

Analysis of Aurignacian interstratification at the Châtelperronian-type site and implications for the behavioral modernity of Neandertals

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The Châtelperronian is a Neandertal-associated archeological culture featuring ornaments and decorated bone tools. It is often suggested that such symbolic items do not imply that Neandertals had modern cognition and stand instead for influences received from coeval, nearby early modern humans represented by the Aurignacian culture, whose precocity would be proven by stratigraphy and radiocarbon dates. The Grotte des Fées at Châtelperron (France) is the remaining case of such a potential Châtelperronian–Aurignacian contemporaneity, but reanalysis shows that its stratification is poor and unclear, the bone assemblage is carnivore-accumulated, the putative interstratified Aurignacian lens in level B4 is made up for the most part of Châtelperronian material, the upper part of the sequence is entirely disturbed, and the few Aurignacian items in levels B4–5 represent isolated intrusions into otherwise *in situ* Châtelperronian deposits. As elsewhere in southwestern Europe, this evidence confirms that the Aurignacian post-dates the Châtelperronian and that the latter's cultural innovations are better explained as the Neandertals' independent development of behavioral modernity.

modern humans

Three families of explanations exist for the origins of modern human behavior (1–3). The “African Recent Model” sees a sudden appearance of symbolic artifacts, exclusive to anatomically modern African populations and resulting from cognitive developments triggered by a genetic mutation, ≈ 50 thousand calendar years before present (ka cal BP). The “African Early Model” sets the emergence of modern cognition ≈ 250 ka cal BP, as part of the anagenetic evolution of those people toward anatomical/behavioral modernity. The “Cultural Model” argues that the cognitive prerequisites of modern human behavior were in place even earlier, before the split of the Neandertal lineage, and invokes social and demographic factors to explain the emergence, disappearance, and re-emergence of symbolic artifacts among both African “modern” and Eurasian “archaic” populations of the early Upper Pleistocene.

Because they reconstruct historical processes, these models are amenable to chronometric testing. For instance, the marine shell beads found in the African Middle Stone Age since at least 75 ka cal BP (4) are inconsistent with African Recent views of the process. Where the other two models are concerned, the key issue is the time and context of the emergence of personal ornaments among Neandertals, the proverbial representatives of nonmodernity. If the appearance of ornaments coincides with the dispersal of modern humans into Europe, the African Early Model remains viable through explanations of such ornaments as a byproduct of acculturation (5–6); if they are earlier, then, under the criteria currently used to assess the African evidence, Neandertals were behaviorally modern, vindicating the Cultural Model.

The Châtelperronian Paleolithic culture of France and northern Spain is unambiguously associated with ornaments, decorated bone tools, and Neandertal remains (1, 7), providing among the best evidence that the emergence of human biological and behavioral “modernity” should be decoupled (8). This conclusion can be avoided only if the Aurignacian culture, generally taken as an archeological proxy for the first European modern humans, predated the Châtelperronian and was the source by diffusion or exchange of the latter's symbolic artifacts (5–6).

Such arguments find support in dates obtained for Châtelperronian levels X–VIII of the key site of the Grotte du Renne, in France (9); at ≈ 33 –32 thousand radiocarbon years before present (ka ^{14}C BP), they fall in the time range of the earliest diagnostic modern human remains in western Europe (10–11) and well after modern humans appeared in at least eastern Europe (12). However, the reliability of the radiocarbon chronology of the Grotte du Renne's Châtelperronian is questionable, because some results are in inverse stratigraphic order and others are markedly rejuvenated (some are as young as ≈ 15 ka ^{14}C BP, suggesting that chemical contamination is a major issue at the site); moreover, the early Aurignacian nature of the lithic and bone tool assemblages in level VII implies an age >35 ka ^{14}C BP for the underlying Châtelperronian (13–14).

The case for a precocious Aurignacian further rests on interstratifications with the Châtelperronian at El Pendo (Spain), Roc-de-Combe, Le Piage, and Grotte des Fées at Châtelperron (France) (15–18), all of which are questionable. At El Pendo, the different levels of the sequence, a slope deposit at the base of a large uvala, feature a diverse mix of archeological materials (an Upper Paleolithic sagaie, for instance, was found 5 m below the purported interstratification, the overlying deposits containing hundreds of Mousterian-like flakes and cores) (19). At Le Piage, a Châtelperronian lens interstratified in the Aurignacian was described for a small area that, in fact, corresponds to a slope deposit yielding a mix of Châtelperronian, Aurignacian, and surface-weathered Mousterian items throughout the entire sequence (20). At Roc-de-Combe, an Aurignacian lens interstratified in the Châtelperronian reportedly existed under the cave's overhang (the external area featured a single, Mousterian level, and the internal area featured a normal Aurignacian-over-Châtelperronian sequence), but this “level” was a post facto theoretical construct assembled from several true excavation units, all of which featured a mix of Gravettian, Aurignacian, Châtelperronian, and Mousterian pieces (20–21).

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Abbreviations: ka ^{14}C BP, thousand radiocarbon years before present; ka cal BP, thousand calendar years before present.

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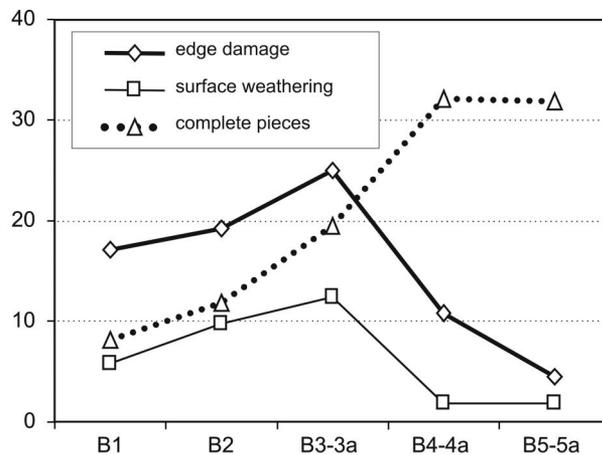
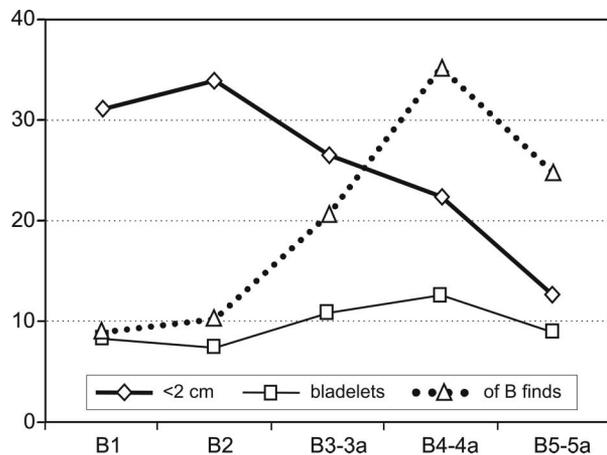


Fig. 3. Lithic indicators of taphonomic process in Châtelperron layer B. (Left) Relative frequencies per level of bladelets and items <2 cm and the percentage of the overall B finds represented by each level. (Right) Relative frequencies per level of edge-damaged, surface-weathered, and unbroken pieces (chips and chunks excluded).

to B5a yielded 70% of the diagnostic Châtelperronian items, the corresponding figure for levels B1 and B2 is only 15%.

These data suggest that, whereas levels B4 to B5a may well have been broadly *in situ*, B1 and B2 were not; given the marked surge in edge-damaged items from B4 to B3, the same probably applies to the latter. In this regard, it must be noted that B2 also yielded a foliate point fragment made on exogenous flint, documenting a brief Solutrean incursion and providing further evidence that the assemblage therein (and, by stratigraphic logic, that in overlying B1 as well) simply cannot be considered “Châtelperronian,” even if it does contain Châtelperronian material.

Discussion

As Bailleau himself pointed out almost 150 years ago already, the extensive damage underwent by the Grotte des Fées before any archaeological work means that we will never be able to reconstruct its original stratigraphy with certainty. The evidence reviewed above, however, suffices to at least reject the proposition that the contents of Delporte’s layer B are entirely *in situ*. Against a large number of better excavated and better documented cases, such a proposition amounts to sustain that the site refutes the index fossil value of the Roc-de-Combe subtype of Dufour bladelets and provides a genuine instance of the otherwise-unknown use by the Châtelperronians of the flat, invasive retouch characteristic of the Solutrean. The alternative hypothesis that the non-Châtelperronian items in the sequence represent exchange with culturally distinct, coeval populations (24), or proof of their briefly coming to the site when the Châtelperronians were not there, implies a local Châtelperronian isolate surviving until the Solutrean and, therefore, is equally untenable.

Thus, only three alternatives remain and are listed as follows.

1. Layer B is Châtelperronian, with the few Aurignacian finds representing accidental mixing, at the time of excavation, with material from the disturbed deposits.
2. Layer B is entirely disturbed, as a result of ancient (Pleistocene) natural processes and/or because it simply corresponds to backdirt from Poirrier and Bailleau’s 19th-century excavations.
3. Levels B1-3a are disturbed, and B4-5a represent an *in situ* Châtelperronian occupation with a few Aurignacian intrusions.

The first hypothesis cannot be fully rejected, but parsimony dictates that the possibilities be restricted to the other two; our

analyses, and Delporte’s 1962 reading of the stratigraphy, as made up of three blocks (B1-3, B4-5, and C), favor the third. The fact that one of the B1-3 bone samples yielded a Mousterian result (>53.9 ka ¹⁴C BP) adds to the evidence that these upper levels contain a variety of objects so chronologically disparate that only the backdirt hypothesis can explain it satisfactorily. The remaining results (Fig. 4) cluster in two nonoverlapping groups (40.6–39.2 and 36.3–34.6 ka ¹⁴C BP, i.e., 44.3–43.4 and 41.9–40.6 ka cal BP); the earlier only includes samples from the possibly *in situ* levels (B4-5) and, as such, provides an assessment of the chronology of the site’s Châtelperronian occupation that is consistent with the evidence from elsewhere in France.

The fact that each of the two B4 results falls in a different group (instead of bridging the gap between B5 and B1-3, as one would expect in a framework of continuous sedimentation and stratigraphic integrity) confirms that levels B4-B4a are not an interstratified “Aurignacian lens.” The seven items of Aurignacian affinities found in B4-5 are easy to understand in the framework of the hiatus indicated by the dates; if, for some time after its deposition, B4 formed (or became exposed) the floor of the cave, any items then abandoned at the site could have been incorporated in the immediately subsurface Châtelperronian levels through ordinary geological processes, compounded by the effects of hyena denning.

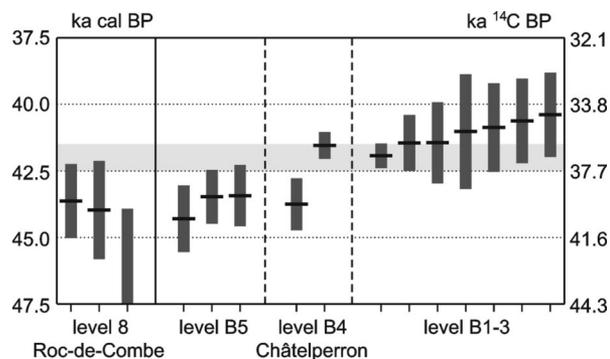


Fig. 4. Radiocarbon dates for Châtelperron (18), calibrated with CalPal (www.calpal.de), 2 σ intervals, compared with those for the *in situ* Châtelperronian of Roc-de-Combe (ref. 20; see Table 5, which is published as supporting information on the PNAS web site). A nonplotted >53.9 ka ¹⁴C BP result also was obtained for level B1-3. The light gray band represents the millennium at \approx 42 ka cal BP (36.5 ka ¹⁴C BP) during which the Châtelperronian was replaced by the Protoaurignacian.

In this scenario, the later group of dates would relate to such hyena occupations, during (or after) which took place episodic Aurignacian I, Aurignacian II, and Solutrean incursions. However, given that current evidence suggests that the replacement of the Châtelperronian by the Protoaurignacian occurred ≈ 36.5 ka ^{14}C BP (≈ 42 ka cal BP) (8, 13, 14), it remains conceivable that, at the lower end of its range, the younger group also covers the terminal moments of the use of the site by the Châtelperronians.

Level B4 also yielded two perforated teeth, a fox canine and a heavily worn down red deer canine. Given the above, it cannot be ascertained whether these ornaments are Aurignacian (18) or Châtelperronian; an attribution to the Châtelperronian would be supported by identical finds from the corresponding levels of the Grotte du Renne (1, 8, 13).

Conclusion

The Grotte de Féés at Châtelperron originally contained important Châtelperronian and Mousterian deposits. Both were palimpsests of remains left in the framework of repeated, short-term, nonresidential human occupations alternating with carnivore denning; scant Aurignacian and Solutrean objects testify to later, sporadic human visits. The presence in levels B4-5a of low percentages of edge-damaged and surface-weathered lithic objects indicates some syndepositional distur-

bance, perhaps in relation to flooding by the stream running 6–8 m below.

After its discovery, this very small site was intensively exploited with little concern for the stratigraphy, resulting in the accumulation of successive generations of disturbed deposits. Consideration of the totality of the evidence shows that, as at El Pendo, Le Piage, and Roc-de-Combe, the pattern of Aurignacian/Châtelperronian interstratification only can be an artifact of postdepositional disturbance, whether that disturbance was caused by natural processes in the Pleistocene or by archaeological excavation and fossil hunting in the 19th century.

The radiocarbon dates for the Grotte des Féés confirm that the Châtelperronian is significantly earlier than the Aurignacian (Fig. 4). If the latter is a proxy for the initial dispersal of modern humans into Europe, then the process postdates by several millennia the Neandertal innovations for which the Châtelperronian stands. Thus, such autochthonous, largely independent cultural developments only can be taken as evidence for the Neandertal's ability for symbolic thinking, as proposed by Cultural Model views of the emergence of behavioral modernity.

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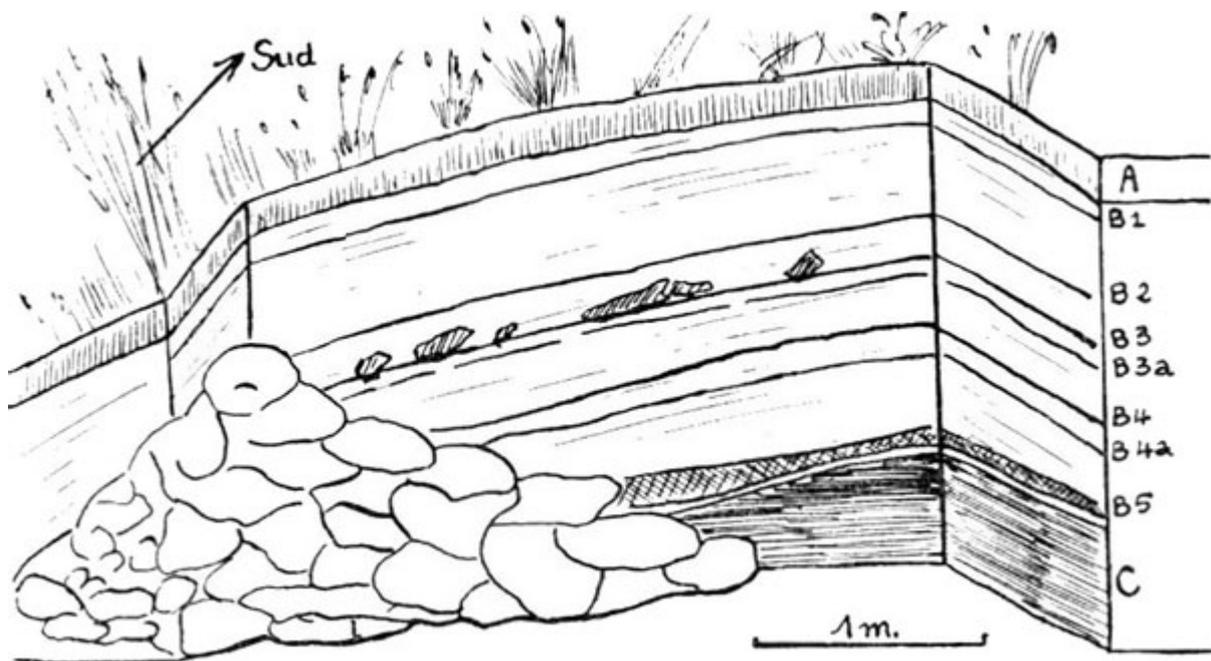


Fig. 5. Delporte's schematic stratigraphic section of Châtelperron (1).

1. Delporte, H. (1957) in *Congrès Préhistorique de France. Compte-Rendus de la XVème Session* (Société Préhistorique Française, Paris), pp. 452-477.

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Table 5. Radiocarbon dates for the Châtelperronian levels of the Grotte des Fées and Roc-de-Combe, CalPal calibration

Site	Level	Culture	Sample	Method	Lab no.	Result BP	calBP	calBP-2s	calBP+2s
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13617	34550 ± 500	40390 ± 800	38790	41990
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-14166	34940 ± 330	40620 ± 800	39020	42220
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13619	35400 ± 450	40870 ± 840	39190	42550
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13618	35890 ± 380	41450 ± 530	40390	42510
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13723	36000 ± 1000	41020 ± 1090	38840	43200
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13724	36250 ± 750	41440 ± 770	39900	42980
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-14165	36340 ± 320	41930 ± 230	41470	42390
Grotte des Fées	B1-B3	Mixed	Bone	AMS 14C	OxA-13620	>53900	—	—	—
Grotte des Fées	B4	Châtelperronian	Bone	AMS 14C	OxA-14318	35540 ± 280	41540 ± 250	41040	42040
Grotte des Fées	B5	Châtelperronian	Bone	AMS 14C	OxA-13622	39150 ± 600	43430 ± 580	42270	44590
Grotte des Fées	B5	Châtelperronian	Bone	AMS 14C	OxA-14320	39240 ± 380	43470 ± 510	42450	44490
Grotte des Fées	B4	Châtelperronian	Bone	AMS 14C	OxA-14319	39780 ± 390	43750 ± 490	42770	44730
Grotte des Fées	B5	Châtelperronian	Bone	AMS 14C	OxA-13621	40650 ± 600	44300 ± 630	43040	45560
Roc-de-Combe	8 (square K9)	Châtelperronian	Bone	AMS 14C	Gif-101264	39540 ± 970	43630 ± 700	42230	45030
Roc-de-Combe	8 (square K9)	Châtelperronian	Bone	AMS 14C	Gif-101266	40000 ± 1300	43970 ± 930	42110	45830
Roc-de-Combe	8 (square K9)	Châtelperronian	Bone	AMS 14C	Gif-101265	45100 ± 2100	48590 ± 2340	43910	53270