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INHALT

Archeo-Music

The reconstruction of Prehistoric musical instruments: hypothesis and conclusions in experimental music-archaeology

Tinaig Clodoré-Tissot

Our PH'D researches on protohistoric and prehistoric musical instruments unearthed in Europe led us to do some experimentations. We tried to rebuild many of the musical instruments made of bone, conch, antler, horn, clay and wood, inventoried for in this thesis (Clodoré-Tissot 2006).
Most of these musical instruments rebuild are wind musical instruments: whistles, flutes, bull-roarer, trumpets ... We also did reconstructions of some percussive musical instruments as ceramics drums. The aim of our research was first to understand how these musical instruments have been build, and the difficulties of their manufacturing technique with flint tools. We will discuss about that finds and present their making of, in details.

Fig. 1. Whistle made of a reindeer phalanx. Laugerie-haute, Les Eyzies-de-Tayac (France). L. 4,9 cm. Upper Paleolithic.

These experimentation in music-archaeology give us an idea of the time and skills involved in the making of these prehistoric musical instruments and help us to get a better understanding of their playing techniques and their sound-making capabilities.

The reconstruction of prehistoric musical instruments made of bone and other hard organic material: shell and animal horn

A) Bones whistles
The whistling phalanx, is one of the oldest whistles invented by prehistoric man.This type of whistle made from a perforated phalanx of reindeer is dated to the Upper Paleolithic (35 000 B.C) in Europe (Dauvois 1994) (Fig. 1). This kind of bone whistle is also known in the Neolithic and in the Bronze Age, made from a perforated phalanx from a mammal (cow, deer, dog ...) (Clodoré-Tissot 2006, 2009. Guitet 2008). Ethnographical comparisons suggest that this whistle could have been used as a game-call, playing also an important role in the hunt of the reindeer in the Palaeolithic, allowing the approach of game. This custom is known in North-western Canada until the early XXe century, where the indians called „dernier-bois" used a whistle made of the phalanx of a reindeer to approach the game. Their frenquency range is between 2000 and 3800 Herz. We could imagine with no doubt that these kind of whistling phalanx played a role in long-distances communications. To rebuild this kind a whistle, we just used a flint borer. Less than 5 mn are necessary to make the hole (0, 5 cm in diameter) in the phalanx. This whistle is fast and easy to build (Fig. 2). If the oldest end-blown whistles are dated to the Upper Paleolithic (30 000 BC), they are also known in the Neolithic, in the Bronze and in the Iron Ages in Europe (Clodoré-Tissot 2006, 2009. Dauvois 1994. Guitet 2008) (Fig.3).

Fig. 2: Processing technique of a whistle made of a phalanx.

Usually made with bones from small mammals or from birds, they have a small window (rectangular or semicircular). The archaeological context of discovery suggests that these bone whistles may have played a role as game-calls. They could also have been used for long-distances communications, and probably for the games of children.

Once the bone has been cleaned (boiled in water 20 mn), we cut the two epiphysis of the bone to obtain a small tube (8 cm long), with a simple flint blade. The bone is always wet before being cut with flint blades. I carved then a small window (rectangular or semicircular) with the help of a bladelet, at 1,5 cm of the proximal end of the bone. Then We abraded the inferior edge of this window, with another small blade in order to obtain the bladed edge. Once this opening has been done, we put a mall plug made of bee-wax or tar (in that proximal end) and try to obtain a windway by pushing the wax, in order to create then a real end-blown mouthpiece, for the whistle. This last operation is not so easy and the reconstruction of a end-blown whistle requires circa 20-30 mn (Fig. 4).

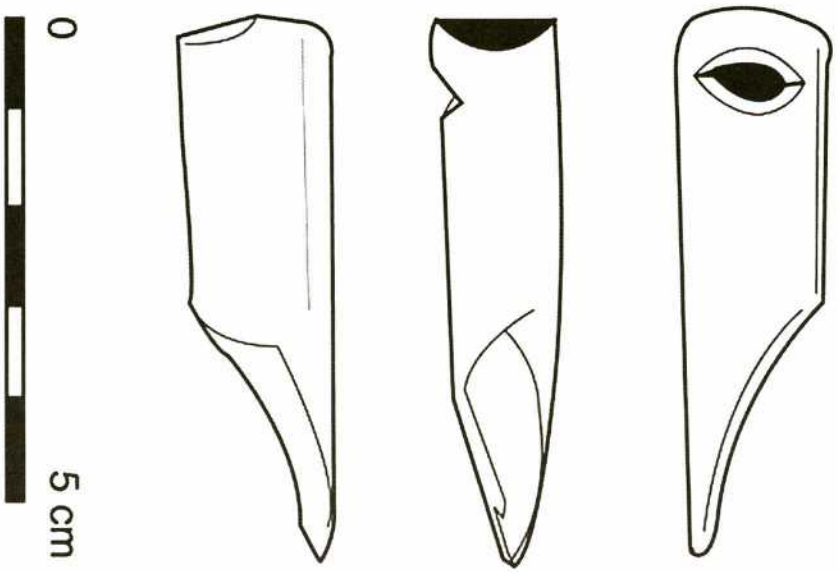

Fig. 3: Whistle. Saviese, la Soie (Suisse). 2800-2600 B.C.

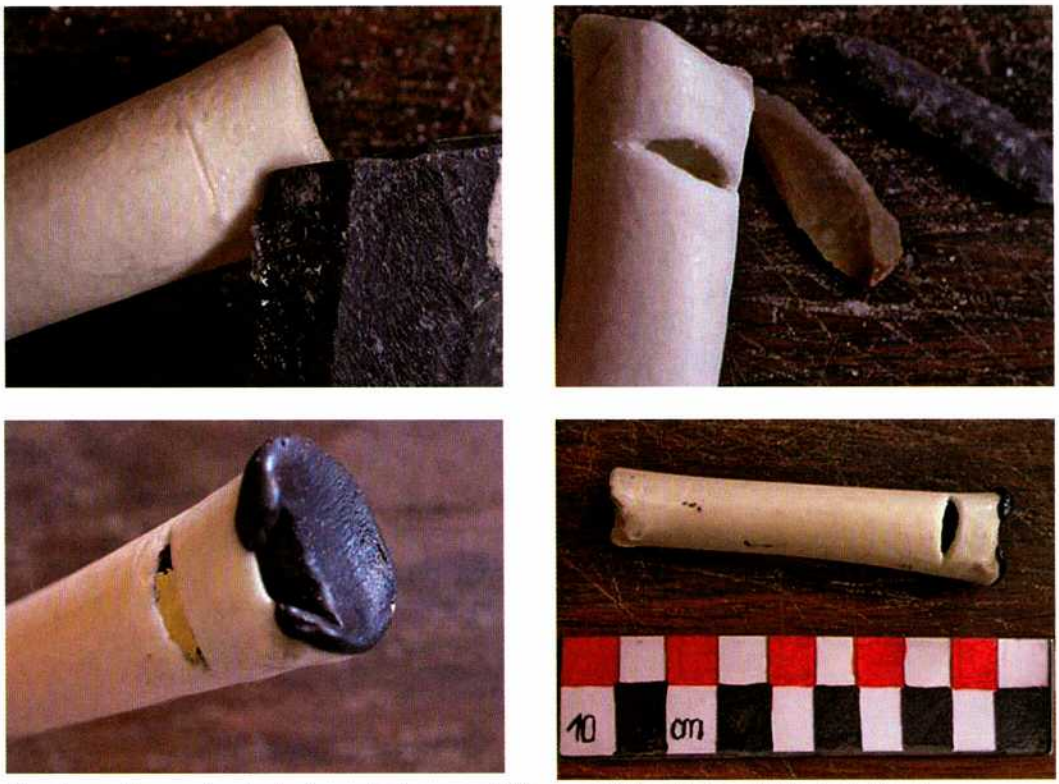

Fig. 4. Processing technique of a bone end-blown whistle. Photo : T. Clodoré-Tissot.

B) Bones flutes

The first flutes attested, with no doubt, have been made by the hand of the Homo sapiens sapiens, in the Upper Paleolithic (circa 35 000 BC) in Europe (Buisson 1990. Conard 2009. Dauvois 1994) (Fig. 5). Bone flutes are preferably fashioned from long birds bones (vultures, eagles). In the Neolithic and in the Metal Ages, the flutes are fashioned from birds bones, but also from bones of mammals (sheep, goat, deer...) (Clodoré-Tissot 2006; 2009. Fages et al. 1983). Prehistoric flutes made of human bones are exceptional discoveries. Most of the bone flutes inventoried for Prehistoric Europe, came from burial sites, sometime settlements.They have 2-5 playing holes, and sometimes a thumb hole. The anthropic origin of the perforation should be examined and not be the results of any carnivore bites (D'Errico et al. 1998).

To rebuild a flute, the two epiphysis of the bone (from a mamal or a bird) are cut. For a mammal bone (sheep, goat..), we clean the interior of the bone to get rid of the narrow by boiling it +/- 20 mn in water. For a bird bone, we abraded the interior with a thin wooden stick in order to get a perfect tube. This first step done, we cut a rectangular opening (0,8 x 0,6 cm) near the proximal extremity with flint blades or bladelets, in order to obtain the window of an end-blown flute like the one found in Veyreau (Aveyron, France) (Clodoré-Tissot 2009. Fages et al. 1983) (Fig. 6).

Then we carved the holes with a borer, The perforations are 0,6 cm in diameter, and the flute of Veyreau got fives holes, and a small hole on his lateral side, near the distal extremity, probably used to put a string. The decoration of the flute is done with a very small borer: points on the sur-

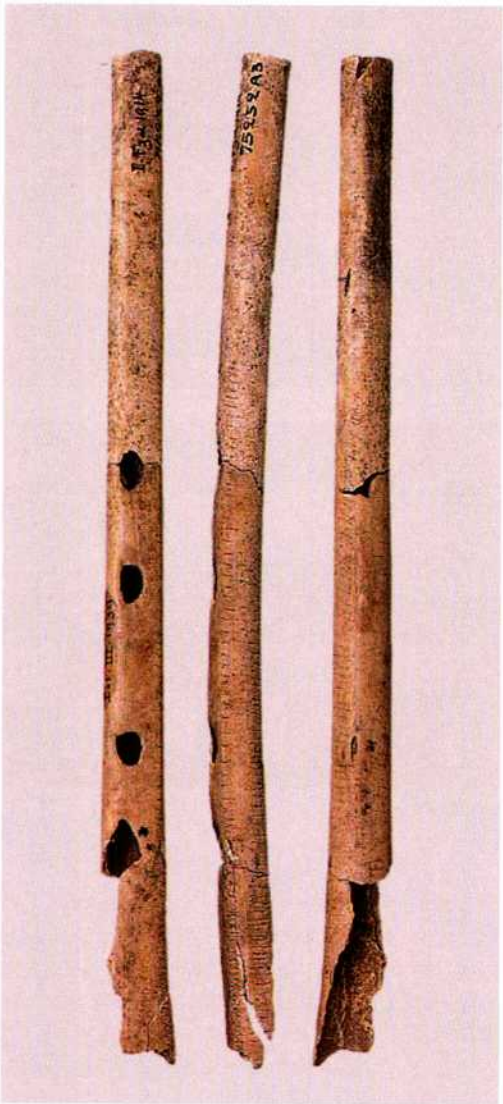

Fig. 5: Bone flute of Isturitz (France). 25000-20000. B.C. Musée d'Archéologie nationale de Saint Germain en Laye. L. 21 cm. Photo : L. Hamon.

face all around the perforations and we realized the endblown mouth, with tar. The manufacting technique is similar to the end-blown whistles. The reconstruction of the Veyreau's flute took more than 1 h 30 (Clodoré-Tissot 2009) (Fig.7).

Paleolithic flutes like the one of Isturitz (Pyrénées Atlantiques), for example, are more simple and faster to rebuild. Most of them don't have any rectangular opening (window) at the bottom, and the holes could be drilled with a simple borer (Buisson 1990).

C) Conch shell horn

The conch shells are attested since the Neolithic period to the Iron Age, in Europe (Clodoré-Tissot 2006; 2009. Montagu 1981) (Fig. 8).

Most of them have been discovered on settlements or in a funeral context, in Mediterranean Europe (Italy, France, Germany, Hungary, Greece, Crete, Cyprus, Malta). The shell selected (charonia nodefera, charonia lampax...) came from the mediterranean sea. The processing technique is not complex, the small terminal end of the shell has to be cut in order to obtain an hole in which we blow.

To cut the terminal end (apex) of the shell, we used only a flint blade on which I retouched the cutting edge several times. Once the shell-end has been well cut all around, we used a pebble to break it, then I carefully polished the terminal end of the future conch shell horn in order to

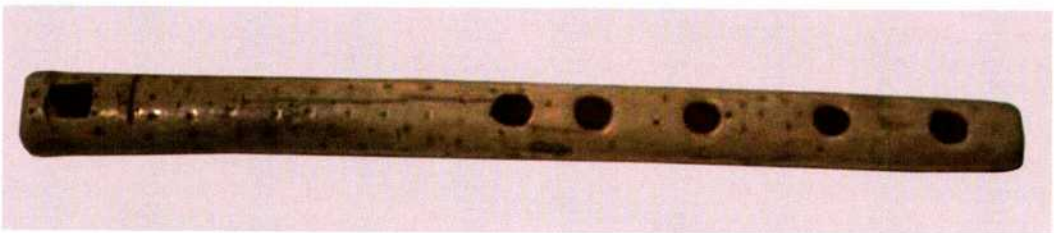

Fig. 6: Bone flute of Veyreau (France). L. 17,5 cm. 2500-2300 B.C. Musée de la musique, Paris. Photo : T. Clodoré-Tissot.

Fig. 7: Details of the reconstruction of the vulture bone Flute of Veyreau (France), Photo: T. Clodoré-Tissot.

get a perfect end-blown mouth. The manufacturing technique is quite simple but requires nearly 2 hours and half (Fig. 9).

Fig. 8: Conch shell horn, grotte de la Palette (Aude). L. 19 cm. 3000 B.C. Musée archéologique de Narbonnes. Photo: J. Goudet.

The archaeological context – some conch shell, like the one from Grotta dei Picioni (Italy), have been discovered in graves, full with flint blades, bones and ochre – add to the time involved both in their subsistence and in long-distance exchanges (from the Mditerranean sea), and in their transformation into a musical instrument, suggest that these prehistoric conch shell horns could be probably considered as a cultual musical instruments, in Prehistoric Europe (Clodoré-Tissot 2006, 2009). Today, the conch is a trumpet used to communicate over long distances. Sometimes played to gather the herd, to prevent dangers, it is also a musical instrument of worship in many cultures around the world.

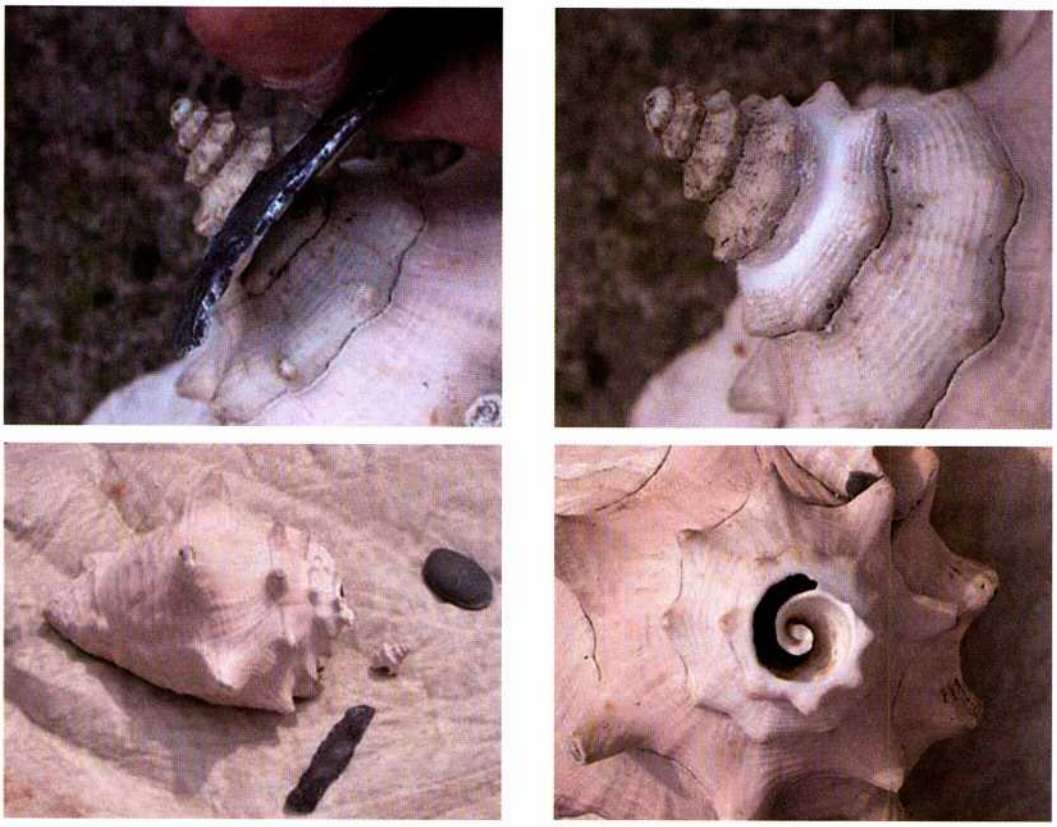

Fig. 9: Processing technique of the conch shell horn. Photo: T. Clodoré-Tissot.

D) Animal horn

It is a high probability that prehistoric man had transformed the animal (Cow, goat, sheep) horn into an instrument for communication over long distances. Animal horn is however a perishable organic matter, we have no archaeological evidence of the use of these instruments before the Iron Age in Europe. The only find of a auroch horn whose end has been cut to get a call-horn with a finely carved mouthpiece, has been unearthed in the salt mines of Hallstatt (Austria), dated to the beginnings of the Iron Age (Hallstatt C) (Clodoré-Tissot 2006; 2009. Kromer 1959).

Two kinds of horns exist in the world: the side-blown horns and the end-blown horns. The horn from Hallstatt is an end-blown horn. To rebuild an horn of this kind, it is necessary to cut the terminal end of the horn and do a perforation with a borer. This part should be abraded. We realized also a side-blown horn. This kind of horn could have existed in Prehistoric Europe; Bronze side-blown horn are known in Ireland dated to the end of the Bronze Age (1000-800 B.C.) (Clodoré-Tissot 2006).

To drill the hole, in which we blow, two differents kinds of flint tools have been used: borers and burins with bevel. The perforation should be 3 cm in diameter. It took more than 2 h to drill the perforation in the horn (Fig.10).

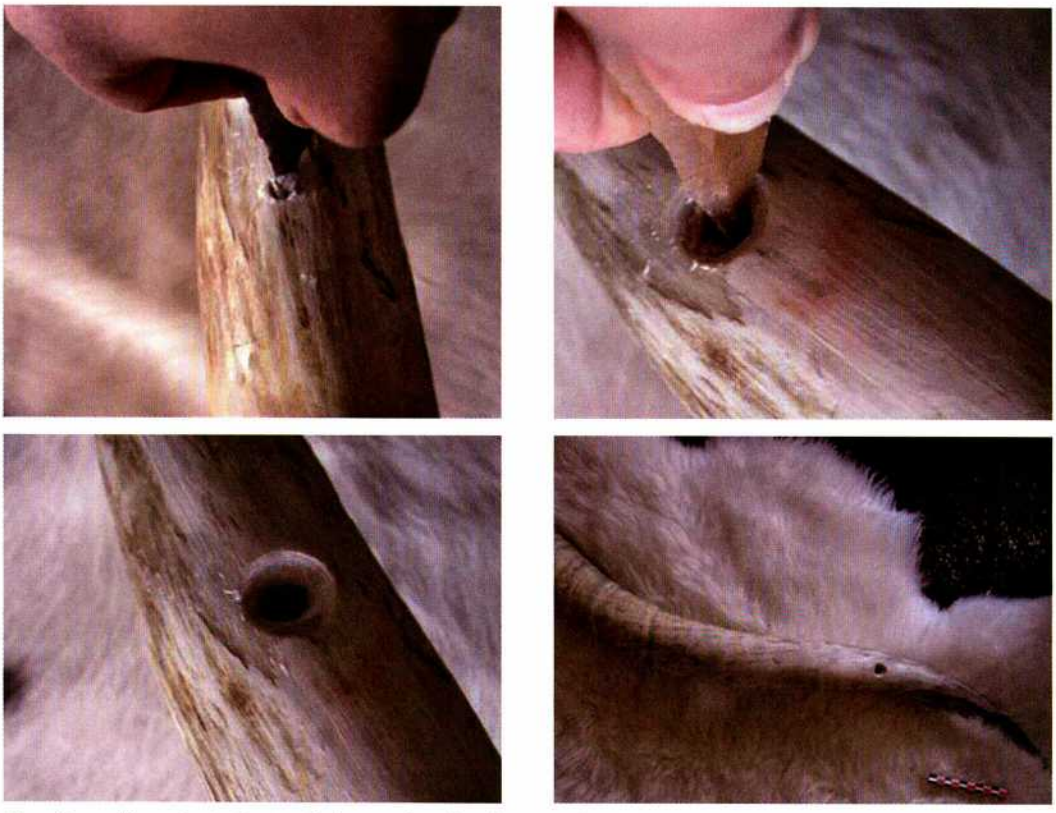

Fig. 10: Manufacturing technique of a side-blown animal horn. Photo: T. Clodoré-Tissot.

II. The reconstructions of prehistoric music instruments made of clay

A) Ceramic whistles

Whistles have been identified in Europe, for the Neolithic, the Bronze and Iron Ages (Clodoré-Tissot 2006, Guitet 2008). Two main shapes are known among the clay whistles identified throughout Prehistoric Europe: geometric and zoomorphic ceramic whistles. Two processing technique exist in order to make these different kind of whistles. The first manufacturing technique is quite simple (Fig. 12, 13) and requires less than 10-15 mn of time. To make a globular whistle such as the one found in Hallstatt (Austria) dated to the beginning of the Iron Age (Hallstatt C), for example, we have to shape a hollow globular shell in clay with a big aperture on the bottom that will be the mouth of the whistle (Fig. 13). One or two holes can be drilled in the clay, like on the whistle found on the settlement of Mramor (Macedonia), dated to 4500 B.C. (Jovcevska 2007) (Fig. 11, 12).

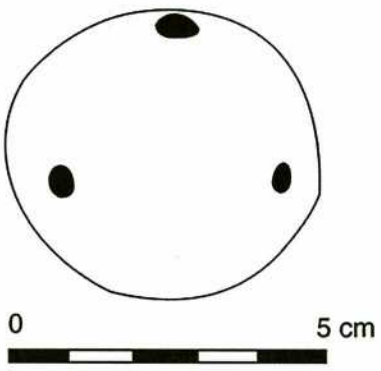

Fig. 11: Ceramic whistle. Mramor (Macedonia). 4500 B.C.

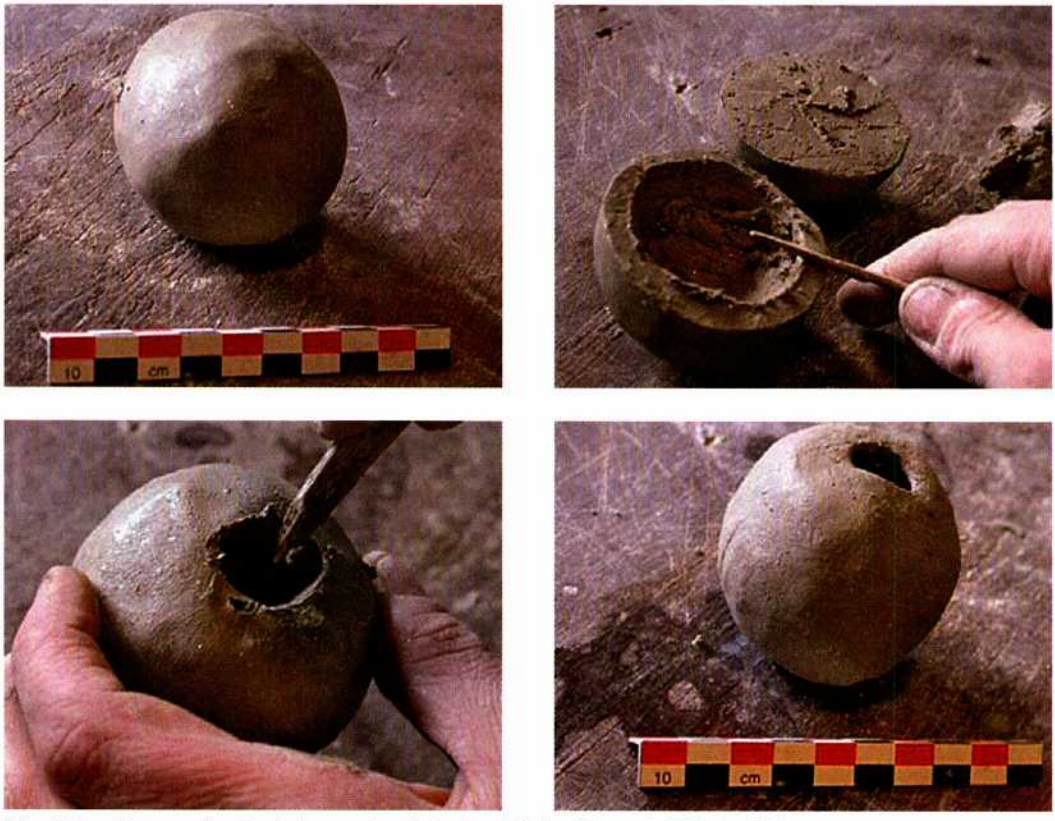

Fig. 12: Processing technique of a globular whistle. Photo: T. Clodoré-Tissot.

The other technique is more complex (Fig. 14, 15) The first step consists in making the hollow body of the clay whistle that will be the resonator chamber. Then, add a small clay piece that will be the air duct (Fig. 14). This is the manufacturing technique of the whistle from Vorosmart (Hungary) and the one from the settlement of Harsova (Roumania) dated to 4500-4000 B.C (Cauwe et al. 2007) (Fig. 15).

The context of discovery of the terracotta whistles and their manufacturing technique relatively simple which doesn't require any special qualifications, suggest that these objects were probably not musical instruments considered as prestige goods. These whistles could have been used to send signals, as means of long-distances communications or they could have been played to imitate birds-calls, or even used as game-calls. These sound objects may have played a role in the daily activities of these settlements. From one culture to another, from one geographical area to another, clay whistles may not have had the same value and social function (Clodoré-Tissot 2006).

Fig. 13: Globular whistle.

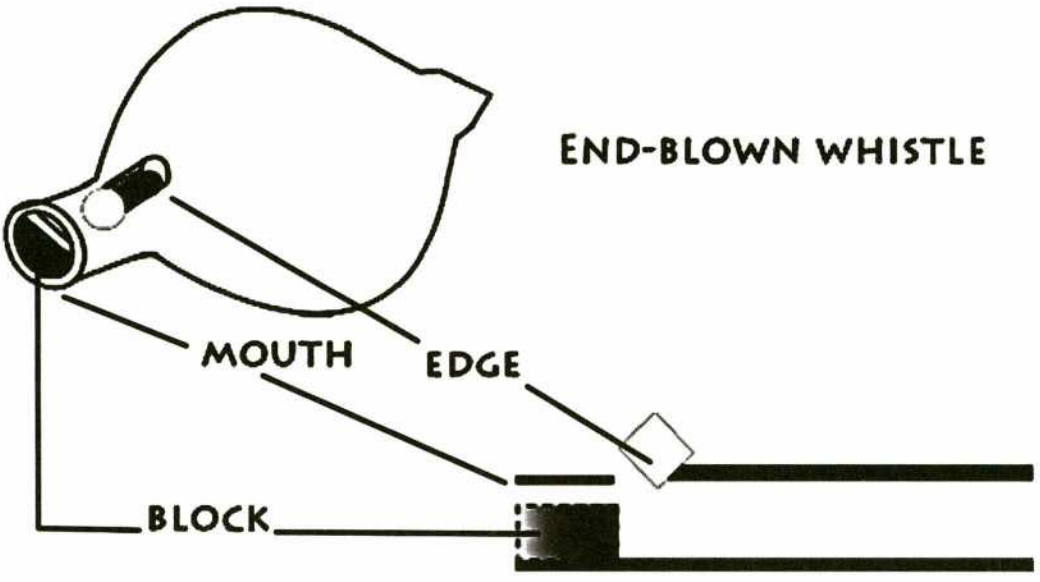

Fig. 14: A endblown whistle with a resonator chamber.

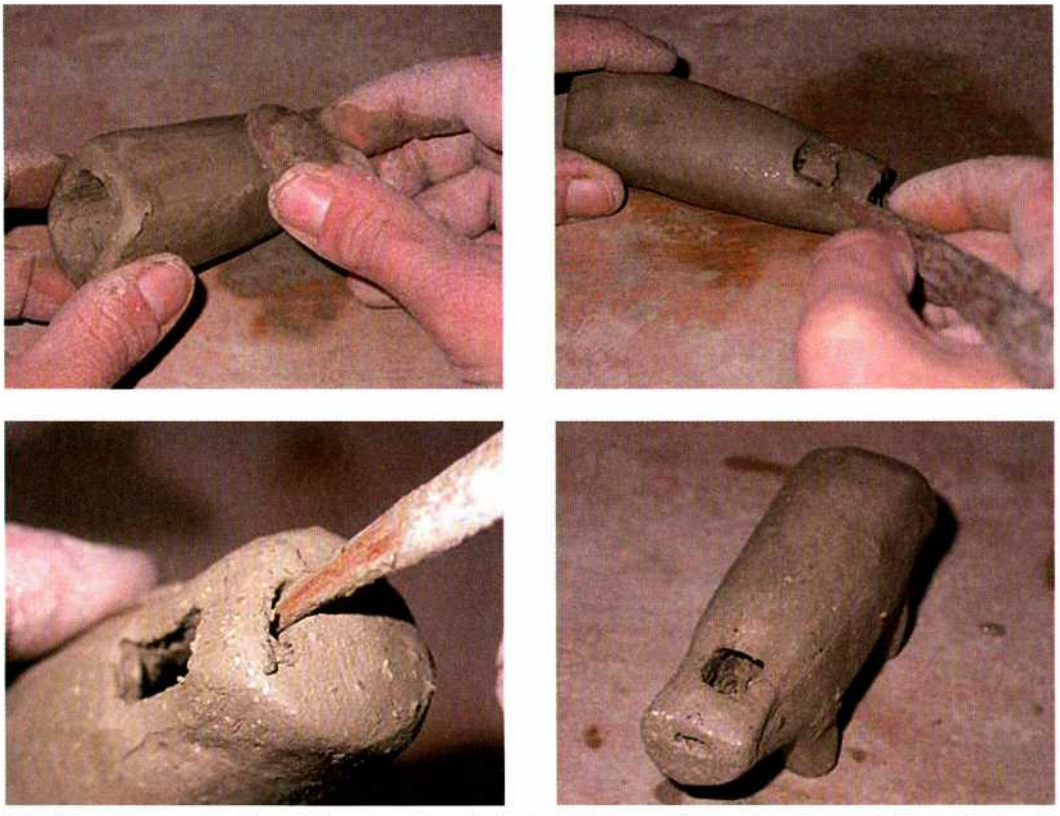

Fig. 15: Reconstruction of the ceramic whistle from Harsova (Rumania). Photo: T. Clodoré-Tissot.

B) Ceramic drums

The first clay drums appear in the third millennium in northern Europe (Danmark, Germany, Netherlands...) (Dauvier 2005, 2006).

They were made from ceramics in shape of an hourglass, with a multitude of small knobs or handles. These ceramic with no bottom, nor base, were probably originally covered with a membrane (goatskin), stretched and fastened to the buttons, which leaves no evidence. The presence of a decoration on the lower 2/3 part of the vessel, the lack of base, the presence of small loops, suggest that these ceramics were drums. Other ceramic drums have been inventoried for the Bronze Age and the Iron Age, in Europe (Clodoré-Tissot 2006. Clodoré-Tissot, Moser 2005).

We realized a drum with strips of clay, stuck with barbotine. The drum has been done in two parts to get the general shape of an hourglass, stuck together with a strip of clay and barbotine that we added. We smoothed the surface and then added the knobs. The drum has been decorated on its 2/3 inferior part. Then we fired it, well dried. The processing technique took us circa 2 h., once fired, we prepared a skin and streched it wet and fastened it on the bottom of the drum, with leather laces.

C) Ceramic horns

Ceramic horns are known since the Chalcolithic and throughout the ages of Bronze and Iron, in Europe. Most of these instruments came from settlements or temporary shelters like the ceramic trumpet of Brugas, Vallabrix, or Rouet (France) dated to 2800-2000 B.C (Clodoré-Tissot 2006. Coularou 2007) (Fig. 17).

The horns have a shape inspired by the natural horn. These ceramic trumpets have a powerful sound and were probably used for long-distance communications. In the Middle Ages, these horns were mainly instruments of pilgrims, they were played to call for field work in the nineteenth century and some potters manufactured these kind of horns especially for religious events, until mid-twentieth century, in Western Europe. This kind of horn is made using the coiling technique. We smoothed each part that I added to the others. The thickness of the walls should be regular. The horn is ligthly curved at its end. The bell of the trumpet is 9 cm wide. Once dried (after one week), I fired the horn. The rebuild of that ceramic horn took me nearly 2 h.

III. Hypothesis and conclusions in experimental music-archaeology

Experiments could help to understand the manufacturing techniques. We can have a better idea of the difficulties involved in the making of these musical instruments.

The making of a bone whistle with flint blades takes 20-30 mn of time. Most of the whistles dated to the Neolithic, the Bronze and the Iron ages in Europe, came from settlements. They are items easy to build by anybody. Their manufacturing technique does not require any special skills. It is not the case of all musical instruments. Some of them are quite easy to build with flint tools, their making requires nearly two hours, strength and patience, for example like the making of a conch shell horn. Other musical instruments, like some end-blown flutes (or tubular ducted flute) made of bone, for example, require skill and experience to realize the end-blown mouth with the windway (Fig. 19) (Clodoré-Tissot 2009).

Experimental archaeology contributes to check the sound-making capabilities of an artefact. We have recently done reconstructions of some small enigmatic ceramics artefacts found on lake-dwelling settlements dating to the Bronze age (1000 B.C.), that could have been used as water-whistles (Clodoré-Tissot T. - to be published 2010) (Fig. 20).

Fig. 16: Detail of the reconstruction of a ceramic drum. Photo: T. Clodoré-Tissot.

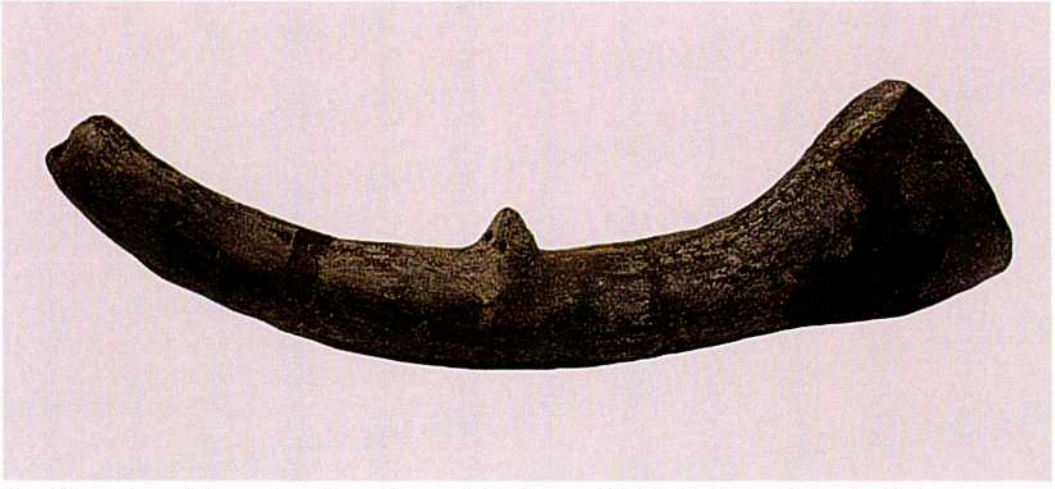

Fig. 17: Ceramic horn from Rouet (France). L. 32 cm. 2500 B.C. Photo: T. Clodoré-Tissot.

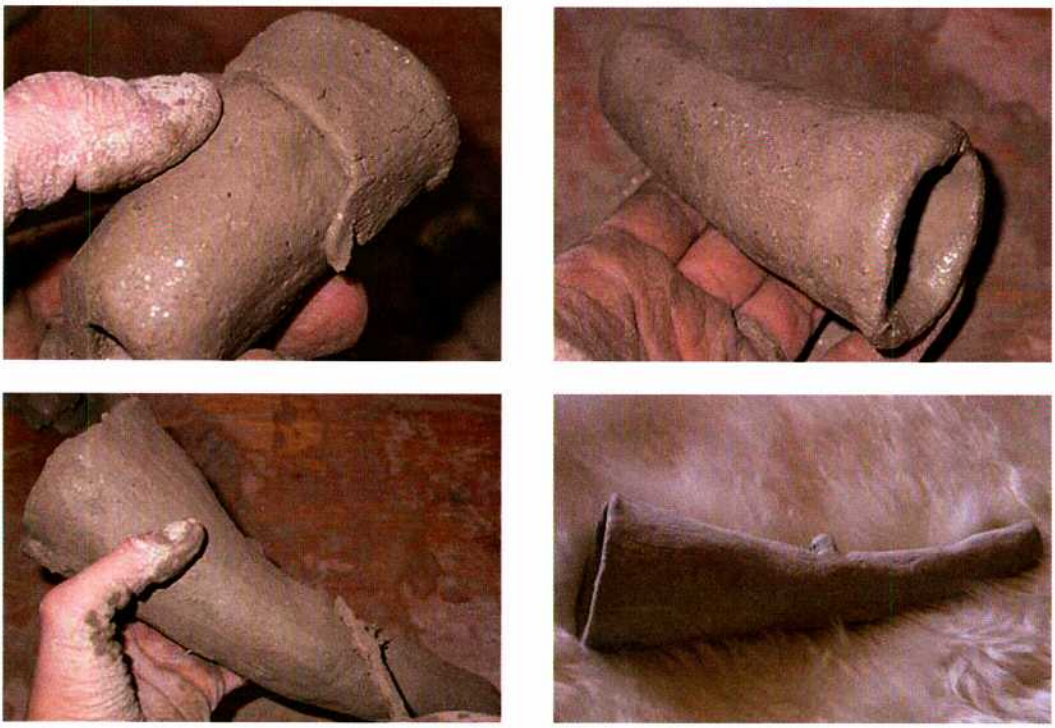

Fig. 18: Manufacturing technique of a ceramic horn. Photo: T. Clodoré-Tissot.

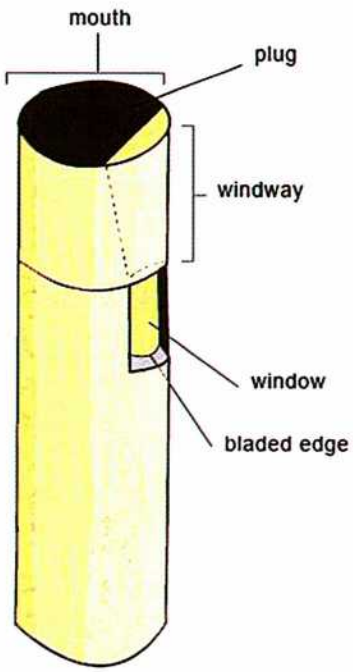

Fig. 19: Detail of the end-blown mouth of a whistle, with the windway and the plug.

Fig. 20: Hypothetic water-whistle. Photo: T. Clodoré-Tissot.

Finally reconstruction could also give us an idea of the sound of the musical instruments and their playing methods. In the case of the Paleolithic flutes, for exemple, like the one of Isturitz (France), Geissenklösterle, or Hohle Fels (Germany) (Buisson 1990. Conard 2009. Dauvois 1994. Guitet 2008). It is not easy to produce sounds, the mouth of the flute is similar to the nay flute or the kaval, and allow to play these flute in the same way.

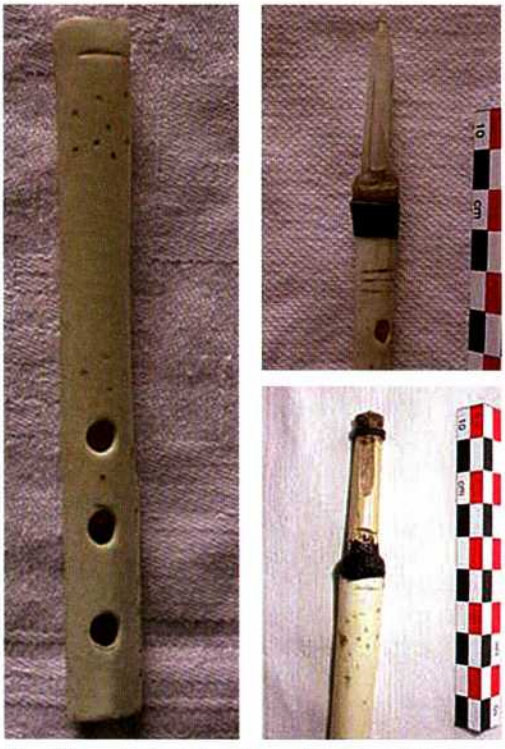

Fig. 21: Reconstruction of a paleolithic bone flute of Isturitz, detail of the reed made of wood and made of the quill of a feather, inserted into the tube.

Putting the flute under the lips and direct the air on the natural bevel of the proximal end of the bird bone-flute. We could also imagine that these Paleolithic flutes could have been played with a reed inserted into the tube (Fig. 21). These reeds are made of a perishable organic matter (quill of a feather, wood, bark) that doesn't leave any archaeological evidence but we can not exlude that they have existed. (Clodoré-Tissot 2009. Ringot – to be published, 2011) (Fig. 21).

We can better imagine their social function, but how far can we go in our interpretation by identifying a musical artefact in the basis of ethnographical comparisons add to the results of experimental archaeology? I really want to underline that the results of experimental archaeological should be check by ethnographical comparisons combined to the results of archaeometry (chemical and use-wear analysis...) (Clodoré-Tissot – to be published 2010).

Zusammenfassung

Unsere Forschungen über vor- und frühgeschichtliche Musikinstrumentenfunde in Europa veranlassten uns zu einigen Experimenten. Wir versuchten, viele der in dieser Studie inventarisierten Musikinstrumente aus Knochen, Muscheln, Geweihsprossen, Horn, Ton und Holz nachzubauen. Das Ziel war zunächst herauszufinden, wie diese Musikinstrumente hergestellt worden waren und die Schwierigkeiten bei der Produktion mit Feuersteingeräten.

Die meisten der rekonstruierten Instrumente sind Aerophone. Sie datieren von der Altsteinzeit bis zum Ende der vorrömischen Eisenzeit. Aus einem perforierten Phalanx (Rentier, Kuh ...) gefertigte Pfeifen und die aus Säugetier- oder Vogelknochen gemachten Stücke wurden wahrscheinlich für den Lockruf verwendet; diese Pfeifen sind mit Feuersteingeräten schnell und leicht herzustellen.

Die Anfertigung der Knochenflöten, wie die am Ende geblasene mit fünf Fingerlöchern, die in einem Grab in Veyreau (Aveyron, Frankreich) entdeckt wurde, verlangt mehr Zeit und Sachkenntnisse. Das ist meistens bei den im Zusammenhang mit Bestattungen von der Jungsteinzeit bis in die Eisenzeit ausgegrabenen Knochenflöten der Fall.

Die seit der Jungsteinzeit bis in die Eisenzeit in Siedlungen und Bestattungen nachgewiesenen Muscheln, die aus der europäischen Mittelmeerregion stammen, sind wirklich leicht in Musikinstrumente zu verwandeln. Aber ihre Bearbeitung mit einfachen Feuersteinklingen erfordert Zeit und Geduld.

Einige Schlaginstrumente, wie die sanduhrförmigen Keramiktrommeln, wurden ebenso nachgebildet. Diese Experimente in der Musikarchäologie vermitteln uns eine Vorstellung von den Zeitumständen und damaligen Fertigkeiten bei der Herstellung. Sie helfen uns auch, Spieltechniken und Klangmöglichkeiten besser zu verstehen.

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