from within a distance of up to 85 km (Floss, 1994, pp. 171–174) while for other Middle Paleolithic sites of that region the amount of raw materials from a greater distance is normally less than 3%. This value increases only slightly during the Aurignacian and rises with the Gravettian, reaching its maximum value during the Magdalenian (Floss, 1994).

One of the key sites in southern Germany is Geißenklösterle cave (Fig. 1: 2) in the Aach Valley near Blaubeuren. As in most other sites of the region, there is no continuous stratigraphic sequence from the Middle to the Upper Paleolithic. Above a Middle Paleolithic horizon, dated by ESR to a mean value of 43.3 ± 4 kyr BP (Richter et al., 2000), which has, however, so far been excavated for only a few square meters, there is an archaeologically sterile layer, followed by an Upper Paleolithic sequence. This sequence starts with Aurignacian, which Joachim Hahn subdivided into two horizons (Archaeological Horizons III and II: Hahn, 1988) and is overlain by the Gravettian and Magdalenian.

In contrast to Hahn, who addressed the lowest Upper Paleolithic horizon (Archaeological Horizon III) as ‘Protoaurignacien’ we refer to this horizon as the Lower Aurignacian. Unidirectional blade production (Fig. 3: 16) is well represented in both horizons (Hahn, 1988, pp. 144–147), and we find almost the same tool types. There are, however, more carinated and nosed end scrapers in the lower horizon (Fig. 3: 1–7) while in the upper (Archaeological Horizon II) there are more simple end scrapers on blades (Fig. 4: 5, 7 and 9). Burins, especially burins on truncation, are represented in almost equal numbers in both horizons (Fig. 3: 8, 11 and 12; Fig. 4: 10). The upper horizon in turn yielded more blades with lateral retouch (Fig. 4: 8) and pointed blades (Fig. 4: 19), as well as more splintered pieces (Fig. 3: 9 and 10; Fig. 4: 13, 14 and 17). There are only a few Dufour bladelets (Fig. 4: 15) in the Upper Aurignacian, and they are lacking in the Lower Aurignacian. Middle Paleolithic type tools are rare in both horizons.

The Lower Aurignacian yielded two perforated teeth (Fig. 3: 17 and 18), two ivory pendants (Fig. 3: 14 and 15), and a pre-form of a bone bead (Fig. 3: 13), while tools made of bone, antler and ivory appear in considerable numbers (Fig. 3: 19). Only art objects are absent. They are in turn present in the Upper Aurignacian (Fig. 6: 13, 15, 16 and 18), representing some of the earliest art objects known. In the Upper Aurignacian, artifacts made of organic materials (Fig. 5: 5, 6 and 12) including bone flutes (Fig. 6: 19), as well as objects of personal ornamentation (Fig. 6: 1–5) are abundant.

While Zilhão and d’Errico — who have not studied the originals — reject the term Aurignacian or even Protoaurignacian for the lower horizon, which they tend to label just as non-diagnostic early Upper Paleolithic (Zilhão and d’Errico, 1999a), we do not hesitate to confirm Hahn’s assessment of the Aurignacian character of the Level III assemblage. The lack of some tool types in the Level III assemblage may well be due to the functional context. An analysis of the faunal remains conducted by Münzel shows that in the Lower Aurignacian there are numerous hints for working of organic materials, especially ivory, and the manufacture of organic tools, even though the number of tools themselves is not very high (Münzel, 1999). In 1977, Hahn already stressed that differences in the frequency of special tool types as well as the occurrence or non-occurrence of tool types may be due to functional variability rather than to chronological differences (Hahn, 1977, pp. 294–296).

Using the TL signal from burnt flints, Daniel Richter dated the Lower Aurignacian of Geißenklösterle cave at an average of 40.2 ± 1.5 kyr BP, while the Upper Aurignacian produced TL ages at about 37 kyr BP. Radiocarbon AMS dates of bone samples from both horizons are somewhat younger: for Level III a mean age of 38.4 ± 0.85 kyr BP was obtained, for Level II a mean age of 33.5 ± 0.35 kyr BP (Richter et al., 2000).
Only one other German Aurignacian assemblage has been dated this early: the one from Keilberg-Kirche near Regensburg in Bavaria (Fig. 1: 4), which yielded conventional charcoal dates ranging between $37.5 \pm 1.45$ and $38.6 \pm 1.2$ kyr BP (Uthmeier, 1996).

In addition to Geißenklösterle, Aurignacian art objects and objects of personal ornamentation are well known from the Lone Valley (Fig. 1: 3), at the cave sites of Vogelherd (Fig. 6: 14 and 17; Riek, 1934; Hahn, 1977, pp. 87–91), Hohlenstein-Stadel (Fig. 6: 7 and 8; Hahn, 1977, pp. 86–87), and Bockstein (Fig. 6: 9 and 12; Hahn, 1977, pp. 82–85), excavated by Gustav Riek and Robert Wetzel in the 1930s, and from the Ach Valley (Fig. 1: 2) at the cave site of Sirgenstein (Fig. 6: 6), excavated by Robert Rudolf Schmidt in 1906 (Hahn, 1977, pp. 92–94). In these caves the ornaments and art objects were associated with...
Fig. 4. Stone artifacts from the Upper Aurignacian/Archaeological Horizon II of Geißenkölsterle Cave (7–10, 13–15, 17, 19) and artifacts from comparable cave sites in Southwestern Germany: Sirgenstein IV (1, 4), Sirgenstein V (2), Vogelherd V (3, 5, 6, 16, 18), and Bockstein-Törle VII (11, 12). 1–3, carinated end scrapers; 4, 6, nosed end scrapers; 5, 9, end scrapers; 7, burin combined with end scraper; 8, blade with retouched edges; 10–12, 16, burins; 13, 14, 17, splintered pieces; 15, Dufour bladelet; 18, 19, pointed blades (modified after Hahn, 1977, 1988).

Assemblages corresponding to the Upper Aurignacian of Geißenkölsterle (Fig. 4: 1–6, 11, 12, 16 and 18; Fig. 5: 1–4, 7–11).

The dates for the assemblages from Vogelherd and Stadel caves range from about 30–32 kyr BP, suggesting that they postdate the Upper Aurignacian from Geißenkölsterle. It must be stressed, however, that in contrast to the other four sites mentioned, Geißenkölsterle cave has been recently excavated with modern standards of documentation and a more systematic sampling, allowing the TL and $^{14}$C dates from Geißenkölsterle to be regarded as much more reliable. We are just getting new dates for the
other sites, using bones definitely worked by man, and this will give us the possibility of checking the dates obtained earlier.

While early Upper Paleolithic hominid remains are absent in Geißenklösterle and only a single tooth was recovered from the Stadel Aurignacian, Vogelherd cave yielded the very well-preserved specimen Stetten I (Fig. 7), which was found at the base of the Aurignacian sequence (Fig. 8) and thus represents one of the earliest finds of *Homo sapiens sapiens* in Europe. This demonstrates that anatomically modern hominids are responsible for the fully developed Aurignacian, while no fossil evidence is at present available for the earliest Aurignacian from Geißenklösterle.

4. Conclusions

Let us now look at the archaeological evidence with regard to the Out of Africa hypothesis. Neither in Eastern or Southeastern Central Europe, nor in Germany can an autochthonous evolution of anatomically modern hu-
mammoth from the existing Neanderthal populations be demonstrated. An in situ development of Upper Paleolithic features out of the local Middle Paleolithic industries appears to be possible regarding the archaeological record in Central Europe. To what extent processes of acculturation took place and in which direction a presumed acculturation was oriented remains subject to controversial discussions. In any case, it is remarkable that essential features of fully developed Upper Paleolithic assemblages are lacking in the very places where
objects as well as art objects, had been initiated by contacts between Neanderthals and anatomically modern hominids. This seems especially true for Western Europe, but may also hold for Southwestern Germany.

In this context, the western European Châtelperronian should be mentioned. On the basis of lithic technology and various organic artifacts as well as objects of personal ornamentation, this appears to be Upper Paleolithic, but was obviously manufactured by Neanderthals, as Neanderthal remains associated with Châtelperronian in Arcy-sur-Cure and St. Césaire, both in France, reveal (Baffier, 1999). At present, it cannot be finally stated whether the Châtelperronian is a genuine Neanderthal creation (Zilhão and d’Errico, 1999a, b), or if it is rather the result of acculturation processes.

Due to gaps in the fossil record, it remains uncertain who was responsible for the transitional industries and for the earliest Upper Paleolithic assemblages in Central Europe. It should be kept in mind that between 40 and 30 kyr BP there seems to have been a coexistence of Neanderthals and anatomically modern hominids in Europe. Examples of very late Neanderthals, for instance, come from Zafarraya and Cariguéla in Spain, Colombéira, Figueira Brava, and Salemas in Portugal (Straus, 1996), and Vindija Layer G, in Croatia (Karavanic and Smith, 1998, pp. 239–241) while early Homo sapiens sapiens specimens have been found in Vogelherd in Southwestern Germany (Riek, 1932).

In summary, it can be stated that the archaeological record in Central Europe, including Germany, appears to support the replacement model rather than the multiregional model, thus providing evidence that Homo sapiens sapiens originated outside Europe.

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References


Straus, L.G., 1996. Continuity or rupture; convergence or invasion; adaptation or catastrophe; mosaic or monolith: views on the Middle to Upper Paleolithic transition in Iberia. In: Carbonell, E., Vaquero, M. (Eds.), The Late Neandertals, The First Anatomically Modern Humans: a Tale About the Human Diversity. Cultural Change and