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The *macuahuitl*: an innovative weapon of the Late Post-Classic in Mesoamerica

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This study is intended to shed some light on a number of issues relating to the famous Aztec weapon called the macuahuitl. *This well-known artefact still presents many problems of interpretation, resulting in a polemic that still rages regarding its origin, spatial-temporal distribution and its real role in Mesoamerican cultural development. The subject of warfare in Mesoamerica is still one of the main areas of investigation for many researchers. However, it is common for researchers to analyze the military phenomenon from a completely symbolic standpoint and overlook the practical aspects such as military tactics, weapons systems and battlefield successes. It is against this background that I have developed a programme of investigation that I have called the Research Programme into Military Equipment in Mesoamerica, which considers the phenomenon of war throughout Mesoamerica from various perspectives. I have initially focused this programme on weapons systems among the Mexicas as they relate to the battlefield.*

> *Sus armas eran unas navajas agudas, de pedernales, puestas de una parte y de otra de un bastón, y era esta arma tan furiosa, que afirmaban que de un golpe echaban con ella la cabeza de un caballo abajo, cortando toda la cerviz.*
>
> Their weapons were sharp blades of obsidian, set into opposite sides of a club, and this weapon was so fierce that they claimed that with one stroke they could chop off a horse's head, cutting right through the neck.
>
> José de Acosta (2003: 233)
>
> *… que dividen a veces a un hombre en dos partes de un solo tajo, con tal que sea este el primero, pues todos los demás son casi nulos e inútiles, tales son la agudeza de esta arma y su fragilidad.*
>
> … that sometimes divide a man in two parts with one single chop, provided this is the first, since all others are useless, such is the sharpness of this weapon and its fragility.
>
> Francisco Hernández de Córdova (1959: 407)

Sword, 'macana', or mace?

The term *macuahuitl* was used by the ancient Nahuas (native American peoples inhabiting central Mexico) as the name for a wooden staff about 70 cm long,

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fitted with blades of obsidian. The term means: *maitl* (hand) and *cuahuitl* (wood or stick) (Coe 1996: 220).

Most researchers characterise this weapon as a sword or '*macana*', by making a cultural comparison, just as the Europeans did when they first saw this artefact, and for that reason most modern studies have been wrong in their interpretation. I propose to call it none of the above, since, if we are strict about its morphology and function, we will see that the *macuahuitl* cannot be called a club since it did not fulfil a bruising function and it cannot be called a sword since a sword's characteristic functions are to pierce and to cut. The Aztec *macuahuitl* does not fulfil these criteria. I consider that it has no western equivalent and as such the *macuahuitl* is a totally Mesoamerican weapon.

Classification

There were at least two varieties of this weapon. The famous *macuahuitl* of about 70–80 cm long had a minimum of six to eight blades on each side. The smaller version was the *macuahuilzoctli* measuring about 50 cm long with a minimum of four blades on each side. It is probable that the first version is that which the Spanish described as 'for two hands' comparing it to their two-handed sword.

Background

If we were to list the many different authors who have mentioned this weapon in their narratives, we would have quite a long list, running from the chroniclers of the 16th century to the researchers of modern times. However, if we consider just those who have done a particular study of this weapon we could count our bibliography on the fingers of both hands, including this study.

Among the first people to mention this artefact were the Spanish Conquistadors who were confronted with it directly, in the hands of the indigenous people on the battlefield in the 16th century. The weapon was also recorded by monks (figure 1).

Of the many modern researchers who have studied this artefact, there are those who, in the course of their general work on the history and archaeology of the Mexicas, have mentioned the weapon without going into any great detail. There are also those who have written works on the Mexicas at war and who doubtless have been unable to disassociate this subject from the weapon in question. In some cases, research has been concentrated on presenting a hypothetical view of the function of this weapon in war, (Katz 1966; Lameiras 1985; Hassig 1988, 1992; Cervera 2003). Others have produced specific work such as Nickel (undated) and Coe (1996), the latter presenting some proposals about the weapon's probable origins. There are also those, such as González (1971: 147–152) and Pohl (1991, 2001, 2005), who have attempted to make reproductions for museums, and Clark (1989), who has produced some functional reproductions.

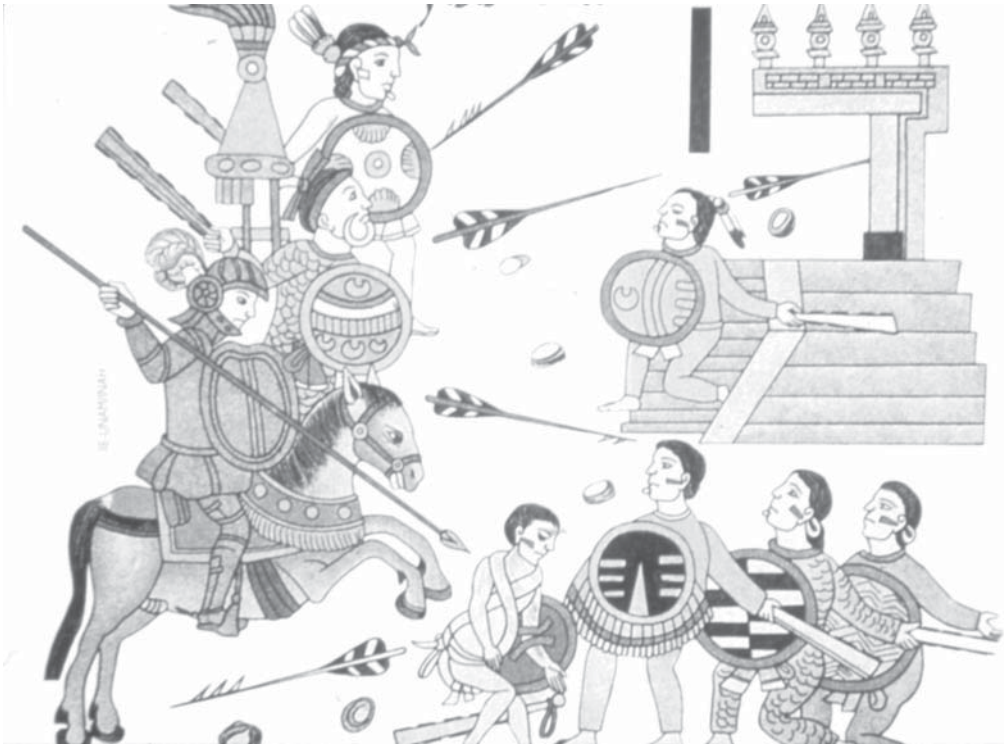

Figure 1 Indigenous warriors during the Spanish conquest, using the macuahuitl. *The* macuahuitl *was also used in the wars against the Spanish. This plate of the Llienzo de Tlaxcala shows this weapon with a design that is probably close to reality*. Lienzo de Tlaxcala, plate 35. National Library of Anthropology and History/INAH.
(Marco Antonio Pacheco)

Spatial-temporal distribution in Mesoamerica

There is hardly any record of this artefact in much of Mesoamerica before the Post-Classic period. The few records that we have refer to certain weapons that had similar functions without necessarily being a direct forerunner of the Nahua's *macuahuitl* as we know it among the Mexicas. Another problem we face is the ignorance and constant confusion by researchers when they consider all such bladed clubs to be *macuahuitls* without considering that they have completely different functions.

Below is a short summary of the actual places and areas of pre-Hispanic Mesoamerica where I have been able to find this artefact or similar artefacts which could be forerunners or variants of it. Any omission of certain regions and cultures from the analysis in this work is a practical one, brought about by the complete lack of evidence of this weapon, as in the case of the Gulf Coast, among other areas.

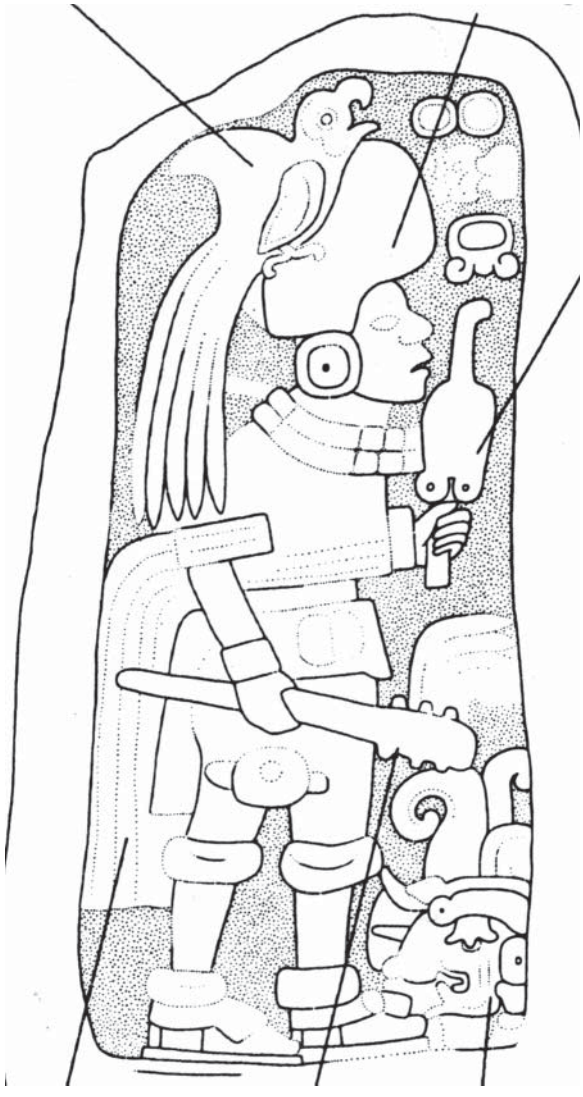

Figure 2 Stele 5 of Uaxcatún. The Mayas of the Pre-Classic already knew this type of club with flint points, but it seems this was not a very common weapon on the early battlefields of Mesoamerica. (Schele and Frieidel 1999)

As far as we know, the earliest evidence of the use of this type of instrument in Mesoamerica is found in the Mayan area. The Mayas of the Pre-Classic already had a type of club with flint points, as represented in Stele 5 at Uaxacatún (Schele and Frieidel, 1999: 169), though this weapon is quite different from that of the Mexicas (figure 2). This weapon is recorded in the murals of Bonampak, a Classic period Maya site, where it is shown as a wooden club without the obsidian or flint blades (Hassig 1988: 85). This is an interesting fact which will be explained later. Evidence of its use in the Late Classic appears in the mural paintings of Mul Chic, Yucatán, dating from between the years AD600–900. In this representation, we can recognise a young warrior holding in one hand a curved club with two blades, presumably made of flint (figure 3). This special

Figure 3 Detail of the mural paintings of Ixmiquilpan, Hidalgo State, Mexico. (Marco Antonio Pacheco)

type of club continued to be seen throughout the Early Post-Classic, recorded in sites such as Cichén Itzá in the form of a much longer stick with flint points. This appears in column 6 of the Temple of Chac Mool, and columns 8 and 52 of the Warriors' Temple (Morris 1931).

Archaeologically speaking, a rather controversial example was recovered in the sacred Cenote of Chichén Itzá, which is now in the collection of the Peabody Museum in the United States (Coggins 1989: 110). The controversy is again based on the incorrect identification of the object. The Peabody Museum classifies these weapons as wooden 'clubs', yet when we look carefully at the

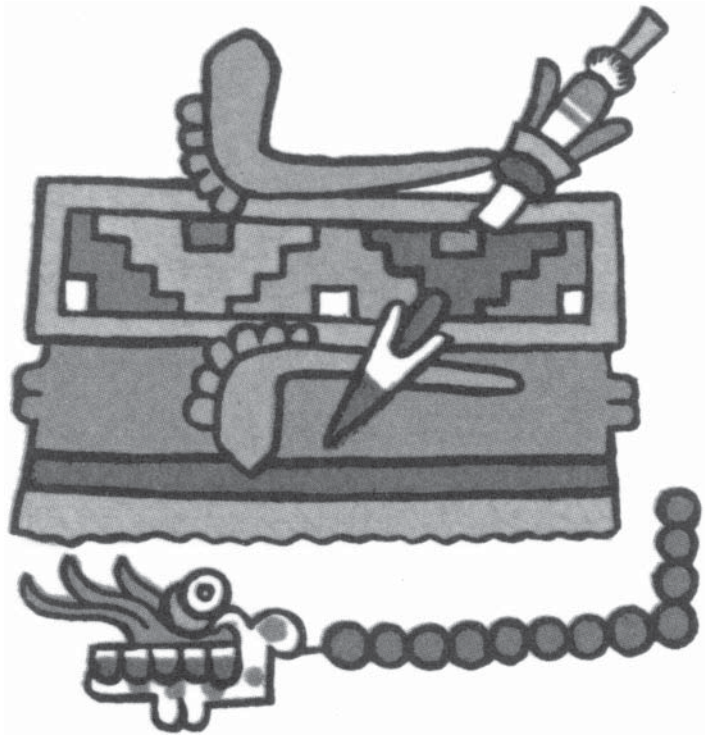

Figure 4 The macuahuitl *was already in general use by the Late Post-Classic throughout Mesoamerica. Some Mexteco manuscripts show versions of the different types of this singular weapon used by the Mextecos, including some that were used like a boomerang.* (Caso 1977)

object, we see that this is a separate part of what the Mexicas would have called a *teputzopilli* in the Náhuatl language, in other words a special kind of lance, manufactured with a long wooden stick to which obsidian blades were attached. This lance is made completely of wood, with carved simulated obsidian blades (Coggins 1989).

In the Oaxaca area, we find records from the Post-Classic period. Dahlgren (1954) says that the chronicles simply relate 'clubs' as wooden swords with obsidian blades, yet we know that manuscripts contain an interesting variety that cannot be found archeologically represented by any kind of instrument. Only the Bodley manuscript records the type of 'macana' normally found in central Mexico, since it seems the Mixtecos used a stick in the manner of a boomerang fitted with obsidian blades, a version that is completely different from the one we usually see. Unlike the latter, such 'swords' seem to have their edges made by inserting blades of obsidian (figure 4).

In summary, there are four types of *macuahuitl* among the Mixtecos. However, I must point out that I disagree with the type of 'club' that has been given the nomenclature D proposed by the researcher, which was without doubt the result of further confusion similar to that which occurred earlier with respect to the major difference between a 'club' and a lance. (Dahlgren 1954: 162).

The archaeological history of the Central Altiplano, including that of the Teotihuacanos and even the famous Toltecs, contains no record of this weapon before the Late Post-Classic period. Paul Kirchoff proposes in his study of historical sources that the Olmecas Xicalancas, during their migration across the

Central Altiplano, took up a number of cultural elements that they adopted into their own culture, including the *macuahuitl* (Kirchoff 1942: 25–26). But the main question in this argument is from whom did they copy this weapon?

One of the most interesting controversies surrounding the origin of this weapon is that the archaeological record of the Early Post-Classic in the cultures of Central Mexico does not make clear that this weapon was used by closely-related groups such as the Mexica and the Toltecs. It would appear that it was the Toltec society that invented and inherited this singular weapon from the Mexicas themselves, but the archaeological record is fairly poor. When we check both the sculptural monuments and the archaeological finds published up until now, this weapon at no time appears. As if that were not enough and arising from the, also controversial, cultural comparison of elements of Chichén Itza and Tula, it is curious to note that the Toltec sculptural records show no club with flint blades such as the ones that appear on the pilasters mentioned earlier (Jiménez 1998: 401). Could it be, maybe, that the weapons systems in the Mayan area were much more evolved than those of the famous Tula warriors of Hidalgo? This is a question that is still to be answered, along with the great debate between Tula and Chichén Itzá.

The origin and distribution of this weapon is a problem still to be solved and which no doubt includes the polemics mentioned earlier. As more and more archaeological finds are unearthed throughout Mesoamerica, this problem might be explained along with the diverse repercussions for understanding the weapons systems and tactical elements used on the battlefields of Mesoamerica. The fact that this weapon does not appear in any archaeological records so far recovered, in a good part of Mesoamerica before the Post-Classic, does not mean that it has not been used or at least not on such a grand scale as the lance or the *átlatl* were.

Finally, we come to the Mexica people, who are the best candidates to be the main innovator of weapons in their age. In spite of the fact that Toltec archaeology does not make clear their use in the Early Post-Classic period, written sources reveal otherwise. In another work, I have already tried to determine the moment when the Mexicas first used the weapons system that they would still be using even during the Spanish conquest (Cervera 2003: 53). Unfortunately, we have to understand that the history of the Mexica during the stage of the migration is fairly ambiguous, since it is a mixture of myth and history.

We know more about this Mexica weapon from written sources than from archaeology itself. According to some chroniclers, the Mexicas already knew about these weapons from the start of their history.

> *Electo el capitán general de esta gente, (Huitzilihuitl) mandó que por toda la frontera de aquel cerro se hiciesen muchas albarradas de piedra … donde todos se recogieron y fortalecieron, haciendo su centinela y guardián de día y de noche … aderezando flechas, macanas, varas arrojadizas, labrando piedras, haciendo hondas para su defensa …*
>
> Elected as the captain general of these people (Huitzilihuitl) commanded that all along the frontage of that hill there should be built many walls of stone … where all [the people] collected and strengthened themselves, posting their sentinels and guardians day and night … preparing arrows, clubs and spears, shaping stones, making slings for their defence …
>
> (Durán 1967: III, 35).

Some of these historical events occurred during the end of the Early Post-Classic period and, in theory, several of the peoples that settled in the Lowlands of Mexico already knew about this weapon (Cervera 2003: 31). Again, the polemic arises in knowing whether or not the real inventors of this particular weapon really were Mexica, as authors such as Michael Coe (1996: 220) have suggested.

For their part, the *conquistadores* had spoken of this weapon ever since their arrival on the coast, saying …

> *… vinieron por la costa muchos escuadrones de indios del pueblo de Potonchan , que así se dice, con sus armas de algodón que les daba a la rodilla (refriendo al ichcahupilli), y arcos y flechas, y lanzas y rodelas, y espadas que parecen de a dos manos, y hondas y piedras, y con sus penachos, de los que ellos suelen usar …*
>
> … many squadrons of Indians of the Potonchan people came down to the coast, with quilted armour that reached to their knees (the *ichcahupilli*), bows and arrows, spears and shields, and swords that appeared to be two-handed ones, slings and stones, and the plumes that they always wear …
>
> Díaz (1999: IV, V)

Others, with some exaggeration, describe their use in battle.

> *Sus armas eran unas navajas agudas, de pedernales, puestas de una parte y de otra de un bastón, y era esta arma tan furiosa, que afirmaban que de un golpe echaban con ella la cabeza de un caballo abajo, cortando toda la cerviz.*
>
> Their weapons were sharp blades of flint, set into opposite sides of a club, and this weapon was so fierce that they claimed that with one blow they could chop off a horse's head, cutting right through the neck.
>
> Acosta (2003: 233)

But of all of these, nobody has produced such a detailed and interesting narration as the one by Francisco Hernández de Córdova (1959: 407), who stated that:

> *… que dividen a veces a un hombre en dos partes de un solo tajo, con tal que sea este el primero, pues todos los demás son casi nulos e inútiles, tales son la agudeza de esta arma y su fragilidad.*
>
> … they can split a man in two with a single blow, provided this is the first one, since all further blows are useless, such is the sharpness of this weapon and its fragility.

Pictographic documents note its use and principally its form. Illustrations of these weapons appear in manuscripts such as the *Mendocino, Ixtlilxóchitl, Telleriano Remensis, Azcatitlan,* and the *Lienzo de Tlaxcala*, among many others emphasizing the fact that, in the context of these documents, no association has ever been found of this weapon with any ritual use except in the famous ceremony of the gladiatorial sacrifice, in which warriors captured in battle were tied by the ankle to a large rock called a *temalácatl*. The prisoner was given the chance of release if he overcame seven elite Mexica warriors, armed with a shield and *macuahuitl*, equipped with obsidian blades, while the captive was equipped with a shield and a wooden staff decorated with cotton plumes to simulate the obsidian blades (figures 5, 6, 7, 8).

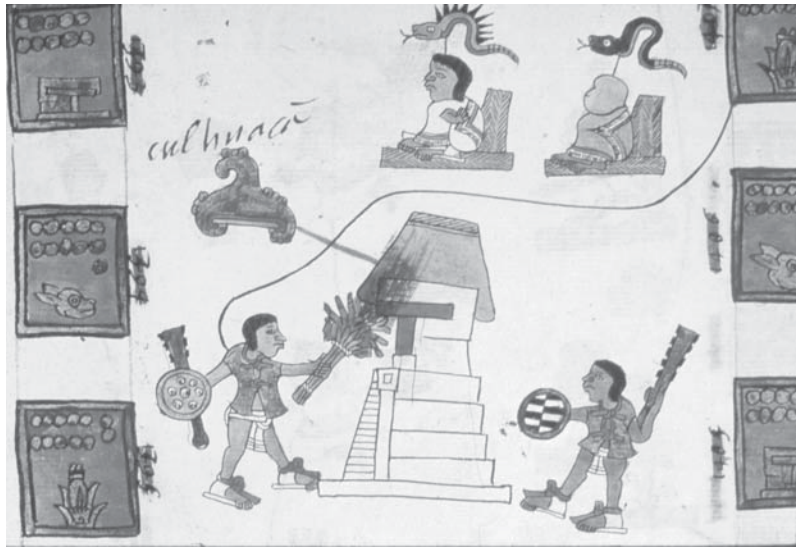

Figure 5 Warrior with macuahuitl. *According to some manuscripts the first Mexica armies used the* macuahuitl *as a weapon, as in this case, during the conquest of Culhuacan. Telleriano Remensis Codex, fol. 29r.* National Library of Paris, France.
(Marco Antonio Pacheco)

Figure 6 Nezahualcóyotl. From the different representations of the macuahuitl, *we find this in Ixlilxóchitl Codex, where it appears to be longer and with more blades, eight on each side, compared with the short handled version. Ixtlilxóchitl Codex f. 106r.* National Library of Paris.
(Marco Antonio Pacheco)

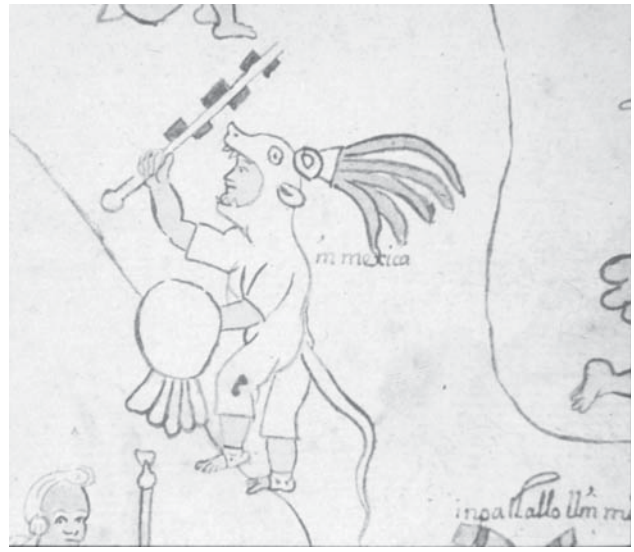

Figure 7 Warrior with macuahuitl. *In this colonial codex, the image of the* macuahuitl *is quite distorted. It appears as a very slender baton with very prominent prismatic blades. Azcatitlan Codex, plate IX*, National Library of France. (Marco Antonio Pacheco)

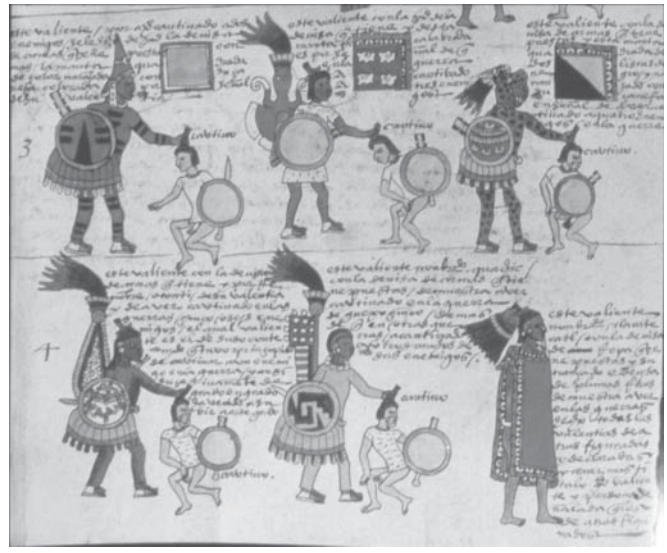

Figure 8 Mexica warriors with macuahuitl *holding a captive. It seems the Mexicas already knew of this weapon from the start of their history, including the various people the Lowlands of Mexico who were their enemies. This image shows a warrior with a macuahuitl fitted with blades, which could probably be removed after battle. Mendocino Codex. f. 65r.* Bodelian Library, Oxford. (Marco Antonio Pacheco)

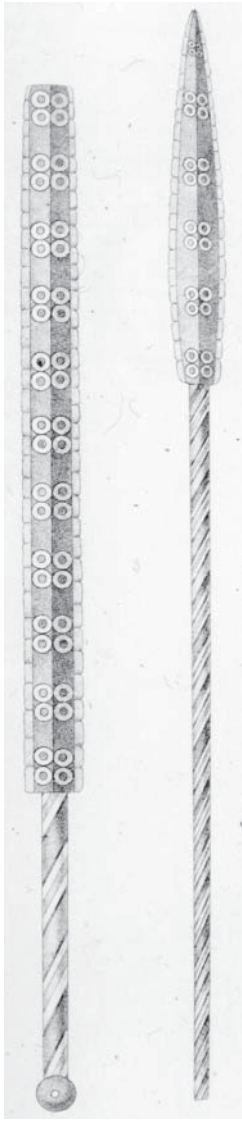

Figure 9 Macuahuitl and teputzopilli in the Royal Armoury in Madrid. Illustration showing one of the few original examples of a Mexica macuahuitl, unfortunately destroyed in the 19th century. (Marco Antonio Pacheco)

Figure 10 Drawing of the macuahuitzoctli. Drawing of a ceremonial wooden votive macuahuitl made by the Mexica people. Collection of the National Museum of Anthropology in Mexico. (Redrawn by Morales)

If it were just from Mexica archaeological evidence alone, we might think that this weapon was hardly used by this people. Very few archaeological objects have been recovered. One of the original examples available was to be found in the Royal Armoury in Madrid until it was destroyed by fire in 1849 (Hassig 1988: 82) (figure 9).

During exploratory works carried out in the 1960s, before the construction of Line 1 and 2 of a Mexico City subway intensive excavations were done in which countless objects were recovered, many of them offerings or gifts (López 1993: 29). These objects included an original *macuahuilzoctli*, measuring about 50 cm

long, found at the corner of Tacuba and Allende (Higuera 1990: 506). This unique example is supposedly in the archaeological vaults of the National Anthropology Museum. In addition, we have a second example that opens up a certain amount of controversy. It is an indigenous reproduction made entirely of wood and recorded by Antonia Morales Monjarás in a study of pre-Hispanic carvings (Morales 1991) (figure 10). It appears that this example is not the same one reported by Mateos Higuera, since this is made entirely of wood, including an indication of the respective blades, while Higuera's report clearly states that there were stone blades inserted (1979: 205–273). Maybe this is an error of identification or in fact there is actually another example that has not yet been located.

From the point of view of the system of Mexica sculptural representation, we can examine the image of a stone box in the National Anthropology Museum, better known as the warriors' *tepetlacalli*. This monument has scenes carved on its four sides associated with militarism and the cosmic vision of the Mexica. In two of them, there are representations of two young warriors carrying among their finery a wooden shaft with three obsidian blades and with a *chimalli* on the other arm (Gutiérrez 1983: 142) (figure 11). I had initially interpreted this representation as a *macuahuitl*, but we know that it is a *macuahutzoclti* from its size and the three blades. We can say that this piece is one of the few sculptural representations from the Mexicas in which this type of weapon appears.

Figure 11 Warriors' Tepetlacalli. This seems to be one of the few Mexica sculptures showing a representation of this type of weapon. Mexica Gallery. National Museum of Anthropology, Mexico. (Marco Antonio Pacheco)

After studying the evidence in Mesoamerica, we can say that this controversy is still running because we cannot be absolutely sure of its distribution and much less of its origin. What is certainly clear is that at the start of the Late Post-Classic period, the Mexica's *macuahuitl* as described at the beginning was a weapon generally in use by the people in most of Mesoamerica, including groups such as the Mixtecs, Tarascans, Tlaxcaltecas and many others, even during their confrontations with the Spanish *conquistadores*. Its importance as a striking weapon was recorded even in artistic representations in the early time of the viceroy such as the images of the Franciscan temple of Ixmiquilpan in the State of Hidalgo, Mexico, which depict a group of Nahua warriors confronting the northern Chichimeca armies in the middle of the 16th century (Gruzinski 1994) (figure 12).

If there is controversy about its origin and distribution and its true function on the pre-Hispanic battlefield, there is even more when we analyze how war was waged among the Mexicas. I have already described what the historians thought about this weapon, but what really happened in pre-Hispanic times when it came

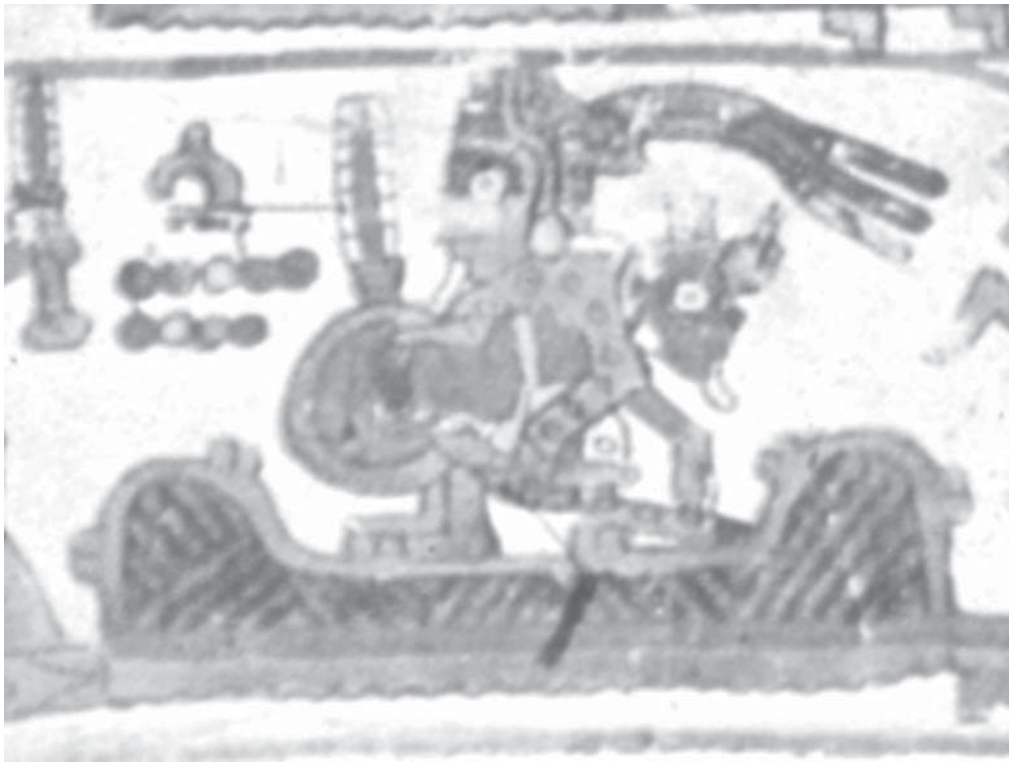

Figure 12 Mace with flint points represented in the paintings of Mul chic, Yucatan, Mexico. The evolution of striking weapons among the Mayans urged them to develop this type of elongated mace with large bifacial flints that made it effective in both striking and cutting. This type of mace continued at least until the Early Post-Classic. (Piña Chán 1972)

to armed conflict? Was the *macuahuitl* perhaps used on the battlefield as well as in some kind of ritual? Evidently not. I have already described in other works the characteristics of the Mexica at war and their respective tactics (Cervera 2003: 75–95).

The serious problem with the *macuahuitl* is without doubt the debate regarding its function, its strength and its destructive potential. On the basis of written sources, there are those who exaggerate the weapon's potential and are not particularly accurate about the reality of it, as in the case of Joseph de Acosta, when he says that with one blow it could cut the head off a horse, an idea that we now know to be impossible.

Some pictorial documents, such as the *Florentine Codex*, illustrate this weapon's cutting ability. According to this document, we know that when the Mexicas were at war, they occasionally uncovered spies among the enemy gangs marauding through the city of Tenochtitlan. Those that were captured were taken to a temple called *macuilcalli* or *macuilquiauitl* to be dismembered with the weapon from which that temple derived its name, the *macuahuitl* (figure 13).

The possibility of being able carry out dismemberment with this weapon is as controversial as the strength of the weapon itself. Francisco Hernández de Córdova assures us that this weapon could be used once only since its blades

Figure 13 Detail of the mural paintings if Ixmiquilpan, Hidalgo State, Mexico. (Marco Antonio Pacheco)

fractured after the first blow and had to be replaced. It is probable that there was a store of extra blades in the camps in order to be able to repair their weapons before the next combat (Clark 1989: 314). As other researchers have already said, it is highly probable that some kind of repairs would have to be done to one edge of the blades leaving the other exposed in order to fit the blades into the groove where they were set into the handle of the weapon (Clark 1989).

These claims give rise to a fairly reliable hypothesis that we can only prove by experimental archaeology – reproducing the weapon and using it on a surface as similar as possible to a battlefield opponent. For this purpose, we carried out the following experimental work.

The Mexica *macuahuitl*: its function on the battlefield

As previously stated, we do not have an original object made by the Mexica that we can copy scientifically and carry out experimentation upon, so we have had to collect a series of data in order to be able to define how to really carry out the experiment.

The instrument basically has the following morphological elements:

- club
- blades
- cord for attaching to the wrist and resin for setting the blades

We know from some sources that the Mesoamericans made their weapons out of excellent quality woods (Díaz 1999: 327). It has been suggested that the type of wood used for the handle of the weapon might have been pine (González 1971: 150) or oak (Hassig 1988: 83) of a type to be found in the Mexteca area (Dahlgren 1954: 167). According to archaeological finds relating to wood in the context of the Mexica, we know that the species used were mostly pine, cedar and willow (López 2003: 74). We have not till now been able to find a reliable source that will tell us the precise wood with which this artefact was made. My proposal is that the wood used for this must have been of great hardness and abundance if it was to provide weapons for the great Mesoamerican armies, so it is quite probable that the *macuahuitls* were made of encino oak.

Two questions arise with regard to how the blades were set and the type of material that was used to stick them into the side of the club. In this context there are various proposals. Francisco González Rul assures us that a type of 'Campeachy wax' could have been used (González 1971: 151). One of the top researchers concerned with the experiment and how it relates to the adhesive used with the weapon is John Clark, who made a reproduction to which he added a type of glue obtained from a mixture of herbs. This did not provide good adhesion when he tried to use the weapon and after a few blows the blades came loose (Clark 1989: 313).

From our point of view and following the historians directly, it was Francisco Hernández de Córdova who claimed that this was done using the tree resin that

has been confused in appearance with bats' guano. Hérnández is very particular, so it is worth quoting him (1959: 907):

> *Con estas cuchillos fijadas y soldados con la goma que los indios llaman tzinacancuítlatl (excremento de murciélago) a un madero de cuatro dedos de ancha y del largo de una espada común, fabrican espadas tan fieras y atroces…*
>
> With these blades fixed and stuck with the gum that the Indians call *tzinacancuítlatl* (bats' excrement) to a piece of wood four fingers wide and the length of a normal sword, they manufacture fierce and atrocious swords.

The way this gum was made, according to Martínez Cortés based on Hernández de Córdova, was to prepare a very strong resin mixed with copal and this was then used to fix the blades (1998).

A cord would be attached to a ring at the end of the handle and put around the wrist of the warrior to prevent the weapon from slipping from his hand during battle. We cannot be certain what material might have been used for this cord, but given some archaeological data from the textiles used by the ancient Mesoamericans, we may suppose that it might have been of very strong vegetable fibres such as the *ixtle* or the bast fibre.

It was necessary to find an expert woodworker to make the reconstruction. We know that when the Spanish arrived a good part of the Lowlands of Mexico was covered in temperate forest in which pine, encino oak, cedar and willow flourished. Of these, the encino oak is the one with the most suitable characteristics for making this weapon, especially its hardness. Initially, for the first test, we made an artefact of encino oak without rejecting the idea that in future we could try with other types of wood used by the Mexicas such as pine, which is much lighter and more flexible, but not as strong.

The form and approximate measurements were taken directly from the artefact in the National Museum of Anthropology, with the help of some manuscripts. The first dummy was produced, measuring 60 cm long and 2.5 cm thick. The groove for inserting the blades was half a centimetre too long, so we agreed to remove half a centimetre on the definitive version. It should be pointed out that this first dummy was made of pine and when it was held in the hand, it seemed quite heavy and hard, but more flexible that the one made of encino. The second really functional sample was of encino and was much harder and heavier (figure 14, 15).

The shape of the weapon was based largely on the manuscripts and descriptions from sources including the illustration of the one in the Royal Armoury in Madrid (Hassig 1988: 82). One slight difficulty was that all the representations in manuscripts showed the flat side of the weapon, leaving us to imagine how it looked edge-on. A further problem regarding the design came from the ethnohistorical information since the designs found in the manuscripts are the final product of different representational hybrid systems, both Spanish and indigenous and, for this reason, we found a great variety of 'designs' which in itself is a problem that doubtless detracts from the value of the design to be reproduced. We referred to documents such as the *Mendocino Codex, Ixtlilxóchitl Codex* and the *Lienzo de Tlaxcala*, among others.

Figure 14 Florentine Codex ANNEX to Book II, f. 110v. This plate of the Florentine Codex shows how spies were dismembered by directly attacking the joints, which gave the weapon the best chance of cutting. Biblioteca Medicea Laurenziana, Florence, Italy.
(Marco Antonio Pacheco/Raíces)

The entire handle was made initially from a large plank of encino wood, which was worked into the right shape. Modern tools were used for making the shaft instead of the pre-Hispanic ones that were probably used, including spoke-shaves, drills, planes and saws. After two days' work we managed to obtain the desired shape, including the groove into which the blades would be inserted. It measured 80 cm long, 7 cm wide and 3 cm thick. The groove for the blades was 4 mm wide (figure 16).

For the stones, it was necessary to enlist the help of archaeologist Gian Franco Casiano, who chipped a series of flakes from a piece of green obsidian from the Sierra de las Navajas for the saw blades. The initial aim was to obtain a series of lenticular blades that, according to the written sources and representations in manuscripts, was the material used for this weapon. Casiano proposed making flakes of obsidian and choosing those that had the straightest and most suitable edges for inserting into the handle of the weapon. Otherwise, we would just try to obtain the straightest edges possible. These flakes were produced using the pre-Hispanic methods of direct percussion, as practised by Casiano and his students at the ENAH.

According to Hernández de Córdova's records and interpretations regarding the type of resin used, we used a mixture of copal and pine resin which allowed

Figure 15 Reconstruction of the macuahuitl by the author. One of the stages in the reconstruction of the macuahuitl by Marco Cervera with the help of Marco Antonio de la Cruz and the archaeologist Gian Franco Casiano. (Marco Cervera)

Figure 16 Reconstruction of the macuahuitl by Gian Franco Casiano. (Marco Cervera)

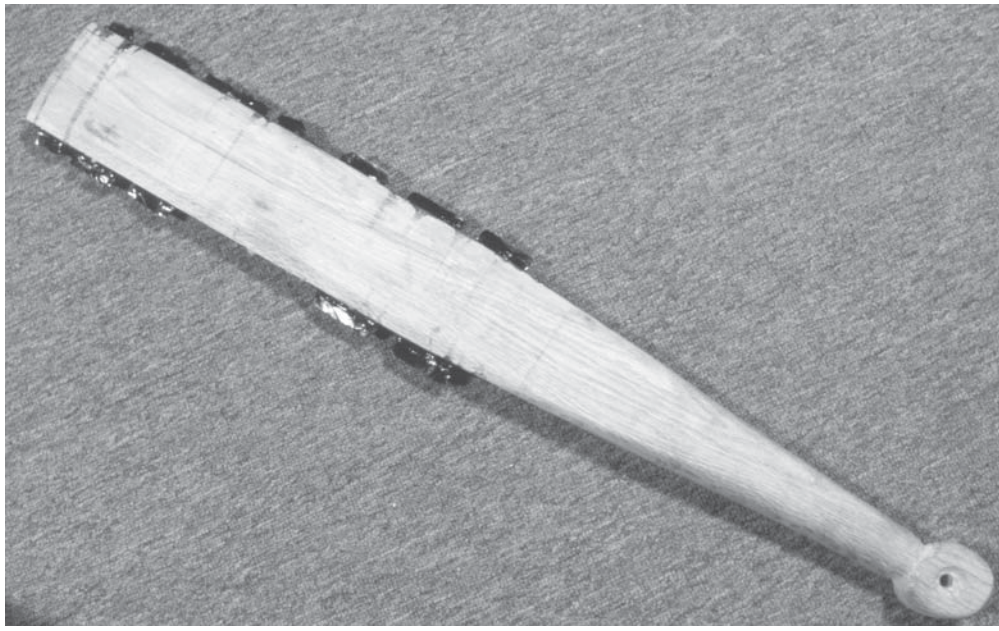

Figure 17 Finished reconstruction of the macuahuitl. (Marco Cervera)

us to obtain a fairly malleable and resistant paste. When the item was finished it had a series of seven flakes on each side, perfectly set with wooden wedges and completely coated in a mixture of pine and copal resin. The final weight with all its blades was 1.5 kg. The stability of the weapon when it was brandished was rather poor since the design itself and the great weight of the type of wood used did not allow good manoeuvrability in the various movements. Now it was time for the most interesting part of this research: the test of its strength and destructive potential.

It should be pointed out that there were a number of inconveniences to be taken into account with this first test, such as the major problem of determining the actual design from the little information available about this artefact, above all about its lateral section. Other aspects could be experimented with using further samples.

The two basic aims of this test were to discover how much injury this weapon could cause and its breaking strength. It was difficult for a while to decide what should be used for the impact test since the idea was above all to be as faithful as possible without of course causing physical harm to any living thing. To avoid argument and any type of legal problem, we chose to use the carcass of a pig taken from a slaughterhouse. In order to be able to perform the test properly, the specific point of attack had to be one extremity of the animal, with the idea of being able to cut through soft tissue, blood vessels and bone with one single blow, and also to learn the weapon's ability to withstand the first impact. Based on the points of attack referred to in the *Florentine Codex* we proceeded to project the weapon with one of its edges directly onto the joint of one of the animal's legs.

The first attack on the joint only managed to split open the tissue without reaching the bone. It should be pointed out that two of the blades came off the handle completely when the weapon was removed from the muscle. This was due to insufficient resin at the base of the blades inside the groove. The second blow was concentrated directly on the extremity, attacking the muscle and bone. The result was interesting since in this case the blade managed to penetrate the tissue and a portion of the bone. The edge of the blade fractured, leaving the section of chipped obsidian in the groove thanks to the adherence of the resin. The edge of the blade was literally fragmented into tiny chips that finished up encrusted in the bone itself.

Summary

From this brief research one can learn the following:

- Some groups of Central Mexico, principally in the transition between the Early and the Late Post-Classic, probably developed this weapon as a result of new technical needs of the battlefield even when their predecessors had weapons with similar form and functions to those of the Mayans.
- Speaking functionally, the *macuahuitl* was able to cut muscular tissue and make slight fractures of bones without being able to amputate it completely, and a large part of its edge would be transformed into tiny micro-flakes that would encrust the wound and bone and make it difficult for the wound to heal.
- As far as the weapon's strength is concerned the blades broke on impact with the bone, and if not perfectly set with resin they could come completely out of their groove. Otherwise, those blades that were properly set were still able to continue with the attack, even after they had broken. It is interesting to note the fact that the wood did not suffer any damage at all.

The tentative interpretation about the *macuahuitl* weapon system leads us to believe that a shield would be required to allow the warrior to defend himself from the impact of a second *macuahuitl* since this was not really designed for defence, but only for attack. The major inconvenience considering the weight of the reproduction is its poor manoeuvrability when using just one hand. In some pictographic documents such as the *Florentine Codex*, it can be seen that this weapon is used with two hands, which seems logical considering its weight and poor stability. However, the weight of the weapon allows it to cause greater damage by forcing the blades into the opponent's muscle mass. Another experiment with a lighter sample, that hypothetically sacrifices strength for manoeuvrability, is needed.

The results of this first test lead us to consider the damage that would be done when even one of the blades impacted on a limb and cut through to the bone, embedding micro-flakes of obsidian, prohibiting healing and causing infection. It seems apparent that the real utility of this weapon lies in the blades rather than in the wood. The main benefit derived from this investigation, and above all

the experimentation, is the construction of a model that can be developed in the light of future research and new archaeological finds into a more faithful representation of the original weapon.

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