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SOUNDS OF DEATH AND LIFE IN MESOAMERICA: THE BONE FLUTES OF ANCIENT OAXACA

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Introduction

Music archaeology is an inherently collaborative endeavour, bringing together experts from an array of fields to draw inferences about the physical and social aspects of music in ancient societies. As several authors have noted (Hickmann 2002; D. Olsen 2007), music archaeology requires both data and expertise from scholars in fields as disparate as musicology, ethnography, archaeology, art history, epigraphy, and history. In this paper, we demonstrate the efficacy of an interdisciplinary approach to music archaeology by presenting the case study of a bone flute from Oaxaca, Mexico. Employing perspectives from anthropological archaeology, iconography, ethnomusicology, and materials conservation, we describe the entire research process: from the discovery of an ancient musical instrument to interpretations about the social context of ancient music itself.

The indigenous music of Mesoamerica has been a subject of ongoing academic interest since the sixteenth century, when Spanish missionaries began documenting the use of music in Native American ceremonial practices. More recent examinations can be dated to the late nineteenth and early twentieth centuries, when scholars began to collect and document ancient musical instruments that entered the art market through illicit looting. Since that time, an enormous amount of information on ancient Mesoamerican music has been generated through research in iconography and art history, ethnomusicology, ethnohistory, and epigraphy. Archaeology itself has been under-represented in studies of ancient Mesoamerican music until recently. This has been due to the fact that most private and museum collections contain looted artefacts and because archaeologists rarely report musical instrument finds in any detail. Due to a theoretical shift away from materialist perspectives in anthropological archaeology, however, there is a growing interest in incorporating information from such objects into archaeological interpretations of ancient society.

This paper represents one such effort, as we seek to understand the social conditions of flute music in pre-Columbian Mesoamerica through the detailed analysis of a deer-bone flute from the site of Yugüe, on the western Pacific coast of Oaxaca (figure 1). The Yugüe flute is unique for several reasons. Dating to between 100 and 250 CE, it is one of the oldest complete bone flutes known for the ancient Americas.¹ Beyond its age, the Yugüe flute is also unique because it is elaborately incised with a design pertaining to the social significance of music (Barber 2007;

1. Bone flutes of equivalent or greater age include thirty-two condor-bone flutes dating to 2500 BCE from the site of Caral, Peru (Shady Solís et al. 2000) and a human radius whistle or flute from the Bourneville Mound, Ohio, a Middle Woodland (1–500 CE) Hopewell site (Baby 1961).

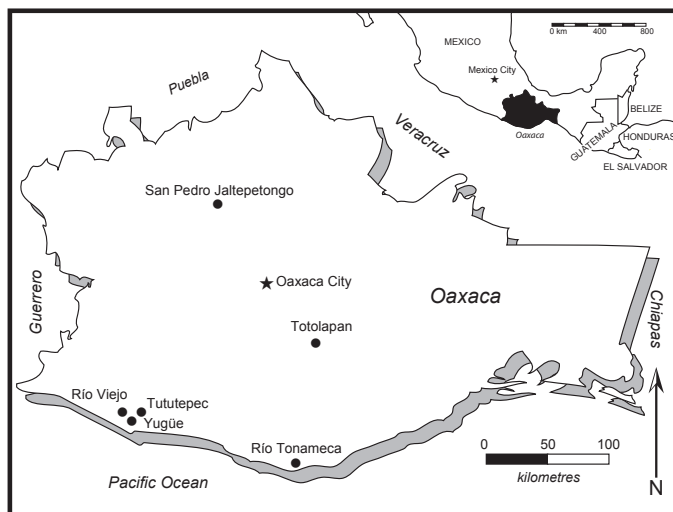


Figure 1. Map of Mesoamerica and Oaxaca showing location of sites mentioned in the text.

Barber and Olvera in prep.). One of six pre-Columbian bone flutes from Oaxaca, the Yugüe flute is the oldest and the only one for which there is well-documented archaeological provenience. For all of these reasons, the Yugüe flute is an invaluable resource for understanding the social setting of flutes, and music more generally, in ancient Mesoamerica.

The following pages describe the interdisciplinary research process we employed to study the Yugüe flute. We begin with a discussion of the archaeological recovery of the flute. The flute was a funerary object, having been buried with a young man who presumably played the instrument in life. The object was not initially identified as a musical instrument because it was in a poor state of preservation—a common occurrence for archaeological finds of such antiquity. For this reason, we next describe the conservation techniques that were required to reconstruct and stabilize the artefact. We continue with a brief iconographic study of the instrument's incising, a longer examination of which is being published elsewhere (Barber and Olvera in prep.). We then provide an organological analysis based on a consideration of the object's form and raw materials. Because of its fragility, the instrument could not be played. The preservation condition of the flute highlights a common dilemma in music archaeology: the near-impossibility of replicating and testing the acoustics of many ancient instruments. Since the instrument was made with an animal bone, any modern deer bone acquired to create a replica, even if its dimensions were similar, would have a different internal topography than that of the original instrument. We conclude by placing the Yugüe flute in the broader context of flutes in Oaxaca and Mesoamerica.

Archaeological recovery

The flute discussed in this paper was recovered during excavations undertaken at the archaeological site of Yugüe on the floodplain of the Río Verde (see figure 1). Oaxaca's largest river, the Verde drains much of western highland Oaxaca and enters the sea near the modern town of Tututepec. The site was founded some time during the later Middle Formative Period (700–400 BCE) and was abandoned at the end of the Terminal Formative Period (100 BCE–250 CE). At 9.75 ha, Yugüe was a relatively small site that probably would have been part of a valley-wide polity dominated by rulers living at the nearby urban area of Río Viejo (Barber and Joyce 2007; Joyce 2005, 2008). Yugüe's small size indicates that it was neither a political nor economic hub. Nonetheless, Yugüe may have had ceremonial significance in the region since the centre of the site consisted of an enormous earthen platform rising ten metres above the surrounding floodplain. Excavations at the summit of this platform uncovered several public, ceremonial structures that were used over a four hundred year period for community burial, feasting, and caching (Barber 2005).

The Yugüe flute was a grave offering included with one of the people who had been interred in a cemetery dating to the late Terminal Formative Period (100–250 CE). This individual, identified during excavation as Burial 14-Individual 16 (henceforth, the "Flute Player"), was a young man who had died between the ages of fifteen and seventeen (Mayes and Barber 2008). In life, the Flute Player had enjoyed good physical health and had not engaged in any heavy labour that would have left indications on his skeleton. His cause of death is unknown, but it was neither caused by injury nor by an illness that had affected his skeleton before he died. The Yugüe flute, a four- or five-stop instrument made from a left deer femur, had been placed in his left hand, oriented as it would have been played. His fingers were curved around the bell, the stops were facing away from his body, and the entire instrument was resting against his left forearm. He was wearing a plaster-backed pyrite mirror pectoral and a small ceramic jar had been placed at his feet.

The Flute Player's physical condition and his grave goods indicate that he was an individual of unusual social status at ancient Yugüe (Barber 2005; Mayes and Barber 2008). Analysis of his teeth and joints has shown that he was healthier and performed less physical labour than most people who had been buried in the Yugüe cemetery (Mayes and Barber 2008). Good physical health and reduced labour are both common characteristics of higher-status people.

Furthermore, the Flute Player's grave goods constitute some of the most elaborate offerings known for the pre-Columbian era in the lower Río Verde valley. A musical instrument like the Yugüe flute would have required specialized knowledge to produce. The incised design on the flute's surface, furthermore, reflects considerable artistic skill. Both specialized knowledge and artistic skill are widely accepted by anthropologists as factors that increase the social value of an object (Mills 2004; Weiner 1985, 1994). The pyrite mirror around his neck was imported from the Mexican highlands because neither pyrite nor the limestone used to produce plaster occurs naturally on the coast of Oaxaca. Like skilfully produced



Figure 2. The Yugüe flute as it appeared during excavation.

objects, artefacts imported from great distances were often inherently valuable in ancient Mesoamerica (Helms 1988). Mesoamerican mirrors, in particular, were potent ceremonial objects associated with rulers, warriors, ritual specialists, and other high-status individuals throughout the pre-Columbian era (Schele and M. Miller 1986; Taube 2002).

Restoration

At the time of the flute's recovery, excavators were unaware that they had found a musical instrument, which is a common problem in music archaeology research. During excavation, only the left side of the Yugüe flute was uncovered—a section of the instrument that contained some of the incised design but no orifices (figure 2). Nonetheless the flute's significance as an art object was immediately recognizable, so special excavation techniques were employed to protect what was clearly an important and fragile artefact. Modern construction at the summit of the Yugüe site platform, combined with nearly two thousand years of erosion, meant that the Yugüe flute was not deeply buried. Therefore, the instrument had been damaged by plant roots, seasonal cycles of wetting and drying, and the downward pressure of soil and human activities on the surface. Excavation exacerbated these forces by changing the flute's preservation environment and exposing the artefact to new humidity levels and air temperatures. To prevent further damage, the flute was excavated in a block of the soil in which it had been buried and then sealed in a plastic bag. The soil at Yugüe created an ideal framework for supporting the flute and, along with the sealed plastic bag, insulating it from the damaging effects of aridity and high temperatures, both of which could have resulted in the complete disintegration of the object. The flute then was transported to Mireya Olvera's conservation laboratory in Oaxaca City where it could be excavated in a controlled environment.

An assessment of the flute in the laboratory confirmed the object's extreme fragility and identified several areas of significant damage. Most importantly, transverse fractures had broken the artefact into three large sections while smaller cracks and breaks had segregated it into over fifty small pieces. Warping of the

bone posed a further complication because some pieces, while still intact, could no longer be reconnected to the whole without leaving visible gaps. A second serious problem was the crystallization of salts beneath the bone's outer surface. This phenomenon had caused segments of the incised exterior surface to begin sloughing away from the rest of the bone. Salt crystallization had damaged the flute even before it was excavated since portions of the instrument's bell had disintegrated while it was still in the ground (figure 3). Additional damage was caused by roots and other organic matter, all of which had stained and eroded the flute's finely polished surface. To mitigate these sources of damage, it was necessary to saturate the many fragments in a polymer.

The Yugüe flute thus posed a significant conservation challenge. After removing the artefact from the block of earth in which it had been encased, it became clear that the object was a flute in addition to being an incised bone. Given the severe structural damage the flute had suffered, however, there was no way that the instrument could be played without altering its external appearance and thus reducing its archaeological and iconographic value. For this reason, conservation of the incised design was prioritized over accurate reconstruction of the flute's form. The combination of water and pressure had caused the flute's shape to become distorted in areas where it had not broken. This was particularly true near the bell and at the embouchure. This distortion was not corrected in order to facilitate the reconnection



Figure 3a. The Yugüe flute, ventral view of deer femur; embouchure is to the right.



Figure 3b. The Yugüe flute, dorsal view of deer femur; embouchure is to the left.

tion of a larger number of incised fragments (see the irregular re-fits of broken pieces in figure 3b). Ultimately, it was necessary to construct an internal support of balsa wood to enable the flute to support its own weight. While impeding organological analyses, the support does allow the entire incised design to be seen without visual distractions on the flute's exterior.

Organology

The application of modern conservation techniques revealed an elaborately incised flute. The instrument was made from the left femur of a white-tailed deer (*Odocoileus virginianus*). It measures 25.3 cm in length, 1.8 cm in diameter at its narrowest, and 5.7 cm in diameter at its widest. There were four stops on the front of the instrument. A fifth circular opening on the underside near the base of the flute was also probably a stop. A square opening on the underside near the top of the flute would have provided the edge necessary to force vibrating air into the flute chamber. The bottom edge of this opening is bevelled such that the edge slants down towards the interior of the flute. An air duct made of organic material would have been attached to the instrument to channel air into this opening. The top of the flute had a large circular opening that would have enabled the flute's maker to empty and clean the interior of the bone. The damage to the bottom of the flute made it impossible to determine the nature of the bell. The presence of finished edges in this area, along with several small openings, suggests that at least a portion of the flute's distal end was open.

Iconography

The iconography of the Yugüe flute reveals indigenous conceptualizations of musical instruments and musical production (for a more complete discussion, see Barber and Olvera in prep.). The central element of the incised design is a partially skeletal male figure facing toward the bell of the instrument (figure 4). The figure's skull was incised around one of the stops, which was incorporated into the image as an eye opening. Five curved incisions representing ribs indicate the figure's torso, while seven fine lines signify a long scalp lock running down his back. The legs, hands, and feet are all fleshed. Only the right arm and hand are depicted; these extend behind the figure near the left leg. The figure wears a patterned loin-cloth, the front and back of which are represented on opposite sides of the flute. A square cartouche with an X-shape inside may represent a buckle at the figure's waist. A long volute signifying sound extends from the skull towards the bell of the flute. Such volutes, sometimes called "speech scrolls," were a widely used means of depicting the movement of air in the pre-Columbian art of Mesoamerica, particularly speech, wind, music, song, breath, and scent (Taube 2001). Attached to the volute is a human face in profile. This second figure wears a long beak-like and fanged mask over his or her mouth and chin. Known as a buccal mask in Mesoamerican iconography, this feature is consistently associated with rain

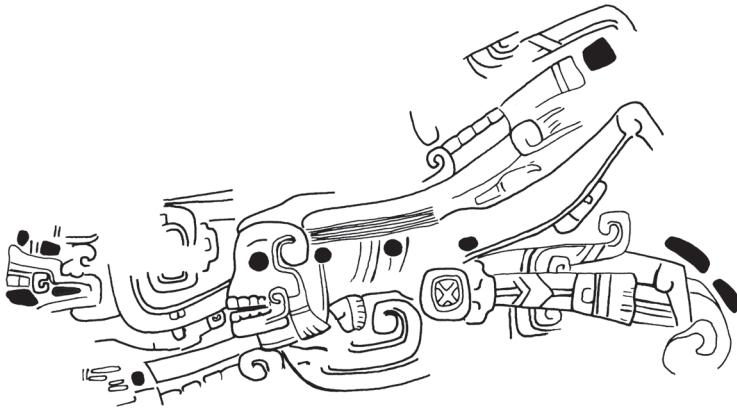


Figure 4. Roll-out drawing of incising on the Yugué flute.

and wind divinities in the pre-Columbian era. This second figure also has a volute extending from its mouth.

We interpret the skeletal figure incised on the flute to be a representation of the instrument's animate nature (for a longer discussion, see Barber and Olvera in prep.). The figure is positioned so that the depiction of its breath or voice is being projected toward the bell of the flute, which is the end from which the musical instrument produced sound. The figure thus is oriented such that, when the flute was being played, the sound would have appeared to emanate from his mouth. In addition, one of the stops of the instrument was used as the eye opening of the figure, thereby incorporating part of the instrument's sound-production mechanism into the skeletal individual's body. Finally, the figure's skeletal mien could be a reference to the fact that the flute was made of bone.

Our interpretation of the instrument's animacy is supported by research in Mesoamerican iconography, ethnohistory, and ethnography. A now-destroyed Postclassic Period (800–1500 CE) mural from the site of Santa Rita, Honduras, for instance, depicts a Maya standing drum (*pax*) emitting sound from the mouth of a skull set into the body of the instrument (Gann 1901:671; Hammond 1972; Houston et al. 2006). An Early Classic Period (300–600 CE) Maya conch shell trumpet has a face incised near the embouchure (Schele and M. Miller 1986:pl. 121). In a manner highly reminiscent of the Yugué flute, one of the trumpet's stops had been used as an eye opening. Citing the Spanish friars Torquemada and Sahagún, Both (2007:97) notes that certain musical instruments were worshipped in shrines where they were stored when not in use and that the sound of these instruments in religious contexts was considered to be the "voice" of the gods. In an examination of early Spanish documents describing music and dance in Central Mexico, Stevenson (1968:90) asserts that drums were treated as living beings by Aztec musicians. The view that drums are animate has continued into the modern era among several ethnic groups in Mexico and Guatemala. Ethnographer Evan Vogt (1977:239) comments on the special treatment given to a Maya *tunkul* (a

two-toned slit-drum) in Zinacantán, Guatemala. Vogt's informants described the two sounds produced by the instrument as older and younger brother. The Yugüe flute's iconography demonstrates that these later notions regarding the animacy of musical instruments have very deep historical roots in Mesoamerica.

One purpose of music, that of summoning powerful divine entities, also is explained by the Yugüe flute's iconography. The "voice" of the instrument makes manifest a second entity who is probably an ancestor impersonating a Mesoamerican rain or wind divinity (see Barber and Olvera in prep.). Ethnohistoric records support this interpretation. Flutes, in particular, played an important role in drawing celestial divinities into the realm of the mundane (Both 2002, 2005b). A description of Aztec human sacrifice in the *Chronicles of Michoacán* (Anon. 1970:218) includes the statement that "the trumpets were blown so that the gods would descend from the heavens." The early colonial *Cantares Mexicanos*, which contain a collection of sixteenth-century and pre-Columbian Aztec songs, are replete with references to the relationship between flute music and celestial phenomena. For instance, descending celestial divinities might play flutes: "It's God! Hear him! He descends from heaven, singing. Angels echo him. They come fluting" (Bierhorst 1985:165). Flutes are consistently associated with "flowery" places and sounds in the songs (i.e., "flower-fluting"; Bierhorst 1985:203). Flowers were an important metaphor for celestial and divine forces among many Mesoamerican peoples (Hill 1992; Taube 2004). The iconography of the Yugüe flute represents an early expression of the idea that flute music was linked with celestial phenomena.

Sound mechanism

The physical characteristics of the instrument provide insight into the technology of sound production. Characteristics of the instrument's shape and embouchure indicate that it was an external duct flute, following the musical instrument classification of Erich von Hornbostel and Curt Sachs (1961:26). Like all duct flutes, the Yugüe flute has an aperture with a bevelled edge that would have been the means by which the instrument produced sound (see figure 3b). The two large condyles of the deer femur make it impossible for a player to blow directly onto this bevelled edge, meaning that a duct would have been required to channel air to the aperture. No such duct is built into the body of the instrument itself since the mouthpiece end of the flute in its current condition consists of a single large opening in the distal end of the deer bone (figure 5). Thus a separate duct made of perishable organic material must have been used to channel air from the player's mouth to the sound-producing edge of the aperture. Any non-perishable duct, such as one made of bone or ceramic, would have been recovered during excavation. Based on observation of the instrument alone, it was not possible to determine whether this duct would have been located partially inside the flute chamber and partially outside the chamber or whether the duct was located entirely outside of the chamber.

Since the instrument's delicate condition precluded the possibility of conducting sound experiments with the flute itself, it was necessary to produce an experi-



Figure 5. Mouthpiece area of the Yugüe flute on the distal end of the deer bone.

mental model to determine how the instrument might have been played in antiquity. Experimentation focused on identifying the mechanism by which the Yugüe flute might have produced sound given the lack of an obvious mouthpiece at the time of its recovery. Because deer hunting is prohibited and coastal deer are rare, femur specimens are difficult to obtain and it was not possible to acquire a white-tailed deer femur of appropriate size for this study.² Instead, a goat femur of similar dimensions was prepared. Two different types of external air duct were tested on the experimental flute. The first consisted of a narrow plastic tube designed to mimic the shape of a bird feather. Given that the upper end of the flute was open, it was necessary to seal this section of the instrument in order to produce sound. A seal of beeswax was used to cover this opening and simultaneously hold the air duct in place.³ While the flute was able to produce musical sounds with this configuration, the tubular duct produced interfering noises. To reduce the noise created by the tubular duct, a flat duct made of two reeds was attached to the exterior using cotton twine. The twine was wrapped around both flute and duct along the length of the duct and then knotted. This method of attaching ducts is documented ethnographically among the Yaquis of Sonora (Densmore 1972) and the Coras of Nayarit (Jauregi 1993). The reed mouthpiece greatly reduced interfering noises

2. The femur from which the Yugüe flute was made is smaller than average (see S. Olsen 1964), which is to be expected for lowland tropical deer (Reid 1997:284). Highland Oaxacan white-tailed deer are much larger (G. Sánchez, personal observation), meaning that the more readily accessible femurs from a highland deer were not appropriate for replicating the Yugüe flute.

3. This practice is documented for modern indigenous Mexican groups such as the Lacandon Maya (Martí 1968:243) and the Pames (Contreras Arias 1988:176). Beeswax would have been a logical adhesive and sealant in pre-Columbian times as well.

and improved the clarity of the musical notes played, but the instrument's sound lost much of its intensity. A third possibility is that an air duct was placed inside the bone, entering the instrument through whatever organic material would have sealed the large opening at the end of the flute (remember that the bevel on the aperture points toward the interior of the bone). This last possibility will be tested in a future study because it will require the creation of a second experimental flute. While we cannot definitively determine the sound mechanism for this flute, it is clear that the mouthpiece and air duct would have been on the opposite side of the instrument from the stops.

Sound mechanism of the Yugüe flute in comparative perspective

The Yugüe flute represents the earliest known example from Oaxaca of a flute with the air duct on the opposite side from the stops, but there are at least five later examples made of ceramic and bone that share this means of producing sound. Two ceramic flutes are from the Oaxaca coast: one from the site of Río Viejo, located less than four kilometres from Yugüe (King 2003:217–19), and the other from the Río Tonameca valley about 130 km east of Yugüe (Brockington 2001:4). Dating to the Early Postclassic Period (800–1100 CE), the Río Viejo flute has a mould-made human figure attached to the front of the instrument near the embouchure. The Río Tonameca flute is undated although it has a similar mould-made human figure attached near the embouchure, suggesting that the instruments are contemporaneous. From inland Oaxaca, three bone flutes with mouthpieces and apertures on the side opposite the stops are known: one from the town of Totolapan near Oaxaca City and two others from a tomb in the town of San Pedro Jaltepetongo in northwestern Oaxaca. The two complete instruments, from Totolapan and one from Jaltepetongo, have six stops. All have apertures and mouthpieces on the side opposite the stops. The Totolapan flute, in addition, would have required an external duct since the aperture is five centimetres from the embouchure of the flute. The Jaltepetongo flutes date to the Late Postclassic Period (1100–1522 CE) (R. Matadamas, pers. comm. to G. Sánchez 2005) and the Totolapan flute probably dates to sometime between 900 and 1522 CE. The animal from which these flutes were made is not known, although the other six-stop Postclassic bone flute from Oaxaca, a type of *quena*, was made from a human femur (Mendoza 1941; Pimentel Díaz 1997).⁴ Another *quena*-type deer-bone flute, dating to the Late Postclassic Period, has a notch on the underside that may have been used for producing sound (Martí 1955:123; 1968:163–64).

While experimental playing and comparison with other finds cannot provide sufficient information to determine the mouthpiece configuration of the instrument, iconography offers additional data. There are depictions of flutes with air ducts on the underside in two pre-Columbian codices that refer to events taking

4. Usually associated with Andean South America but also present in Mesoamerica, *quenans* are end-blown flutes in which the player blows directly onto a bevelled notch on the embouchure of the instrument.

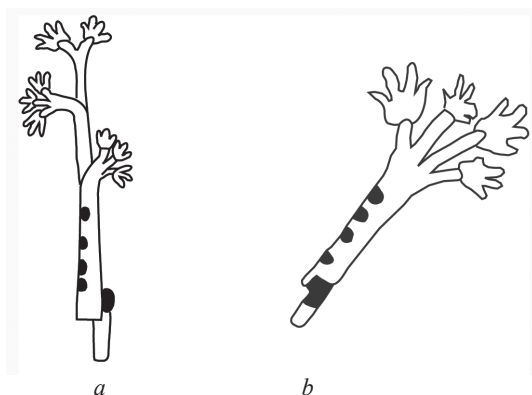


Figure 6. Hill of the Flowery Flutes: (a) Codex Tonindecye (redrawn from Nuttall 1975); (b) Codex Ica Nacuaa (redrawn from Caso and Leon-Portilla 1996).

place in coastal Oaxaca. Both codices date to the Late Postclassic Period and are believed to have been produced in the western highlands of Oaxaca. Plate 46 of the Codex Tonindecye lists places conquered by the Mixtec-speaking ruler Lord 8 Deer Jaguar Claw (1063–1115) (Nuttall 1975).⁵ Among the conquered towns is a place identified as the “Hill of the Flowery Flutes” (Hermann Lejarazu 2006). The toponym for the site consists of a hill with three vertically placed flutes that have flowers growing out of them (figure 6a). All three flutes have four stops and an external air duct on their undersides. The ducts are flat, probably made of reed, and must have been attached to the flutes using an adhesive such as beeswax or pitch. The dark colouring at the joint between the flutes and the ducts may represent just such an adhesive. Another possibility is that the extensions represent tabs used to direct air into the flutes, a practice documented for some Aztec flutes (Both 2005a). While the places depicted on plate 46 of the Codex Tonindecye have not been identified, Hermann Lejarazu (2006:24) has proposed that several of the towns on this page were located on the coast of Oaxaca near the ancient city of Tututepec, which is only twelve kilometres from Yugüe (see figure 1). Hermann Lejarazu (2006:24) goes further, suggesting that the conquered towns were inhabited by Chatino language speakers, the same language that would have been spoken by the inhabitants of Yugüe. A second version of Lord 8 Deer’s conquests is depicted on plate 7 of the Codex Ica Nacuaa (Caso and León-Portilla 1996).⁶ In the Codex Ica Nacuaa there is only one flute shown in the place sign for the Hill of the Flowery Flutes, but the style of instrument is identical to that of the Codex Tonindecye (see figure 6b).

The archaeological data indicate to us that there was a tradition in parts of pre-Columbian Oaxaca of using flutes with mouthpieces and apertures on the underside of the instrument. Given our very small sample size and a lack of comparative

5. Also known as the Codex Nuttall or Zouche-Nuttall (see Jansen and Pérez Jiménez 2004:269).

6. Also known as the Codex Alfonso Caso or the Codex Columbino-Becker (see Jansen and Pérez Jiménez 2004:269).

data from elsewhere in Mesoamerica, it is not possible to confirm that this technique of sound production was exclusive to the region prior to the Late Postclassic Period. Nevertheless the concentration of flutes with this type of sound mechanism in southern and western Oaxaca, as well as the thousand-year history of such instruments' use in this circumscribed area, may indicate that people who lived in the region employed a distinctive technique for producing some of their flutes.

The art and sound of ancient Oaxacan flutes

The Yugüe flute provides a unique opportunity to consider the social context and technology of ancient flute music in Oaxaca and Mesoamerica more broadly. In the era just before contact, flutes played an important role in ceremony because flute music was capable of summoning divinities. This indigenous conception of flute music was obviously very old since the iconography of the Yugüe flute represents a similar phenomenon even though it predates the period of Spanish contact by 1,300 years. Given the special ability of flutes to attract the attention of divine forces, flute players themselves must have had significant ceremonial responsibilities (e.g., Both 2002, 2007). The Yugüe Flute Player was no exception. He was interred not just with the Yugüe flute, but with a pyrite mirror, which was also a valuable and potent ceremonial object (i.e., Barber and Olvera in prep.; Olivier 2003; Schele and J. Miller 1983). His connection with the instrument and his ceremonial responsibilities were so important that he was buried with the instrument that he played. Other people buried with flutes are documented elsewhere in Oaxaca. For instance, the previously discussed Jaltepetongo bone flutes were recovered from a tomb (R. Matadamas, pers. comm. 2005). Because the Yugüe flute was understood to be animate by pre-Columbian people, a social relationship may have existed between the Yugüe flute and the Flute Player. While the ethnohistoric sources are silent on this topic, it may be that pre-Columbian Mesoamerican musicians and instruments had a bond that was analogous to the relationships of friendship, caring, and antagonism that characterize interactions between people.

Although common ideas about the social function of music were widespread both geographically and through time, the technologies employed to make music varied widely. Flutes were ubiquitous in pre-Columbian Mesoamerica, but the sound mechanism of several of Oaxaca's flutes is distinctive. The placement of the aperture on the opposite side as the stops occurs in instruments made from at least three media: bone and ceramic as identified in archaeological finds, and reed or wood as depicted in the codices. This specific sound mechanism was thus a result of social or cultural factors rather than simply raw material or desired sound characteristics. The geographically circumscribed region in which this configuration occurs suggests to us that, despite broadly shared ideas about the meaning of music, ideas about music technology probably were confined within more local traditions in pre-Columbian Mesoamerica. Local traditions themselves changed through time. The Yugüe flute is considerably older than all of the other Oaxacan flutes available for study, and it has several characteristics that make it unique

from the later instruments. Most notable is the fifth stop on the underside, a feature that does not occur in other examples and is extremely rare—though not entirely unknown—in Mesoamerica. The Yugüe flute also had a very complicated sound mechanism when compared with the later bone flutes of the *quena* type. Although there are many possible explanations, to some degree the differences must be a function of experimentation in musical instrument technology through time.

Conclusion

An interdisciplinary approach to music archaeology allows for the examination of many aspects of ancient music. In the case of the Yugüe flute, archaeological provenience revealed that the instrument was an object linked with a specific individual who would have fulfilled important ceremonial responsibilities for the small community in which he lived. Having knowledge of the site from which the instrument was obtained also allowed considerations of the development and geographic spread of specific musical technology. The careful excavation techniques employed, however, would have been useless without the subsequent application of materials conservation techniques that enabled the delicate instrument to survive the damage caused by its removal from the ground. Organology offered initial insight into the sound mechanism of the instrument and demonstrated the distinctive means by which the pre-Columbian peoples of Oaxaca may have designed some of their flutes. Iconography, ethnography, and ethnohistory were invaluable sources of analogy for interpreting the design on the flute and for reconstructing the sound mechanism of the instrument. Perhaps most importantly, music archaeology offers new perspectives and enables the generation of new hypotheses that will direct future research within all of the disciplines involved in music archaeological research.

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Abstract in Spanish

Resumen

Este ensayo presenta un estudio en la arqueología musical la cual se enfoca en una flauta hecha del fémur de un venado proveniente del sitio arqueológico de Yugüe, en el estado Mexicano de Oaxaca. Utilizando perspectivas de arqueología antropológica, conservación, y etnomusicología, discutimos la tecnología e ideología de la música de las flautas en la Mesoamérica antigua. La flauta de Yugüe provee datos invaluable en términos de estas perspectivas debido a su antigüedad (esta de 100–250 d.C.), su condición casi completa, y porque está tallada en una manera elaborada. La flauta era una ofrenda mortuaria la cual se había puesto en la mano de un joven elite quien murió entre las edades de 15 y 17 años. Al igual que la mayoría de los instrumentos encontrados en contextos arqueológicos, la flauta de Yugüe se encontró en un mal estado de preservación. Se requirió conservación profesional antes de estar analizada. La estabilización reveló una flauta con ducto externo y estaba tallada con una representación antropomórfica del mismo instrumento y de un ancestro o deidad que se manifestaba a través de la música. Aunque las incisiones estaban generalmente intactas, a causa de su condición delicada no fue posible tocar el instrumento. Una copia experimental se hizo para determinar el mecanismo con cual la flauta producía sonido. Basada en estos estudios interdisciplinarios, nosotros argüimos que la flauta de Yugüe era parte de una tradición tecnológica regional caracterizada por la ubicación de la boquilla al lado opuesto de lo orificios. Las incisiones indican que el instrumento era visto como un objeto animado que tenía la habilidad de manifestar fuerzas divinas o ancestrales. Finalmente, instrumentos más recientes de la época pre-Colombiana e imágenes de los códices demuestran que la tecnología e ideología representada por la flauta de Yugüe tenía una larga historia en la Mesoamérica.