WHAT CAN WE SAY ABOUT THE SPATIAL-TEMPORAL DISTRIBUTION OF EARLY AURIGNACIAN INNOVATIONS?

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Abstract

In order to analyze the spatial-temporal distribution of early Aurignacian innovations, this paper addresses two major research questions: how the early Aurignacian artifact assemblages are characterized and what cultural innovations provide useful markers for the development and spread of the Aurignacian. Based on ESR and TL dates and a large number of radiocarbon dates from the Aurignacian of the Swabian Jura in southwestern Germany, we argue that some innovations of the Aurignacian are documented at an early date in this region. The Swabian Aurignacian also provides a distinctive regional signature for lithic and organic technology, ornaments, figurative art and musical instruments. We view the early Aurignacian and Fumanian as separate technocomplexes of similar ages with distinct spatial distributions and distinct signatures in material culture. The Danube Corridor and Kulturpumpe models, used to explain the situation in the Swabian Jura, are discussed. In order to test these models this paper compares the spatial-temporal patterns of Aurignacian innovations in western Eurasia. The Upper Danube Valley is seen as one key center of cultural development during the early Upper Paleolithic. Other centers of innovation are indicated by the early appearance of Upper Paleolithic innovations in other regions such as northern Italy and northeastern Spain. Special attention is given to the split-based points as one of the major type-fossils of the early Aurignacian.

INTRODUCTION

The Aurignacian is the first Upper Paleolithic technocomplex documented over large parts of Europe (Hahn, 1977; Delporte, 1998). Although these assemblages show distinct regional signals, they are characterized by numerous common features, both technological and behavioral, especially a number of innovations which we associate with anatomically modern humans.

To answer the question raised in the title, this paper will address two major research questions: 1) what characterizes the earliest Aurignacian artifact assemblages? 2) what cultural innovations provide useful markers for the development and spread of the Aurignacian?

The first focus will be on the Aurignacian of the Swabian Jura in southwestern Germany and its implications for the diffusion of early Upper Paleolithic innovations. The results will be compared with data from other regions. The largest part of the paper will be dedicated to the discussion and the conclusions which can be drawn with regard to the spatial-temporal distribution of early Aurignacian innovations.

Useful markers for the development and spread of the Aurignacian are innovations which appear together with this technocomplex and which are unknown or very rare in the preceding Middle Paleolithic. Among these innovations are both new lithic and organic technologies and tool types. Much more impressive, however, are art objects, personal ornaments, and musical instruments which were used to store and transfer symbolic information and therefore are often viewed as indicators for cultural and behavioral modernity (see for instance Wadley, 2001; d’Errico et al., 2003; Conard and Bolus, 2003; Bolus, 2004; Mellars, 2005; Conard, 2006; Zilhão, 2007).
THE EVIDENCE FROM THE SWABIAN JURA

The Swabian Jura, with its famous cave sites in the Ach and Lone Valleys (Fig. 1) is one of the key regions for the discussion about early Aurignacian innovations. The fact that some of the innovations mentioned above are documented at an early date there led to the Danube Corridor and the Kulturpumpe hypotheses which see Swabia as one center of early Upper Paleolithic innovations (Conard and Bolus, 2003, 2006). While during the last years these models have been rejected by several authors including João Zilhão and Francesco d’Errico (2003, 2004), and Alexander Verpoorte (2005), this paper presents data to test these models.

ESR and TL dates and a large number of radiocarbon dates confirm the antiquity of the Swabian Aurignacian: While at Geißenklösterle Richter et al. (2000) have dated the Aurignacian of Archaeological Horizon (AH) III to ca 40 ka BP$_{TL}$ using the thermoluminescence signal of burnt chert, the radiocarbon signature for the Aurignacian of the Swabian Jura ranges between 40 and 29 ka $^{14}$C BP, with most dates falling between 30 and 35 ka $^{14}$C BP (Conard and Bolus, 2003, 2006; for the most recent and complete datelists see Conard and Bolus, 2008). At each site where data are available, a stratigraphic break and an occupational hiatus separates the Aurignacian from the underlying Middle Paleolithic strata (Conard et al., 2006). Aside from stratigraphy, radical differences in lithic and organic technologies as well as in other classes of artifacts, including ornaments, figurative art, and musical instruments, separate Middle Paleolithic and Aurignacian assemblages. Since the Swabian Aurignacian appears suddenly in a highly developed form containing numerous regionally unique signatures, this material culture must have developed quickly with the makers of the Aurignacian, which in our view were anatomically modern humans. Moreover, it must have in part local roots, since many of its most prominent characteristics are unknown.

Fig. 1. Map of southwestern Germany with the principal Aurignacian sites in the Ach and Lone Valley
Four sites, Vogelherd and Hohlenstein-Stadel in the Lone Valley, and Geißenklösterle and Hohle Fels in the Ach Valley (Fig. 1), have produced examples of carefully carved ivory figurines (Hahn, 1986; Schmid, 1989; Conard, 2003a; Conard et al., 2007). These works of figurative art are among the oldest examples known worldwide (Fig. 2). They fall into the time range between ca 35 and 30 ka $^{14}$C BP and are only lacking in the oldest Aurignacian deposits in Swabia (i.e., AH III of Geißenklösterle and AH Va of Hohle Fels).

Personal ornaments from the Swabian Aurignacian include a wide array of perforated and grooved teeth from different carnivores and herbivores. The sites have also produced a broad variety of beads and pendants made from mammoth ivory (Conard, 2003b). Specific forms including finely carved double perforated beads are present in both the Ach and Lone Valley sites, but are un-

![Fig. 2. Hohle Fels, Swabian Jura. Aurignacian ivory figurine depicting a water bird. Dimensions are 47 × 13 × 9 mm. Photo: H. Jensen. © University of Tübingen](image)

![Fig. 3. Personal ornaments from the Swabian Aurignacian. 1–2 – Hohle Fels AH V; 6–14, 17–20 – Hohle Fels AH IV; 3–5 – Hohle Fels AH III; 21 – Geißenklösterle AH III; 15 – Geißenklösterle AH II; 16 – Bocksteinhöhle; 1–2, 9–10 – double perforated ivory beads; 3 – basket-shaped ivory bead; 4–5 – toggle shaped ivory objects; 6–7 – perforated fox canines; 8, 19–20 – half-finished ivory beads; 11–12 – disc-shaped ivory beads; 13 – ivory bead; 14 – perforated tooth; 15 – retoucher of antler used as pendant; 16 – perforated cave bear canine; 17 – perforated upper eyetooth from red deer; 18 – violin-shaped ivory pendant; 21 – bone bead. After Conard et al., 2006](image)
known in the Aurignacian of other regions. They appear throughout the whole temporal range of the Aurignacian in the Swabian Jura (Fig. 3).

Finally, musical instruments have to be mentioned. Three flutes have been recovered from AH II at Geißenklösterle. Two are made from swan bones, and the third one (Fig. 4) was carefully carved from mammoth ivory (Hahn and Münzel, 1995; Conard et al., 2004). Additionally, three fragments from what appear to be a bone flute have recently been recovered during the re-excavations of Vogelherd (Conard and Malina, 2006). We assume that music was part of the daily culture of Swabian Aurignacian people. Nowhere are earlier examples of musical instruments known, and both the traditions of figurative art and musical instruments from the Swabian Aurignacian are key examples of radical cultural changes that accompanied the appearance of the Aurignacian. These finds show that artifacts with symbolic meaning expressing cultural and behavioral modernity are much more common in the Aurignacian than in earlier periods.

ORNAMENTS AND FIGURATIVE ART FROM OTHER REGIONS

We know that anatomically modern humans outside Europe produced ornaments that are considerably older than those found in the Aurignacian. Recently, ca 100,000-year-old Middle Paleolithic shell beads from Skhul in Israel have been published (Vanhaeren et al., 2006) which add to the evidence of similar age from Qafzeh, also in Israel (Taborin, 2003); perforated shells from the MSA at Blombos cave in South Africa have an age of ca 75,000 years (Henshilwood et al., 2004). Only slightly older than, if not contemporaneous with the Aurignacian are ornaments from the Initial Upper Paleolithic and the Ahmarian of Üçağızlı in Turkey (Kuhn et al., 2001) and perhaps from Ksar ‘Akil in the Lebanon (Mellars and Tixier, 1989), both with ages of ca 40 ka $^{14}$C BP. Roughly as old as the ornaments from the Swabian Aurignacian are grooved teeth from the so-called “Proto-Aurignacian” or, as we prefer to call it (Conard and Bolus, 2006), the Fumanian of Grotta di Fumane in northern Italy (Broglio et al., 2002; Broglio and Dalmeri, 2002), shell and non-shell ornaments from Riparo Mochi, also in northern Italy (Stiner, 2003), perforated marine mollusks from Arbreda in northeastern Spain (Maroto et al., 1996), and perhaps a variety of ornamental objects from the Early Upper Paleolithic deposits of Kara-Bom and Denisova Cave in the Altai Mountains (Derevianko and Rybin, 2005; Derevianko and Shunkov, 2005). The earliest ornaments from southwestern France at sites including Castanet, Brasempouy, and Les Rois appear to be of similar age or slightly younger than the ornaments from the earliest Aurignacian of Swabia (White, 2007).

The oldest unambiguous examples of figurative art are those from the Swabian Jura and sev-
eral monochrome depictions from Fumane (Broglio and Dalmeri, 2005). The spectacular paintings from Grotte Chauvet (Clottes, 2001) probably slightly postdate the oldest figurines from the Swabian Aurignacian by a couple of millennia. This means that figurative art does not appear in Europe, or for that matter anywhere else, prior to the Aurignacian or the Fumanian.

DISCUSSION: THE SPATIAL-TEMPORAL DISTRIBUTION OF EARLY AURIGNACIAN INNOVATIONS

In accordance with the Danube Corridor and the Kulturpumpe models, there is good evidence of early Aurignacian innovations from the Swabian Jura, and nowhere in Europe is there clear evidence for earlier manifestations of a fully developed Aurignacian. Many artifact types, especially specific forms of ornaments, figurative art, and musical instruments are unique to Swabia, and the organic and lithic technologies show a strong local signature as has already been stated.

As far as other regions are concerned, based on the work of colleagues including François Bon (2002), Alberto Broglio’s research team (Broglio et al., 2002), and Nicolas Teyssandier (2007), it is becoming increasingly clear that the early Upper Paleolithic assemblages described as ‘Proto-Aurignacian’ are different from the early Swabian Aurignacian and the Aurignacien ancien of southwestern France, while the technological and typological links between southwestern France and Swabia are obvious. The long, narrow laminar debitage and especially finely retouched and backed tools from the Fumane type assemblages (Fig. 5) are absent in the Swabian Aurignacian. Similarly, abundant evidence contrasts the art, ornaments and organic tools of the two regions. Marian Vanhaeren and Francesco d’Errico’s (2006) work on personal ornaments from the Aurignacian also points to links between the Swabian and southwestern French Aurignacian, as well as to the Belgian Aurignacian. Based on a number of technological and stylistic characteristics, these groups of sites are more closely related than those of other regions.

The early dates from Swabia and the many innovations that characterize the Aurignacian of the region point to the Upper Danube Valley as one key center of cultural development during the early Upper Paleolithic between ca 40 and 35,000 years (Fig. 6). The Danube Corridor hypothesis.

**Fig. 5.** Grotta di Fumane, Italy. Stone tools from the Fumanian deposits: 1–8 – backed points; 9–10 – truncated points; 11–13 – backed bladelets; 14 – carinated burin. After Broglio et al., 2002
argues that modern humans migrated into central Europe via the Danube Valley. This would help to explain the early dates for the Swabian Aurignacian, as well as the early dates for the sites of Willendorf II and Keilberg-Kirche, and the fact that the Aurignacian represents a radical break in the cultural sequence of the region. We argue that modern humans arrived in a depopulated Swabian Jura, roughly 40,000 calendar years ago. The apparent absence or low population density of Neanderthals could be related to climatic stress associated with Heinrich cold event 4. The fossil evidence for the earliest anatomically modern Europeans, though very sparse, does not contradict the Danube Corridor hypothesis. With an age of ca 35 ka $^{14}$C BP, the directly dated human remains from Peštera cu Oase in Romania (Trinkaus *et al.*, 2003), unfortunately found without archaeological context, are the oldest anatomically modern humans, while the Aurignacian fossils from Mladeč in Moravia have been directly dated to ca 31 ka $^{14}$C BP (Wild *et al.*, 2005) and thus are clearly younger. The oldest fossils from French Aurignacian sites such as La Quina Aval, Brassembouy, and Les Rois seem to be older than Mladeč but younger than Oase (see Trinkaus, 2007 with references).

Of course, other routes and other centers of innovation are probable, as indicated by the early appearance of Upper Paleolithic innovations in other regions such as northern Italy and northeastern Spain (Fig. 6). From these centers, the innovations spread rapidly as Upper Paleolithic populations occupied larger parts of Europe as is shown by the increasing number of Aurignacian and Fumanian sites between 35 and 32 ka $^{14}$C BP (Fig. 7). This process was accompanied by the displacement and eventual extinction of the indigenous Neanderthal populations, although a slight degree of interbreeding cannot be ruled out. The role of Eastern Europe and Central Asia where some relatively old dates for early Upper Paleolithic assemblages have been established (see Sintsyn, 2003; Derevianko and Rybin, 2005; Derevianko and Shunkov, 2005), has yet to be determined. At present we do not have the chronological resolution to rigorously confirm or refute models for the origins of the Aurignacian and the other early Upper Paleolithic technocomplexes (for discussion see Bon 2002; Conard and Bolus,
This being said, the evidence for one of the early Upper Paleolithic innovations, the split-based point which is often regarded as the most typical early Aurignacian type-fossil (Fig. 8) is of relevance here. None of the directly dated split-based bone points or points of Mladeč type from the Swabian Jura and from Austria produced dates older than about 32,500 $^{14}$C BP (Bolus and Conard, 2006). These data correspond with those from the French site of Trou de la Mère Clochette (Brou, 1997, 2001), the British site of Uphill Quarry (Jacobi and Pettitt, 2000), Potočka cave in Slovenia (Hofreiter and Pacher, 2004; Rabeder and Pohar, 2004), and several sites in eastern central Europe (Natural Environment Research Council, 2007). One serious problem is that up to now only a few points have been directly dated. What is obvious in any case is the fact that split-based points are lacking in the oldest Aurignacian deposits from the Swabian Jura. Instead we find straight ivory points with solid bases (Fig. 9),

![Fig. 7. Map showing Aurignacian and Fumanian sites dating to the time-span between ca 35 and 32 ka BP. This period reflects the early phases of the expansion of the Aurignacian](image)

![Fig. 8. Vogelherd, Swabian Jura. Aurignacian split-based points from AH V. Photo: H. Jensen. © University of Tübingen](image)
which may be regarded as another regional signature of the earliest Swabian Aurignacian. These points have not yet been directly dated, but clearly underlay deposits bearing split-based points.

A map recently published by Paul Mellars (2006) presents possible dispersal routes of modern populations across Europe and shows the distribution of split-based points. Some dates given in this map were produced using the Oxford ultrafiltration technique, and all values represent calibrated dates, thus tending to be older than the uncalibrated dates usually given. These dates argue for an east to west dispersal of modern humans, thus giving support to the Danube Corridor model. This work is in agreement with the results of a much earlier study by Henri Delporte (1958). Analyzing the distribution of split-based points, Delporte concluded that such points from central Europe were older than those from western Europe. He also argued that their distribution reflected an east-west diffusion of this innovation. In contrast to Mellars, Delporte could not argue on the basis of radiocarbon dates but had to draw his conclusions on the basis of stratigraphic and geographic evidence. Although Mellars indicates in his map that the split-based points are not necessarily directly associated with the adjacent age estimates, his manner of illustration is very suggestive. In the light of new results from the directly dated split-based points mentioned above it must be stressed, however, that the diffusion of split-based points did not run parallel to the initial east-west dispersal of modern humans in Europe, at least as far as the eastern half of Europe is concerned. The initial dispersal of modern humans across much of Europe including Swabia predates the advent of split-based bone projectiles.

CONCLUSIONS

To conclude, the major points of the present paper be summarized in the following way: 1) the European early Upper Paleolithic is characterized by both early Aurignacian and Fumanian assemblages of similar ages with distinct spatial distributions and distinct signatures in material culture; when both technocomplexes are present at one and the same site, the Aurignacian always overlies the Fumanian; 2) there is clearly an Aurignacian pre-dating the split-based point horizon; 3) considerable data point to Swabia as a key center of Aurignacian innovations with some unique innovations so far only documented in the Swabian record; and 4) having the evidence from other regions and other early Upper Paleolithic technocomplexes such as the Fumanian in mind, we envision a high degree of polycentric innovations in the early Upper Paleolithic of Europe.

What we need now are precise local cultural stratigraphic sequences from well dated contexts. Additional field work such as that underway at Hohle Fels and Fumane are needed to produce the high resolution data to sort out the spatial and temporal patterns of population dynamics and cultural innovations in the early Upper Paleolithic of Europe. As we have sketched out here, regional patterns of variation are beginning to emerge. We are confident that future research will allow the processes discussed here to be refined to a point where we can identify local signatures and gradually piece together a coherent picture of cultural change at this unique threshold in prehistory in which anatomically and culturally fully modern
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