Putting Ancient Sounds on Exhibit. The Case of two Mesoamerican Bone Rasps at the Pigorini Museum, Rome

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Abstract: Two scraped idiophones made of human bones from ancient Mesoamerica (omichicahuaztli) are currently on exhibit at the Museo delle Civiltà – museo preistorico etnografico "Luigi Pigorini" in Rome. An interdisciplinary project was carried out to detect the properties of the bones and the sound characteristics of the instruments. The cultural biographies of the instruments were reconstructed beginning with the social role of these artefacts in the American indigenous cultural context, to the paths that brought them to Italy. This case study allows us to make some considerations about the materiality of ancient sound artefacts within the western museum context, specifically highlighting how visitors can perceive sound coming from distant cultural backgrounds and the ways instruments can be studied and mediated to the contemporary Italian public. This case study is a clear example of the benefits of incorporating an anthropological perspective on archaeological heritage.

Introduction

In this paper we focus on a Mesoamerican musical instrument category referred to as *omichicahuaztli*, which is an indigenous term from the Nahuatl, composed of the word *omitl* (bone) and *chicahua* (fortify, produce strength). It translates into "bone that gives strength".[1]

According to Western organology, the omichicahuaztli is classified as a scraped idiophone, which is an instrument that produces sound by the vibration of its own body, without the need for strings, membranes, or columns of air.[2] It is composed of a main sonorous vibrating object with a notched surface and the scraper component, usually classified as "non-sonorous object".[3] The sound is produced when the player uses a scraping movement, hitting directly or indirectly the sonorous object that composes the instrument. During the performance, the scraper moves along the teeth of the notched surface of the sonorous object (direct movement), to be alternately lifted off the teeth and quickly and rhythmically snapped against them (indirect hit).[4]

During Pre-Hispanic times, the omichicahuaztli was usually made of human long bones; mostly femur, tibia, and humerus. Among the Aztecs, human bones were considered the containers of life energy and were the privileged raw material to manufacture bone rasps, as the

[1] Karttunen 1992; Molina 1970 [1571]; Siméon 2007 [1885]; Bellomia 2017, 15.

[2] Sachs – Hornbostel 1914, 553–590.

[3] Sadie 1984, 279. 816; see also MIMO (Musical Instruments Museums Online), *Revision of Hornbostel-Sachs classification*, 2011, 6 (http://network.icom.museum/cimcim/resources/classification-of-musical-instruments/L/1/ last seen: 22/8/2018). As we are going to show, the emitted sound is actually affected by the material morphology and characteristics of the object used to scrape the notches, so that it is directly involved in the vibration of the body of the instrument, so that we consider both the components as sonorous, and from now on prefer to call it "scraper".

[4] Ibid.

above mentioned Nahuatl etymology of their name suggests. Such bones were chosen especially if they once pertained to the body of sacrificed victims because of the high status of these individuals.[5]

The notches of these instruments used to produce sound, were manufactured by carving a variable number of transverse incisions, parallel and equally spaced from each other, on one side of the bone. To produce sound these notches were scraped with a hard object, such as a shell or a smaller bone. The pre-Hispanic Mixtec Codex *Vindobonensis* is the only source that visually refers to the way that these instruments would have been played.[6] On page 24 (**Fig. 1**) we can see the deity 9 Wind scraping a notched femur with another bone (possibly a scapula) on top of a human skull used as sound box or resonating chamber.[7] The emitted sound is comparable to that of the modern *guiro*; this is made of wood or dry gourd and is in use widely today in Latin America. Nevertheless, this comparison cannot go beyond the organological features of the instruments since the güiro's origins are African.[8]

Most of the archaeologically-known omichicahuaztli instruments come from burials and many are intentionally broken as if they had been ritually "killed" before being deposited beside the body of the deceased.[9] This state of preservation makes organological or acoustic analysis difficult.

Two late 16th century colonial chronicles referring to the Mexicas, written by Hernando de Alvarado Tezozomoc and by Diego Durán, discuss the use of the omichicahuaztli instruments exclusively in the context of the commemorative ceremonies of warriors who had died in the battlefield or who had been sacrificed to the gods.

Fig. 1: Codex Vindobonensis (facsimile), page 24, detail of 9 Wind playing an omichicahuaztli with a human skull used as resonating sound box.

According to Tezozomoc,[10] the commemorative ceremony for the fallen warriors was ritually marked with the rhythmic sound of the omichicahuaztli by younger family members of the deceased. In this case these rhythms were made scraping a notched deer bone with a shell. The omichicahuaztli was an instrumental accompaniment to other percussion and wind instruments that were played together during the ritual mourning of the families of the dead. Elders surrounded the richly dressed and adorned bundles containing the remains of the warriors and danced to the sounds made by the omichicahuaztli in the ceremonial plaza in front of the temple of Huitzilopochtli, the warrior

[5] López Áustin 1984, 149; Bellomia 2017, 181–185.
[6] The Vindobonensis Codex, sent by Cortés to Charles V on 10 July 1519, is one of the very first American documents arriving in Europe and also one of the few pre-Hispanic Mixtec manuscripts that we possess today. It narrates historical-mythical, calendaric, and genealogical accounts about the Mixtec ruling dynasties. Since 1677, it has been stored in the National Library of Vienna (Jansen 1982).
[7] Beyer 1916.
[8] Facchin 2014, 305.
[9] McVicker 2005; Pereira 2005.
[10] Tezozomoc in particular describes a historical event, which is the funeral of the warriors who died during the Battle of Chalco that took place during the reign of Moctezuma I (1440 – 1469). See Alvarado Tezozomoc 1943[1598], 301.

Fig. 2: Omichicahuaztli MPE 4209 (reproduced with permission of Museo delle Civiltà – Museo Pigorini, Rome)

god. The ceremony lasted for four days, after which the priests cremated the bodies of the dead and scattered their ashes over the heads of the relatives of the deceased.[11] A similar account of this ritual is given in chapter 18 of Diego Durán's *Historia.*[12]

According to the Mexica worldview, the souls of those who died in battle made an eighty-day journey to *Tonatiuh Ilhuicac*, the Sky of the Sun, with the mission of accompanying the Sun to the zenith for four years,[13] and the function of the described ceremony was to facilitate them on their journey, ritually marking its beginning.

Materials and their cultural biographies

Today, hundreds of omichicahuaztli are preserved in various museums in Mexico and the United States, as well as in Europe.[14] From the late 19th century onwards, only those bone rasps showing some figurative decoration were studied in detail[15] and were evaluated on the basis of the artistic and cultural value of the instrument's decorative components. These instruments are now on display in museums, even when the sound producing device - the notched surface – is incomplete or not well preserved. In most of the cases, the object used to scrape the notches is not recovered or presented with these instruments on display, which complicates their archaeomusicological study.

The omichicahuaztli (inventory numbers MPE 4209 and MPE 15395/G) discussed in this article are integrated in the Museo delle Civiltà exhibiting space labeled "Americhe", in the showcase dedicated to human sacrifice. Also, on display with them are the two objects used as scrapers which are a shell (MPE 4209), and a human fibula (MPE 15395/G). This state of conservation of the sonorous object together with its scraper is an exception among the known pre-Hispanic bone rasps from Mesoamerica.

Specimen MPE 4209 (**Fig. 2**) is composed of a left human femur with 19 transverse incisions, four of them perforated at regular intervals, and a shell of a sea snail *Oliva julieta* that was rubbed against the notches of the omichicahuaztli to produce sound.[16] The head and the neck of the femur were originally decorated with shell (*Spondylus princeps*) and an obsidian mosaic pattern, which was glued to the bone with a vegetal resinous material obtained from *Pinaceae* trees.[17] The mosaic decoration makes it unique among the other known omichicahuaztli, though unfortunately the tesserae are now almost completely lost.

[11] Ibid.
[12] Durán 1967[1581], 154.
[13] López Luján, Leonardo 2015, 138; López Austin 1980, 361–370; Durán 1967[1581], 155–187.
[14] Bellomia et al. 2016.
[15] Gutierrez Solana 1983; Lumholz – Hrdlicka 1898, 61-79; Seler 1898, 62-73; Starr 1899; Trejo Mojica 2008, 17–18; von Winning 1959.
[16] Bellomia 2017; Velázquez Castro *et al.* 2014.
[17] Pecci – Mileto 2017.

This specimen arrived at the Pigorini Museum as part of an exchange of objects between Luigi Pigorini[18] and the Archaeological Museum of the University of Bologna. It had joined the collection of the *Istituto delle Scienze* of Bologna through a donation made in 1745 by pope Benedict XIV.[19] The discovery made by Davide Domenici, as member of our research team, of an Italian mid-16th century booklet that contains a list of objects arriving from the newly discovered continent, made it possible to trace back the history of this omichicahuaztli. The instrument arrived in Europe during the second half of the 16th century from the Post-Classic Mixtec kingdom of Tututepec, Oaxaca. The booklet describes the instrument as the "leg of a king", accompanied by a mosaic covered human skull, likely its resonating chamber, that is now lost. Both the omichicahuaztli and the human skull are said to have been manufactured from the bones of a "king that was made prisoner in a war by another enemy king" who was eventually sacrificed.[20]

Specimen MPE 15395/G (**Fig. 3**) is composed of a complete right human femur with 19 transverse incisions, four of them perforated at regular intervals (similar to the last specimen discussed), accompanied by a complete right human fibula used to scrape over the notches to produce sound. This instrument has not any kind of decoration. It was brought by an anonymous priest to Paris in 1878, where Enrico H. Giglioli bought it.[21] In 1913, Pigorini purchased Giglioli´s entire collection and as a result, the notched femur, together with the fibula, merged into the American collection of his museum.[22] Giglioli attached a label to it, where it is described as coming from a tomb in Quiché, Guatemala, where it had been excavated alongside two small steatite amulets (inventory number 6763 and 6772), and one "singular symbolic axe" with a handle made of schist (6725).

Fig. 3: Omichicahuaztli MPE 15395/G (reproduced with permission of Museo delle Civiltà – Museo Pigorini, Rome).

The two omichicahuaztli specimens have demonstrated to have two unique biographies, consisting of two different stories to tell,

[18] Luigi Pigorini (1842–1925) was an Italian archaeologist and founder of the museum that now bears his name. For more information see http://www.pigorini.beniculturali.it/personaggi.html (19/07/2018).
[19] Nobili 1993.
[20] Domenici 2016, 53.
[21] Bellomia 2017, 222. Enrico Hillyer Giglioli (1845-1909), was an Italian anthropologist, but also explorer and collector of *exotica*. He took part in a circumnavigation of the world occurred between 1865 and 1868 for scientific purpose, as assistant of the zoologist Filippo De Filippi (1814–1867). After his death, his collection of more than seventeen thousand objects from all continents became part of the Pigorini Museum. See http://www.pigorini.beniculturali.it/personaggi.html (20/07/2018).
[22] Bellomia 2013, 126–128; Giglioli 1901, 185–186; Nobili 2010, 14–15.

although today, they share space in the same museum showcase.

Methods involved in this research

A multidisciplinary research approach was applied to both two instruments to reconstruct their cultural biographies as artefacts, including the analysis of their biological properties as bones and of their organology and acoustic characteristics as sound producing devices, and results provided these instruments with a story to tell and then a new role in the museum space.[23] The first method for analyzing these instruments was an osteological study that determined biological sex by measuring the femoral head diameter. In addition to determining biological sex, the living stature was obtained measuring the femoral length (using direct measurement and regression formula) and the age of death was estimated by observing the stages of fusion and the degenerative changes of the epiphyses. A detailed material analysis of the bone surfaces provided information that allowed for a reconstruction of the taphonomic processes that transformed these artefacts from human remains into musical instruments. The markings on the instruments were organized into probable steps of an operational stratigraphy or *chaine operatoire*, following the work of Pereira,[24] to reconstruct the sequence of stages involved in production and use: raw material procurement, cleaning, shaping, decoration and finally, use-wear patterns. Markings on the surface relating to the use-wear, were useful in determining the probable performing pattern of musicians playing these instruments. Once this data was obtained, it was possible to reconstruct the playing pattern of the instruments using their original scraping tools and digitally record their sound (**Fig. 4**). Since it was not possible to take the specimens out of the museum, the recording was made using a portable Tascam DR-70 recorder and two microphones AKG C1000S.[25] All the files were recorded at 96 Hz, 24-bit resolution.

Fig. 4: The recording setting. A: the positioning of the microphones. B: the executive technique and the position of the player (photo by Amedeo Abate).

The recordings allowed us to analyze the acoustic characteristics of the instruments and to integrate a replication of their sound in the exhibition space, giving museum visitors the opportunity to not only "look at" but also "listen to", both of the omichicahuaztli instruments, although behind a museum glass.

Results

The anthropometric analysis revealed that MPE 4209 was a young/adult male individual, with a stature of 159 cm, while MPE 15395/G was a young/adult female, 155 cm tall. The taphonomic evidence – including the specific cut

[23] Some other results of this research are discussed in Velázquez Castro *et al.* 2014; Domenici 2016, Bellomia – Fiore, in press, Bellomia *et al*. in preparation.

[24] Pereira 2005.

[25] The equipment used for the recording session has been purchased by the Department of History, Cultures and Religions of Sapienza, Università di Roma, while the software is iZotope RX, property of Antonio Maria Buonomo, the sound engineer that collaborated with this project. For the detailed acoustic analysis see Bellomia and Buonomo (in preparation).

marks that appeared at the ends of each of the remains – suggests that both the bones were disarticulated from the body of a recently deceased individual. Both of the specimens were made into musical instruments using several manufacturing techniques. The bone material was first cleaned using an irregular lithic tool as testified by the scraping *striae* left on the surface of the remains. After the remains were cleaned, sound-related modifications were made to the front surface of the femur. These modifications included the production of notches, which were manufactured by the *sciage* technique. This consisted of sawing the bone until the desired depth of the notch was reached. In the case of MPE 4209, the femoral inner cavity was opened by sectioning the distal epiphysis from the rest of the instrument body. A circular hole was manufactured close to the distal edge by manually rotating a conical sharp tool. After the desired sonic modifications were made to the instrument, the mosaic decoration was applied on the head and the neck of the femur MPE 4209.[26]

Interestingly, use-wear marks were visible along the edges of the central notches, which suggests that the repeated movement made by the scrapers to produce sound had been made in both directions, away from and then back towards the musician. The use-wear was taken into great consideration during the recording of the instruments, as an important performative data. The degree of use-wear on the notches of MPE4209 is quite extensive and almost completely degrades the notches, while that of MPE15395/G is lower, so that left the notches visible and well-preserved (**Fig. 5**). The measurements of the depth of the notches confirm a visual rhythmic patterning that is inscribed on the body of the instrument. The depth demonstrated an intentional positioning of the perforated notches at regular intervals. This is clearly shown in the histogram in **fig. 6** that refers to the MPE 4209 instrument.

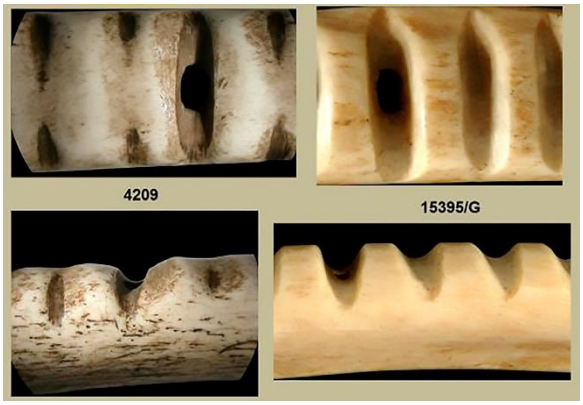

Fig. 5: Comparison between the different degrees of wear on the notches of the two instruments: front view (top), section (below). the consumption of the bone surface of MPE 4209 (left) is visibly greater than that of MPE 15395 / G (right). Optical microscope photo by Ivana Fiore.

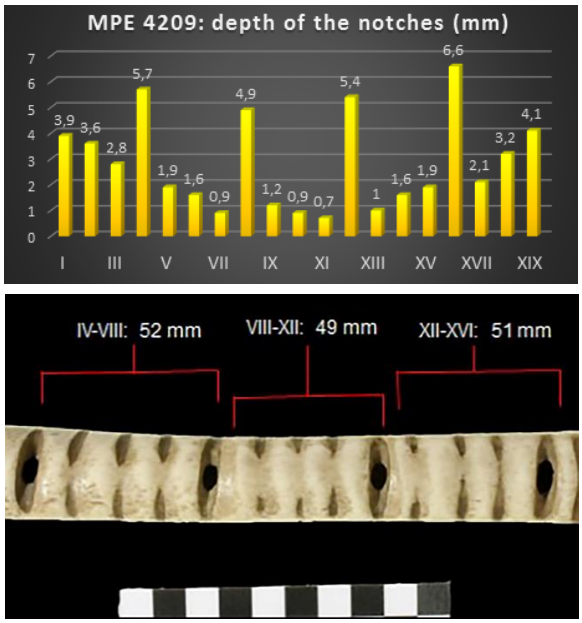

Fig. 6 A: MPE 4209: gradual variation of the depth of the notches, with evident four peaks of depth in correspondence of the four perforated notches. B: Measure of the regular distances between the perforated notches (histogram and image by Author).

The main goal of the acoustic analysis was to quantify to what extent the intentionally increased depth of the four perforated notches affected the production of the corresponding sound pulses, thus experimentally verifying the presence or absence of any acoustic effect

[26] For a detailed reconstruction of the *chaine operatoire*, see Bellomia – Fiore, in press.

deriving from the positioning of the holes at regular intervals.

The recording session made us able to get as close as possible to the timbre of the instruments, which had been still little investigated. The analysis of the spectrograms and of the corresponding waveforms visually demonstrated different frequencies emitted by the two instruments as well as sound variations when different "scrapers" were used. An analysis of the recordings confirmed that there was a certain degree of audio-visual rhythmic intentionality in the manufacture of the instrument and in the placement of the perforated notches at regular intervals. The recordings revealed thus the *intention behind the action*, that is the conscious choices that guided the manufacture of both the artefacts.

Another important goal of the recording session was to investigate the possibility of returning the multisensory dimension of these instruments so that museum visitors could have the opportunity to experience them in a more complete way.

Discussion

The analysis of the bone rasps presented in this article is an example of the scientific processes involved in the attainment of sound from artifacts. Our goal was not only to deepen the knowledge of specific artefacts, but also to suggest one way to exhibit these instruments and their associated sounds to the public. From the beginning of our analysis we faced a problem with regards to their definition as we struggled to emancipate them from a Eurocentric organological classification, which could have resulted sterile if not accompanied by an analysis of the Mesoamerican cultural context of use.

We considered the bone not only from the anatomical point of view, but also considering the *emic* definition as a chicahuaztli made of bones, "a bone container of vital energy". The etymological analysis is necessary for understanding the indigenous cultural perception of human body and the use of it as raw material for the manufacture of the omichicahuaztli. Osteological and taphonomic analyses let us reconstruct the material identikit of the bones and the manufacturing stages. The recording and analysis of the sound tracks gave us further information and another perspective of the organological structure of this idiophone classification. Additionally, the acoustic analysis experimentally confirmed the supposed intentionality in the positioning of the notches and holes that characterize this type of instrument and make it a sound producing device.

Ancient musical instruments often present as a very stimulating case study, forcing us to question our own analytical categories, as these artefacts represent a combination of material and immaterial culture.[27] As already mentioned, the Mesoamerican bone rasps currently on display in several museums' collections, were traditionally examined and displayed due to their iconographic meaningful surface and their sound function was ignored. This traditional "iconographic" approach has remained unchanged throughout the last century, and this has resulted in objects becoming subjected to a purely visual contemplation in the exhibiting space of Western museums. In some recent works there is actually an attempt to study the organology of some other bone rasps from Oaxaca, but these scholars still focused on the taphonomic traces of these instruments and less space was given to recording and analyzing the sound produced by the instrument.[28] Moreover, musical instruments now on display in Western museums give us the chance to investigate the different exhibiting techniques used to convey contents of immaterial nature. The presence of musical instruments behind the glass case should be not only visual but also acoustic. Thus, an acoustic analysis of the instrument's

[27] Stockmann 1984, 4.

[28] Higelin, 2012; Sanchez – Higelin 2014.

capacity to produce sound has become essential.

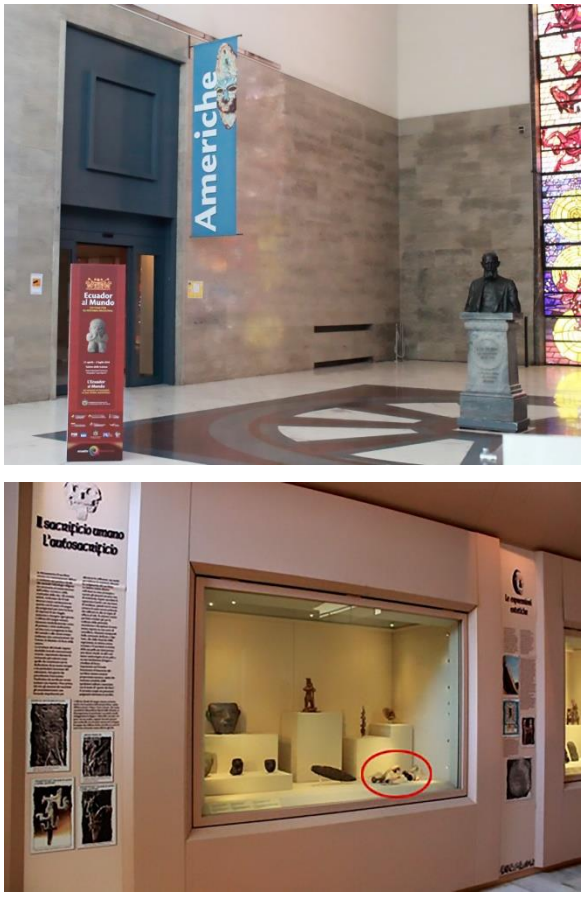

Fig. 7 A: The entrance of the exhibiting room "Americhe". B: the showcase dedicated to human sacrifice (courtesy of the Museo delle Civiltà – Museo Pigorini, Roma).

Emphasis on the importance of Mesoamerican archaeomusicology has grown consistently in recent years. The discipline is moving away from the classificatory tendency of the 20th century[29] to question the materiality of musical instruments and to investigate their historical trajectories and meaning.[30] The progression of archaeomusicology as a discipline was influenced from the beginning by the progressive approach of ethnomusicology to cultural anthropology that took place during the second half of the 20th century, looking at sound related material artefacts as precious sources for a better understanding of ancient music as a culturally marked behavior.[31]

The theoretical framework of this research has also been greatly influenced by the concepts of materiality and material culture in archaeology and anthropology, which focus on the infinite ways human beings and things *entangle* in a dynamic social network.[32]

Integrating theoretical approaches between archaeology and cultural anthropology offers a strong position from which we can address the issue of materiality of archaeological objects. In this light, we can consider archaeological objects to be more than indicators of cultural traits that can be studied from a "materialist" point of view. As such, in a museum context, artifacts as materials have a way of conveying meanings, stories, knowledge.

Of course, scientific analysis of material objects, according to the laws of natural sciences, can and often does give important results, but may be pushed too far. It should always be remembered that an artefact, regarded as a cultural element, can be considered the result of a complex of ideas in the minds of the human beings by whom it is made and used.[33]An artefact is generally aimed at responding to the wishes or desires of those who make it and then use it or even abandon it, to fulfill certain tasks. The way that the artifact takes shape is often directly determined by the technical capabilities, experiences and cultural purposes of its manufacturer or user but its materiality can also contribute to determining them, making the relationship between human beings and material objects circular.

In the case of archaeological artefacts, detecting the intentionality in the manufacturing

[29] Castañeda – Mendoza 1933; Martí 1968; 1978; Sachs 2013[1940].
[30] Schaeffner 1996 [1936].
[31] Blacking 1973; Both 2010; Giannattasio 1998; Kaufman 1992; 1990a; 1990b; Kolinski 1967; McAllester 1971; Merriam 1964; Nettl 1975; 2005[1983].
[32] Appadurai 1986; Gosden 2003; Gosden – Marshall 1999; Hodder 2014; 2012; Meskell 2005; Meskell – Preucel 2004; Miller 2005; Myers 2001; Thomas 1991. Hodder 2014; 2012.
[33] Izikowitz 1935, 2.

process begins with an analysis of their material aspects, which is then contextualized in a specific cultural framework. Materiality and its relationship with human beings is well represented in the case of the omichicahuaztli, an "exotic" musical instrument "trapped" in a museum glass case (**Fig. 7**).

Indeed, this research began with the identification of enduring properties of materiality considering artifacts as tangible vehicles to express specific cultural needs, as a typical positivist scientific approach may suggest. But as the study progressed, our roles as social actors demonstrated an "entanglement" in the circuit of human and non-human relations,[34] and we experienced what does it means to make and to perceive sound today using an archaeological musical instrument.

We had the opportunity to carry the study of the sound properties of these two bone rasps, analyzing them critically to detect the best way to give their ancient sounds a new location within the museum context. But some other questions raised during this research: what kind of sound can we produce today, playing musical instruments whose sound performance was originally experienced in a geo-historical circumstance that could not be re-enacted? What kind of experience can an exhibition of such sounds offer to visitors? Can we talk about an "authentic" acoustic experience? Finally, what does authenticity consist of, in listening to sounds ideally coming from a material past, but inexorably far from it?

The American conservator Barbara Appelbaum subdivides the life cycle of a museum artefact into five stages: original use, discard, collection, and institutional acquisition. Each one involves "a change of location, change of ownership, and change in use, with accompanying changes in attitudes toward many of its aspects. […]. All these changes in the lives of objects are accompanied by changes in values".[35] Panagiotis Poulopoulos, curator at the Deutsches Museum in Munich, applied this multi-stage biographical model to musical instruments, in a paper dedicated to the practice of "recycling" musical instruments preserved in museums, using a historical and socio-cultural perspective.[36] His primary focus are Western historical musical instruments, but some of his considerations are also valid for instruments coming from Non-European archaeological or ethnographic contexts. Moreover, a curator who works on ethnographic collections, is led to broaden his conception of artefacts to include intangible contents for the purpose of conservation. By virtue of this inclusion, he or she manages to overcome the ethical contradiction that arises deciding to "put objects at physical risk in order to facilitate the preservation of cultural significance".[37] Musical instruments are invented, modified, and eventually abandoned, in response to the expressive needs of specific times, places, and cultures. In our case, we considered the omichicahuaztli, not only as tangible archaeological specimens, but also as material testimonies of a cultural practice of the past, capable of producing intangible effects.

We argue that the five-stage model of Appelbaum can be successfully used to describe the life cycle of non-Western musical instruments, because it highlights their transition as sound objects to exotic museum artefacts.[38] During the 19th century, many private collectors and professional performers, driven by the scientific interest in acoustics from the perspective of Darwinian evolutionism, collected historical Western musical instruments as well as musical *exotica*, (i.e. extravagant sound devices acquired through frequent contacts with colonial areas outside Europe). They were fascinated by the exotic and went in search of unusual

[34] Hodder 2012, 88–112.
[35] Appelbaum 2007, 124.
[36] Poulopoulos 2016.
[37] Clavir 1996, 101.
[38] Bellomia 2017, 311.

artefacts that guaranteed them a privileged status in possessing them.[39]

Until the second half of the 20th century, the tendency was to maintain the material quality of musical instruments to assure a high degree of performative "authenticity". After which, the interest of musicians, researchers, and museum curators shifted more towards the preservation of the object itself, rather than the authenticity of the performance, due in part to contemporaneous developments in museum conservation at that time.[40] Since then, playing ancient instruments that belonged to museum collections became increasingly difficult, because the risks for their material conservation had been recognized.

Today, things are changing again. The general desire to "return to the senses" is expressed in museums through the application of "sensescapes", which further motivates the archaeological recovery of sensorial heritage.[41] Rather than looking for authenticity in the acoustic performance of an ancient instrument, which is definitely unachievable, scholars focus now on a better understanding of an instrument's sound properties through the use of senses. Scholars started applying a scientific approach for studying the "sound-ability" of the instrument. Sound-ability differs from "playability" in the sense that there is no pretense behind how an instrument was originally played, producing what we would call music. The concept of playability is based on an arbitrary judgment of the quality of sound; this cannot be considered a valid scientific method to analyze ancient sound related artefacts, especially when referring to instruments from non-Western cultural contexts. On the other hand, sound-ability recognizes a value to the study of the sound skills of the materiality of instruments, considering their original state of preservation and organological characteristics.[42] Furthermore, sound-ability can be investigated with modern technological reproductions of sound that can vary from basic recordings to more complex virtual acoustic patterns. Moreover, this data can be collected with a minimal stimulation of the instrument, without having to worry too much about the preservation of the instrument.[43]

The theoretical principles mentioned above guided our study of the acoustic properties of the Mesoamerican omichicahuaztli housed at the Pigorini Museum. The purpose of recording the sound of these instruments was not to verify the playability of the instrument (claiming to play them "authentically"), but to experiment their sound-abilities. We intended this concept as representing all the sound qualities inscribed in the physical body of the instrument, transformed by the hand of its producer, as they are experienced today by contemporaries.

At times, the body of musical instruments have at least two "voices", one musical and the other historical,[44] that are both worthy of being preserved for future generations. This forces scholars to choose between the preservation of one quality over another or put at risk the material integrity of these artefacts, to gather knowledge about their immaterial function. The authenticity of the "voices" of the omichicahuaztli do not lie in the adherence to their native sound phenomenon of the past, which is irremediably lost and impossible to reconstruct. Rather, the reliability of the result of an acoustic analysis of past instruments must be sought in the scientific study of the sound phenomenon

[39] Poulopoulos 2016, 92. 106. At the beginning of the 19th century, at the same time as the inauguration of the first modern museums, an intellectual movement called "Early Music Revival" spread among collectors and performers, aimed at an authentic experience of ancient music, for which it was essential to play the original musical instruments (Haskell 1996, 175).
[40] Poulopoulos 2016, 118.
[41] Classen – Howes 2006.
[42] Odell – Karp 1997, 6–7.
[43] Bellomia – Buonomo, in preparation.
[44] Watson 1991.

that they are able to produce today, respecting the material of which they are made.

Conclusions

The central aim of this case study was to demonstrate the benefits of taking an anthropological perspective at ancient archaeological heritage. We started with the question: can archaeology and anthropology collaborate to investigate the historical appropriation and display of the non-Western artefacts integrated in Western museum collections, and in a sense redefine their social role in contemporaneous ethnographic museums? In North American academic context, the approach to archaeology has always been characterized by its theoretical dependence with anthropology. This is due to the presence of many indigenous communities owning nowadays several autochthonous cultural traits. These communities are ideally considered heirs of the native material culture studied by archaeologists.[45]

In 19th century Italy, the reasons for the collaboration between archaeological and anthropological approaches were of a different nature than what we see in North America. The historical events of the 16th century, when Europe experienced scientific-philosophical upheavals as well as drastic changes to aesthetic trends (even different fashions and habits) would have subjected the Other to continuous redefinitions.[46]

The flow of exotic luxury goods from the Americas to Europe is testified by the rich ethnographic collections exhibited today in European museums. This is well demonstrated in 16th century Rome, the seat of the Papal State, which was the final destination of many ships charged with *exotica* sent as gifts and destined to enrich the Renaissance *Wunderkammern*,[47] from the beginning of the European adventure in the New World onwards. This is what happened to MPE 4209, which was taken away during the mid-16th century by a religious man, as a trophy of the victorious catholic evangelization against the indigenous violent practices. But then it started its European pilgrimage, and merged in different private collections as a weird exotic item. Finally, through the last exchange, it reached its modern location, becoming an example of the Mesoamerican use of mosaic decoration in 19th century and a material evidence of ancient pre-Hispanic human sacrifice today.

After being opened to the public and under the pressure of 18th century illuminist theories about science, museums have gradually incorporated as their heritage these exotic artefacts collected during Renaissance. A moment of great fervor for exoticism in Italy is the second half of the 19th century, when figures such as Enrico H. Giglioli, Paolo Mantegazza, and Luigi Pigorini gathered great amounts of ethnographic objects from each part of the world to exhibit them to the Italian public alongside Italian prehistoric objects. The use of interpretative analogy was a common custom among the positivists evolutionists scholars of that time.[48] The bone rasp MPE 15395/G arrived to the Pigorini Museum exactly during this epoch, as an example of the elaborated ancient Mesoamerican bone craft production, which according to those positivists scholars was comparable to that of European bone artefacts dating back to prehistoric times.[49] The Pigorini museum, still labeled Prehistoric *and* Ethnographic, is a very fruitful research field, by virtue of its special status of "double soul institute". Within its walls one can find a floor entirely dedicated to archaeological collections, mostly Italian artefacts dating back

[45] Willey – Phillips 1958, 1; Domenici unpubl.
[46] De Benedictis 1998, Domenici 2017.
[47] One of these *Wunderkammmern* was the *Museo Kircheriano*, founded in Rome by the German Jesuit Athanasius Kircher (Geisa 1602 – Rome 1680) in 1651, then merged into the Royal Prehistoric Ethnographic Museum founded by Luigi Pigorini in 1876.
[48] Nobili 1990; Caldarelli – Pulini 1988.
[49] Giglioli 1901, 185–186.

to prehistoric times, and another floor occupied by ethnographic Non-European heritage.[50] This double-faced nature of the institute makes it a historical document through which it is possible to test the complex relationship of interdependence of the two disciplines through time, in the study of the indigenous civilizations of the Americas. Other academic disciplines, such as art history, have also played an important role in defining Non-European collections now on display in Europe. For a long time, the exotic objects that have arrived in European museums have been defined according to their aesthetic value, as works of art *sui generis*; consequently, their values as historical and cultural elements have been obliterated by their nature as objects capable of arousing aesthetic interest. Barbara Plankensteiner, ethnologist and director of the Museum für Völkerkunde in Hamburg, reconstructed the academic trajectory that led ethnographic artefacts to be considered primarily by their quality as "art objects", simplifying their hybrid nature that includes art, history, anthropology:

> *Artefact is related etymologically and by its practical connotation to a narrative about the object's history of production and is in essence an aesthetic concept. [...] Ethnographic objects, which by their immanent character would have to be classified as artefacts, have been studied and collected by a discipline, that is, nascent anthropology, which in its early years adopted the methodologies of positivist natural history. Therefore, spatial distribution and taxonomic classifications dominated the research of the time and finally determined the classification of these objects within the museums and shaped their character until today.*[51]

Throughout this long journey through different epochs, no one has ever considered the sound properties of these bone rasps as a possible area of any scientific study. Instead scholars were distracted by how these artefacts, as material elements of an abstract discourse on the Otherness, served to the West to define itself in opposition to something.

We here investigated the kind of information that can be obtained by studying the materiality of archaeological musical instruments and trying to reproduce their sound. We examined how the characteristics of sound may have differed from the "original" sound that these instruments once emitted when they were played by indigenous hands, within their own indigenous context. Finally, we discussed the problem of the great cultural barrier that exists between our present acoustic perception and a sound coming from such a distant time and space.

The previous pages have demonstrated how much a multi-disciplinary approach in analyzing ancient instruments can tell us about the individuals who may have manipulated them in the past. Not only does analyzing these instruments shed light on ancient indigenous sound production practices, but it also offers information about the people who brought these instruments to Europe; with precise religious, scientific or cultural intentions, or simply, with the desire to acquire the instrument based on its aesthetic properties. These intentions ultimately determined its acquisition into our museum collection and then its preservation.

The main goal of the last part of this article is to address the current social role of two Mesoamerican musical instruments in a European museum context and to what extent their narrative can be expressed through their showcase. Thanks to their material quality of being *perpetually coeval* to every time period when they were physically experienced by such multiple

[50] The latter corresponds to the first floor and it is organized in different exhibiting spaces, dedicated respectively to Africa, America, Asia and Oceania. While the second floor is dedicated to prehistory.

[51] Plankensteiner 2013, 159–160.

"humanities", these two omichicahuaztli have gone through different historical-cultural epochs, from the original funerary use in pre-Hispanic context, to the racks of Renaissance *Wunderkammern*, to the positivist displays of modern museums, up to the 21st century ethnographic museum context.[52]

A museum artefact has a contradictory nature. While it must be protected from natural physical degradation due to the passage of time, it is also paradoxically crystallized in a material form that places it in a temporal elsewhere that denies its *coevalness* with its observer-user.[53] The static condition of museums restricts the sensory experience of objects on display to an interpretation that is primarily visual. This is especially true for a museum exhibiting artefacts that were once meant to be listened to and can no longer remain silent. Indeed, the very nature of sound producing artefacts, such as the omichicahuaztli, encourages a methodological approach that involves the use of the senses. Archaeomusicology enriches our knowledge of the human sensorial experience in the past and projects it into the present in the museum context.

A museum exhibition centered on an ancient civilization's music creates a very different experience to an audience than what may have been originally experienced in the past. This variable experience forces scholars to recognize the fluidity of the sound produced from ancient instruments, situating the sonic perception into the present rather than trying to obtain the past. It is important to maintain the integrity of the sound from the ancient instrument so that the public is not deceived by claims of past sounds *as they were meant to be heard*. To represent the present perception of sound in

Fig. 8: Detail of the showcase showing the omichicahuaztli on display (courtesy of the Museo delle Civiltà - Museo Pigorini, Roma).

museum exhibits, we can begin by studying the material properties and the corresponding sound-ability of the archaeological musical instruments as objects par excellence related to the ancient sound production.

The feeling after the conclusion of this study is that something intangible continues to escape us, the ancient sound phenomenon yet remains in many ways unreachable, elusive, difficult to frame with the scientific tools at our disposal, because of its ephemeral nature. However, the new data presented in this study has built upon our knowledge of this category of instruments. What needs to be done now is to use all the gathered information to enrich the exhibition languages and techniques offered to visitors.

These objects were pulled from a museum showcase and to the same showcase they will have to go back. But together with their materiality, we have now also their sound. Thus, the results of this study are destined to enrich the current "sacrificial" interpretation of the bone rasps, which does not exhaust their complexity (**Fig. 8**). As an outcome of this research, a possible future direction will be to integrate the audio tracks into the exhibition, accompanying the instruments on display, to allow visitors to listen to, as well as to observe, such ancient sound producing devices.

[52] Bellomia 2017; Domenici 2016.

[53] Fabian 1983.

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