Punctured reindeer phalanges from the Mousterian of Combe Grenal (France)

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Izvleček

V musterjenskih nivojih najdišča Combe Grenal je bilo najdenih več prstnih členkov severnega jelena, ki so preluknjani. Vse luknje se odpirajo v medularno votlino. Mnoge najdbe spominjajo na žvižgalke in ni izključeno, da so bile tudi uporabljene kot žvižgalke. Po drugi strani pa je mnogo lukenj nedvomno naravnega nastanka. Pri ostalih je nastanek lukenj nejasen zaradi delovanja po-sedimentne kemične korozije. Najdbe iz Combe Grenala tako ne potrjujejo niti ne zavračajo obstoj glasbe in simbolov v evropskem srednjem paleolitiku.

Abstract

There are a number of reindeer phalanges from the Mousterian levels of Combe Grenal with holes penetrating into the marrow cavity. Many of these resemble and could have been used as whistles. However, it is clear that many of the holes are due to natural cau-ses, and in the remaining cases, the cause of the hole is ambiguous, often because of post-depositional chemical corrosion of the bone. This assemblage thus neither proves nor disproves the existence of either music or symbolism during the Middle Paleolithic of Europe.

BACKGROUND

Reindeer phalanges with holes penetrating into the marrow cavity have been recovered from numerous Middle Paleolithic sites in Europe. Very early in the history of Paleolithic archaeology, Lartet and Christy (1865-1875, 44, B pl. V) interpreted such specimens as whistles. Since that time, a sporadic debate has been carried on about the anthropogenic versus natural origins of the holes in these specimens (Martin 1906, 1909, 150-168; Wetzel and Bosinski 1969,126-128; Chase 1990; see also Albrecht et al. 1998). This is not a trivial question, since the manufacture of whistles in the Middle Paleolithic would have important implications for the behavior and perhaps even mentality of Middle Paleolithic hominids.

Whistles may be used as signaling devices. Such a use implies symbolism, which is a fundamental component of human language, but is absent from the communication systems of other species. Symbolism implies an arbitrary meaning for a sign or signal - arbitrary in the sense of purely conventional.[1] Since the sound of a reindeer-phalange whistle has no “natural” meaning, the use of whistles for signaling would imply the use of symbolism. Because the use of language by the Middle Paleolithic inhabitants of Europe is still a matter of some controversy, proving that whistles were being used would be a very important matter.

Whistles may also be used as musical instruments. Many species produce sounds that to our human ears resemble music. However, tones and rhythms seem to have a particular psychological or neural effect on humans, an effect that is apparently unique to us. Music plays an important part in our lives. Although its evolutionary significance may be unclear, documenting the origin of music in the Middle Paleolithic would nevertheless be an important achievement.

It is also possible that whistles, if they existed in the Middle Paleolithic, had a different role that was

[1] I am using Peirce’s (1932-1960) definition of symbolism as reference by arbitrary convention. Smoke indicates fire by association and a painting of a horse at Lascaux indicates a horse because it looks like one. However, the meaning conveyed by the sounds of the word “table” is completely arbitrary, and understanding the word depends on learning the set of conventions that constitute the English language. Thus symbolism lies at the very heart of human language.

less significant for the evolution of symbolism and language. For example, using whistles as calling devices to lure birds or other game would imply considerable intelligence. This would include the ability to recognize the resemblance between the sound of a whistle and the sound of a bird call and the ability to recognize that a bird would approach another bird producing that call. However, it would not indicate the use of symbols, where the meaning of the sound is entirely arbitrary.[2]

My purpose here is not to review the entire debate, but simply to review in some detail a large collection of punctured reindeer phalanges from a single source, the Mousterian levels of the site of Combe Grenal. It is quite easy to produce a loud sound by blowing across the holes in some of these specimens. That is not, however, proof that they were used as whistles, since the same would be true of many objects with a small hole penetrating into a large hollow cavity. Because it has been very clearly demonstrated that either carnivore gnawing or chemical corrosion can produce holes in bone (e.g., Binford 1981:45-6; Chase 1990; D'Errico and Villa 1997, 1998; Hill 1989:174; Lyman 1994:206; Maguire, Pemberton and Collett 1980:88), it is necessary to look at these specimens more closely from a taphonomic point of view.

THE SITE OF COMBE GRENAL

The site of Combe Grenal is a collapsed limestone cave located outside the village of Domme (Dordogne, France). It has been excavated sporadically since 1816, but it is best known because of excavations by François Bordes from 1953 to 1965 (Bordes 1972) that produced a deep stratigraphy and rich faunal and lithic remains.

The Middle Paleolithic layers produced a rich ungulate fauna associated with varying Mousterian industries. Reindeer (*Rangifer tarandus)* were present in all levels from bed 35 through bed 4 and dominated the ungulate fauna in many of these (Bordes and Prat 1965; Chase 1983:149-54). Among the reindeer remains were 23 phalanges with holes. Since at least some of these resembled whistles, and since it was quite easy to produce a loud tone by blowing across the holes in some of them, this sample of specimens provides a good taphonomic test for the origin of such holes.

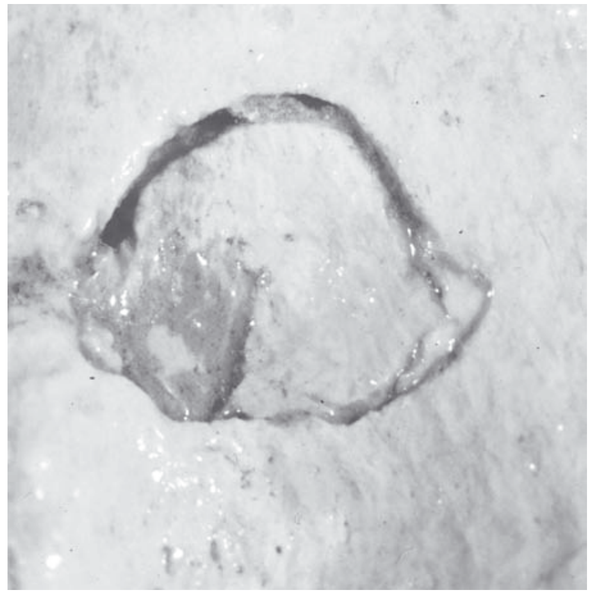

Fig. 1: No. 14A, a right first phalange from bed 14. The bone has been punctured, but the hole is still blocked.

The majority of the faunal material from Combe Grenal was not assigned identifying numbers. In order to describe them, therefore, I will use arbitrary designations consisting of the level number followed by a letter (A, B, etc.).

Punctured phalanges from Combe Grenal

14A - right[3] first phalange (Fig. 1)

This phalange has a partial puncture of the palmar/plantar diaphysial shaft near the proximal epiphysis. A disk of bone has been pushed downward part-way into the marrow cavity, but still blocks the hole. There are no clear traces of carnivore tooth marks elsewhere on the bone, although there is minor damage of chemical origin that has nothing to do with the puncture. The puncture has been varnished over, obscuring minor details of the border. This puncture may be of human origin, but because it did not in fact produce a hole, the phalange could not have been used as a whistle.

14B - right first phalange

There is a slit-like hole in the proximal end of the palmar/plantar diaphysis. This hole is part of a break that goes all around the proximal end of the phalange and has been glued back in place. The hole in no way resembles a puncture; it almost cer-

[2] Noble and Davidson (1996) would probably disagree. They argue that what is required to recognize an iconic relationship (in Peirce's [1932-1960] terminology) is essentially equivalent to what is required to construct a symbol. However, this falls beyond the scope of the current article.

[3] Because it is not possible to distinguish phalanges from right versus left feet of reindeer, the terms "right," "left," "medial," and "lateral" are used in relation to the foot, not to the skeleton as a whole.

tainly dates to the time of the break, and is probably of modern origin.

19A - right second phalange

There is a very large hole in the medial side of the diaphysis. The origin of the hole is not entirely clear. There is heavy attrition of the adjacent spongy tissue, probably due to chemical action. There is also damage of chemical origin next to the hole and on part of its border. The opposite border may show a conical cross-section, which could indicate a puncture. At least part of the hole, then, is the product of chemical action, but this could be an enlargement of a puncture.

21A - left second phalange

There is a large depression fracture on the medial surface of the diaphysis. The depressed bone is broken but still blocks the hole. There are what may be tooth marks on the opposite side of the diaphysis. There has been some chemical damage to the spongy tissue of this specimen, but the hole in the side was certainly caused by either pressure or percussion. This may have been due to carnivore action. In any case, the fact that the hole is still blocked by bone indicates that this phalange was not a whistle.

22A - right first phalange

Heavy attrition of spongy tissue due to chemical action has opened small irregular gaps into the marrow cavity at the anterolateral corner of the proximal end. The rest of the bone also shows signs of chemical damage. There is no reason to believe that this specimen represents a deliberately made whistle.

22B - right first phalange

There is serious chemical destruction of bone over the entire specimen, with severe attrition of the spongy tissue. A very large hole in the proximal end of the palmar/plantar face of the diaphysis opens up the marrow cavity. The edges of this hole are paper thin in places. In other places, the bone has separated into laminae. It is impossible to determine the original cause of the hole. It could be entirely due to chemical damage, or it could have some other cause. In the latter case, evidence has been completely destroyed by chemical action.

22C - right first phalange

There is evidence of chemical action over the entire surface of this specimen, too. There is a very deep hole in the spongy tissue of the posterolateral corner of the proximal epiphysis. Adjacent to this hole, there is an elongated opening into the marrow cavity. The posterior wall of the diaphysis here is paper thin. Opposite this hole, there is another deep hole into the spongy tissue of the anterior surface of the proximal epiphysis. The combined locations of these holes very much resemble damage by carnivore teeth closing down on both sides of the bone. However, if in fact there was ever evidence that the hole into the cavity was caused by pressure, this evidence has been completely obscured. The entire border of the hole today shows only evidence of chemical action.

22D - right first phalange

This specimen also shows abundant evidence of chemical action damaging the spongy tissue. There is a large hole penetrating into the marrow cavity at the proximal end of the posterior surface. The wall of the diaphysis is paper thin, and the only damage still in evidence around the border is chemical in origin.

22E - right first phalange

There is damage to the spongy tissue of this specimen that might have been caused by either gnawing or chemical damage. There is a circular hole into the marrow cavity at the proximal end of the medial face of the diaphysis. This clearly represents a depression fracture due to either pressure or percussion. Part of the margin is still in place although somewhat depressed. The fact that this piece is still attached to the wall of the diaphysis indicates quite clearly that the bone was punctured when it was still fresh and elastic. There is another depression fracture on the dorsal side, at the epiphyseal end of the marrow cavity. There are two dents on the dorsomedial surface of the diaphysis. Although these are covered by varnish, they very closely resemble tooth marks.

22F - left second phalange (Fig. 2)

There is some damage of uncertain origin to the spongy tissue of this specimen. There is a large hole at the proximal end of the posterior face of the diaphysis. The wall here is 1.4 mm thick. The border shows no evidence that this is a puncture. The surface of the hole's border is approximately at right angles to the surface of the bone, rather than at an acute angle; a puncture will normally be conical rather than cylindrical in cross-section. There is a smaller hole on the medial surface that to the naked eye appears to be an incomplete puncture with a disk of bone partially pressed down into the marrow cavity. Under magnification, it is clear that this disk has not been depressed. Rather, it is what has been left behind by the removal of overlying and surrounding bone, probably by chemical action. There are also possible tooth marks on the lateral face. In all, this is a somewhat enigmatic bone. The small hole appears to be the result of chemical action. The larger hole may have been due to gnawing, but chemical action on the bone makes this uncertain.

22G - left second phalange (Fig. 3)

This specimen is generally in good condition. There is a large subcircular hole in the medial face. Beside it is an arced line of surface discoloration. Under magnification, this appears to follow a crack related to the hole itself. The border of the hole is tapered, so that the opening is larger on the interior than the exterior, as is typical of a pressure or percussion caused puncture. There are possible tooth marks on the opposite side of the bone. All in all, this hole could have been made by either a human or a carnivore. The possible tooth marks give slightly greater credence to the latter.

22H - left second phalange

There is a circular hole on the medial face. The borders of this hole are consistent with a puncture due to either pressure or percussion. The border is tapered in a "conical" manner on one side; it is more irregular where it intersects cancellous tissue. The only other mark on the bone was probably made by a grain of sand or quartzite that is still embedded in the bone. Of all the specimens, this is probably the best candidate for a deliberate whistle, but a carnivore bite cannot be excluded.

23A - right first phalange

This carries the excavation identification number P9-97. There is shallow pitting over almost the entire surface of the dense bone of this specimen. Chemical damage to the spongy tissue has obscured the origins of two deep holes that meet through the spongy tissue of the proximal epiphysis (without penetrating into the marrow cavity). There is no good reason to think that these holes are due to anything except chemical action, but there are two dents on the posterolateral corner of the diaphysis that were probably made by carnivore teeth.

23B - right first phalange

The entire surface of the bone is uneven and wavy due to chemical damage. There is a large hole at the proximal end of the posterior surface. The wall is approximately 1.4 mm thick here. The edge of the hole is tapered conically, which is consistent with a pressure or percussion fracture. Damage to the adjacent soft tissue could be related. While this hole may be a puncture due to either human or carnivore action, it is also possible that it is simply the result of chemical action.

23C - left first phalange

There is considerable chemical damage to the entire bone, especially the spongy tissue. There is a large irregular hole in the proximal end of the posterolateral surface of the diaphysis. However, most of the observable border of this hole has been damaged during or after excavation, so that it is impossible to

Fig. 2: No. 22F, a left second phalange from bed 22. To the naked eye, the hole appears to be a partial puncture (A). Under magnification, it is clear that it is due to erosion of the bone by chemical action (B). There are possible tooth marks on opposite side (C).

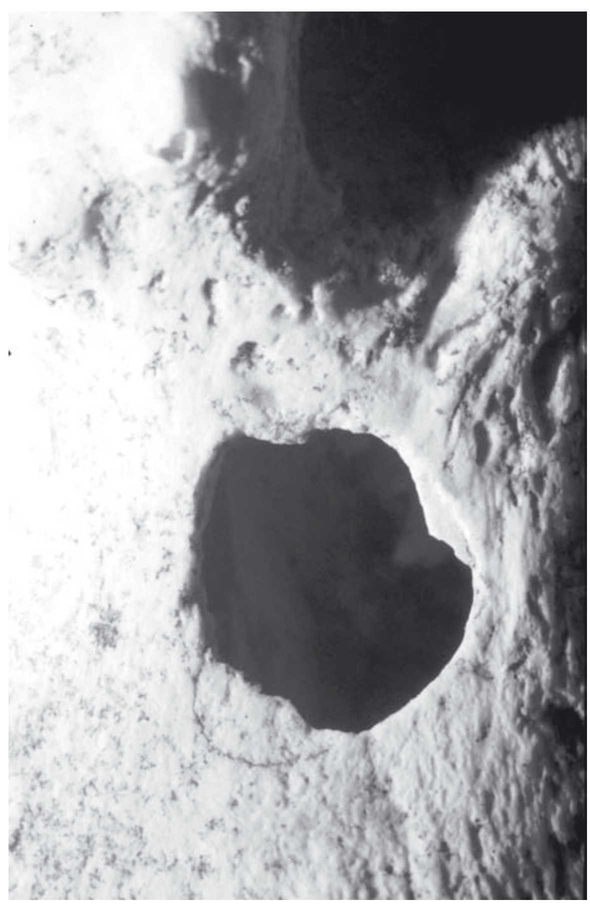

Fig. 3: 22G, a left second phalange from bed 22. Puncture with an adjacent crack. There are possible tooth marks on the bone, opposite this hole.

determine the original cause of the hole. Damage to the adjacent spongy tissue appears to be due to chemical action. There are possible tooth marks in the spongy tissue of the proximal epiphysis.

23D - left first phalange

There is a hole at the border of the spongy and dense bone at the proximal end of the posterior surface. There has also been attrition of the adjacent spongy tissue. These could be the result of gnawing, but chemical damage makes this impossible to verify. There is a long crack spiraling across the diaphysis, with one side slightly depressed. This probably has nothing to do with the hole.

23E - right second phalange (Fig. 4)

There is a hole at the proximal end of the shaft on the dorsomedial surface. The wall is very thin. Opposite this hole, there is a depression that to the naked eye appears to be a depression fracture, but was actually caused by the removal of tissue due to chemical action. There is a dent or pit near the distal end of the shaft that may be a tooth mark or the result of chemical action. There is damage to the spongy tissue at the proximal end. Overall, the nature of the hole is consistent with chemical action, but it is also possible that the hole originally had another cause that has now been obscured by chemical damage.

24A - Left first phalange

This bone has been severely corroded. There is a huge opening with extremely thin borders through the palmar/plantar wall of the proximal end of the shaft. Much of the spongy tissue has been removed from this part of the proximal epiphysis. These phenomena are almost certainly due to chemical action. In addition, there is a deep conical hole penetrating into the spongy tissue. However, chemical damage to the bone has been so severe that is pointless to speculate about the origins of this particular hole.

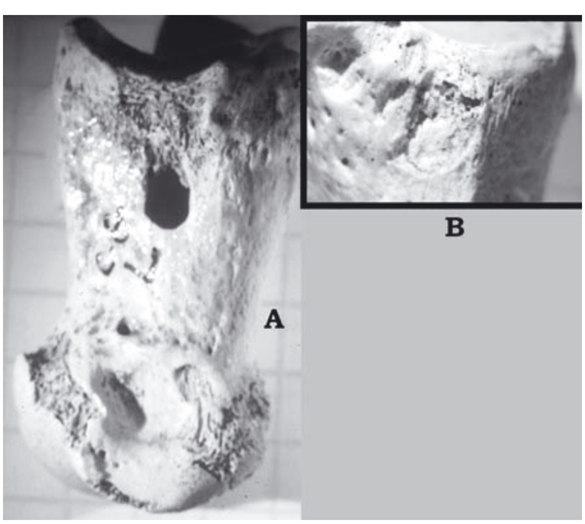

Fig. 4: 23E, a second phalange from bed 23. Hole may or may not be due to chemical action (A). The same is true of a depression on the opposite side (B).

24B - Left first phalange (Fig. 5)

Two holes penetrate this bone from opposite sides of the proximal end. A hole in the palmar/plantar surface also penetrates into the spongy tissue, but the bordering dense tissue varies from thin to approximately 0.8 mm. thick. While the bone as a whole shows some evidence of chemical damage, the size and depth of this hole are out of proportion to the amount of such damage, and the border shows the beveled or cone-like cross-section typical of a puncture caused by pressure or percussion. Opposite this hole there is a very deep and narrow puncture that communicates with the first through the spongy tissue, not through the marrow cavity. The obvious explanation for both holes is that they were formed when a carnivore bit down on the proximal end of the bone.

27A - Left first phalange

The entire surface of this bone is covered by shallow pitting. There is a very large hole in the palmar/plantar surface of the proximal end of the shaft. Based on color, it would appear that most of the border of this hole represents damage during or after excavation, damage that enlarged the original hole. (The existing border of the hole is approximately 1.6 mm. thick.) What is left of the original border of the hole is consistent with either a puncture or chemical damage. The pitting of the surface appears to be due for the most part to chemical damage, but some of the pits may represent light tooth marks. All in all, it is difficult to draw any solid conclusions about the origin of the hole.

29A - Left first phalange

There has been severe chemical damage to the

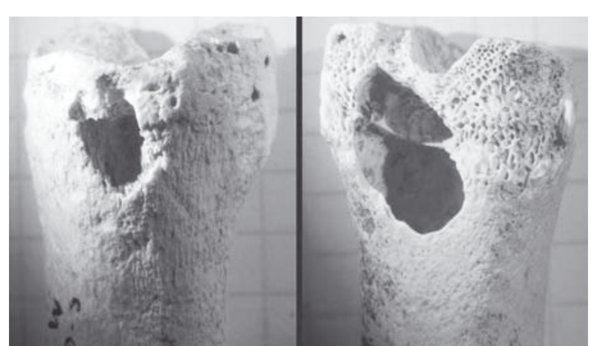

Fig. 5: 24B, a left first phalange from bed 24. These two holes on opposite faces of the proximal end were almost certainly made by carnivore teeth. Chemical damage has subsequently obscured details of the holes.

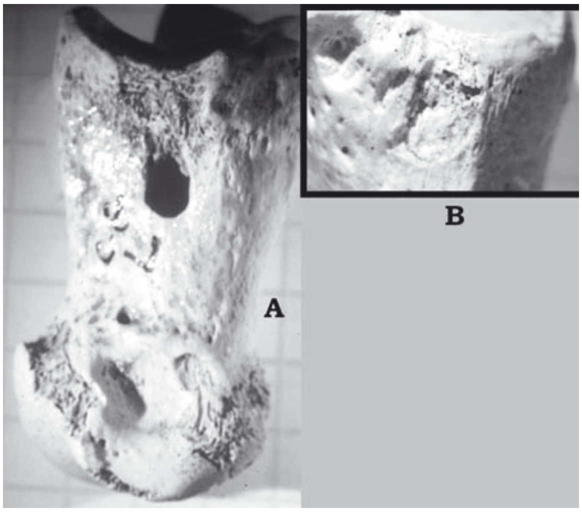

Fig. 6: 29B, a left third phalange from bed 29, with connecting holes in both lateral and medial faces.

surface of the entire bone, with the exception of the proximal articular surface. There is a hole that penetrates the proximal end of the palmar/plantar surface of the shaft of the bone and that has removed part of the spongy tissue of the epiphysis. Chemical damage makes it difficult to determine the origin of the hole. Opposite the hole, the dorsolateral surface of the proximal part of the bone is more pitted than the rest of the bone surface, but bubbling of varnish on the bone in this area makes observation difficult. Overall, no cause can be assigned to the hole with any certainty. It is quite likely due to chemical action.

29B - Left third phalange (Fig. 6)

The surface of this bone is still in fresh condition. Two holes meet from opposite sides of the bone, penetrating from the lateral and medial surfaces respectively. The hole in the lateral surface is very clearly a puncture. The cause of the other hole is not so clear, mainly because of varnish on a large part of the border, but it is not inconsistent with gnawing. These holes were probably the result of a bite with opposing teeth.

GENERAL OBSERVATIONS

A few of the holes in these bones are punctures or depression fractures. Others are apparently due to chemical damage. Others have been enlarged by chemical action which has also destroyed evidence of how the hole was originally made.

There is an apparent uniformity in the placement of the holes, but this is explainable in terms of anatomy. The great majority of the holes in first phalanges are through the proximal end of the palmar/plantar

Table 1: Locations of the holes.

First Phalanges	
Proximal end of palmar/plantar surface	10
Proximal end of dorsal surface	0
Proximal end of medial surface	1
Second Phalanges	
Medial surface of shaft	5
Lateral surface of shaft	0
Palmar/plantar surface of shaft	1

surface. However, as Henri-Martin (1909) has pointed out, this is the thinnest part of the first phalange of a reindeer, so that whether a bone was attacked by chemical action or by carnivore chewing, this is the most likely location for a hole to occur. The same explanation can probably account for the fact that the majority of the holes in second phalanges penetrated the medial surface.

Finally, it should be pointed out that many holes penetrate only into spongy tissue, and others penetrate through both spongy and dense tissue. Either of these is consistent with natural causes; neither is consistent with deliberate manufacture of a whistle.

INTERPRETATION

The reindeer phalanges from Combe Grenal, then, do not provide unambiguous evidence of human workmanship. Some holes almost certainly have a natural origin. Other specimens have been so damaged by chemical activity that there is no way of determining the original cause of the holes. On the other hand, there are certain specimens with holes that *might* have been made by humans, which leaves the problem of interpretation unsolved.

This is not, however, an unusual situation in the sciences (see Chase and Dibble (1992). In fact, this exact situation is addressed by statistical theory, which distinguishes between “type I” errors, where one accepts a false hypothesis, and “type II” errors, where one rejects a true hypothesis. (“Hypothesis” is used to mean a proposed explanation, in this case for the holes in the phalanges.) If we accept a human origin for the holes without clear evidence, we risk making a type I error; if we reject a human origin without clear proof, we risk a type II error. There are two ways of resolving this dilemma, one statistical, the other related to the intellectual context of the study.

Statistically, it makes sense to accept the alternative that is more probable. In the case of the Combe Grenal material, there is no way of assigning an exact numerical probability to either. In addition, because bones have commonly been damaged by chemical action, on only a small sample (about seven specimens) can we determine whether the cause of the hole was natural or human. There is, however, a rough measure of likelihood. Wherever the cause of a hole in a phalange can be determined, it turns out to be a natural, non-human one. On these grounds, it would seem preferable to risk the type II error and conclude that all the holes had a natural origin.

However, there is another solution that does not depend on estimating probabilities, but rather on the nature of the question the data are being used to answer. In an Upper Paleolithic context, the presence of whistles would be interesting but unremarkable. Proof that whistles were used in the Middle Paleolithic would be much more interesting, because of their implications. Whistles may be used as either signaling devices or as musical instruments. The presence of musical instruments implies the presence of a behavior and neural structure that is characteristic of all humans but of no other species. The use of signaling devices implies symbolism, something that is fundamental to human language but absent from the communication systems of all other species. In other words, by documenting the existence of whistles in the Middle Paleolithic, we would be also be documenting the evolution of a uniquely human phenomenon.

This means that we can apply the principle of Occam's razor. According to this principle, when neither of two explanations can be disproved, the simpler explanation is preferable. If we explain a hole in a phalange in terms of natural taphonomic factors is relatively simple, because we have no doubt that natural forces capable of making holes in bones existed at that time. If we explain it as the deliberate manufacture of a whistle, our explanation entails a new phenomenon, either symbolism or music. In this case, the latter explanation is justified only when a natural explanation can be excluded

This point may also be expressed slightly differently. In the absence of other conclusive evidence of whistles in the Middle Paleolithic of Europe, their existence remains to be demonstrated, and ambiguous cases are insufficient as demonstration. Thus the data from Combe Grenal, being ambiguous, fail to document the origins of either music or symbolic communication in the Middle Paleolithic of Europe. Any such demonstration must be found elsewhere, either at another site or using another kind of data.

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