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# Ancient Maya Stone Polishers And Issues With The Terminology For The Artifacts Polished With These Tools

Rachael Landry
*University of Central Florida*

# ANCIENT MAYA STONE POLISHERS AND ISSUES WITH THE TERMINOLOGY FOR THE ARTIFACTS POLISHED WITH THESE TOOLS

by

RACHAEL R. LANDRY

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# ABSTRACT

The ancient Maya adorned themselves with ornamental objects. This study investigates a type of polishing tool used by the ancient Maya to manufacture certain types of ornaments. Five stone polishing tools used by the ancient Maya are presented and analyzed. Relevant artifact forms are examined to establish which types of artifacts were being polished with these tools. An extensive discussion of the archaeological record and artistic representations of miniature earflares and buttons, which were polished with many of these stone polishing tools, is also included because the terminology used to refer to these objects has varied throughout the academic literature and is in need of clarification.

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# INTRODUCTION

This paper presents and analyzes a technology used by the Ancient Maya to polish artifacts. This technology involved the use of a specific form of lithic polishing tools. Artifacts in the process of being manufactured were rotated against these stones to produce a polish; this rotating motion eventually led to depressions in the stones. All of the polishing tools presented in this study exhibit these characteristic circular depressions. The shape of the bottoms of the depressions varies between these stones and reflects what forms of artifacts were polished with each of the tools. To understand which artifact forms were worked using this technology, an extensive review of miniature earflares and buttons, which were worked with some of these tools, is undertaken to demonstrate the ambiguity in naming these objects seen in the academic literature. This is important as these artifacts are often miscategorized which is misleading and can cause an incorrect understanding of what type of artifact is being referenced.

The ancient Maya adorned themselves with ornamental objects made of many materials including types of stone, shell, and bone. Considered a precious jewel, jadeite was highly valued by the ancient Maya and most likely prized above all other materials used for adornment. The properties of jadeite as well as its value are discussed in the first section as several of the polishers presented in this study where used in the manufacture of jadeite objects.

Following this, the lapidary techniques used by the ancient Maya are covered. This shows that working stone, and particularly jadeite, was a difficult and time consuming process; the Maya surely spent much time and effort manufacturing beautiful objects of adornment. The lapidary process is also relevant to the polishers used with non-lithic materials as objects made of other materials would have been worked in a similar fashion. This section will also explain that

although most of the lapidary tools used by the ancient Maya were likely formed from perishable materials, some lithic lapidary tools were also used. Particular attention will be given to the reaming and polishing, as well as the abrasives previously reported from the Maya area. This will explain the identification of the presented tools as polishers.

The next section details types of artifacts, jadeite and otherwise, that were processed with the stone polishers presented in this study. This will establish which forms of artifacts could have been polished with these tools based on the shapes and sizes of the depressions left on the tools. Only artifact forms that could have been polished with these tools are presented.

Following this, the archaeological record of miniature earflares and buttons will be examined in order to demonstrate the differences between these types of artifacts and to show how they were utilized. This section will highlight the fact that buttons have often been mislabeled and combined with other artifact types including earflares, miniature earflares, discs, or beads. The archaeological record also shows that, although miniature earflares and buttons were used together in some instances, they are actually distinct artifact forms often used for different forms of adornment.

Next, the artistic representations of buttons will be examined. This will demonstrate that buttons were utilized differently than earflares and miniature earflares. It also shows that buttons were a common artifact form during the Late Classic and Early Postclassic Periods.

This study then analyzes five stone tools used to polish ornamental objects. These five stones all contain multiple depressions that resulted from their use. The first two stone polishers were both recovered from Cancuen, Guatemala. Although these have been presented as earflare polishers, I argue they were actually used to polish buttons. The third polisher was used to polish beads; it was found at the site of Vargas IIA in the Middle Motagua Valley, Guatemala. The

fourth polisher, also used in the manufacture of beads, is from Caracol, Belize. The final polisher is from Nohmul, Belize; it is a multipurpose polishing tools used for several types of artifacts.

This study focuses on stone polishing tools and ornamental objects used by the ancient Maya. Investigations into the linkages between artifacts, their artistic representations, and the tools used in their production provides insight into what types of ornamental objects were being produced, where production took place, and how some of these objects were manufactured. It also corrects some of the terminology used by previous researchers.

# JADEITE

As many of the polishers presented in this study were almost certainly used in the manufacture of jadeite artifacts, the physical properties of jadeite and jadeite's utilization by the ancient Maya are first examined. The other polishers presented, although not necessarily associated with jade-working, also benefit from this examination. As stated by Digby (1964:11-12)

> It should be noted, however, that while there are . . . examples in jade of all the objects indicated as being made of that material, shell and bone were also being used for the same purposes, and no doubt part of the regalia of all but the most important personages may well have been made of these less precious materials.

## Physical Properties

The generic term “jade” refers to both jadeite and nephrite as well as these minerals in combinations with other minerals. Only jadeite and, more often, jadeite in combination with other minerals will be discussed since nephrite was neither available nor used in Mesoamerica. Jadeite is a silicate of sodium and aluminum and a member of the pyroxene group; it has a specific gravity of 3.3 to 3.6, and it's hardness on the Mohs scale is 7 (Proskouriakoff 1974:1). Pure jadeite is rarely found; it is much more often found mixed with other minerals, of which acmite, albite, and diopside are common. The green color of jadeite is due to tiny amounts of chromium, but chromium has also been found in colorless jadeite. There are additional inclusions that can change the appearance and physical properties of jadeite; these include albite, muscovite, mica, quartz, and other minerals (Proskouriakoff 1974:1). Jadeite can mix with molecules from other pyroxene minerals in any proportion (Foshag 1957:14).

Importantly, with the changing proportions of minerals, the hardness of the stone will also vary. While harder stone was preferentially selected by the ancient Maya for the finest pieces of adornment, softer stones were also worked to create minor objects. The ancient lapidary would have exerted less effort on these inferior, softer stones, usually reserving them for objects such as beads or simple pendants, but these stones were occasionally finely worked (Foshag 1957:24-34).

Jade is rare and only forms in a few places around the world (Kovacevich 2006:128). Jadeite forms in areas of high-pressure and low temperatures, alongside serpentine; these geological conditions are common in suture zones (Chenault 1988:92). The only identified source of jadeite in Mesoamerica has been found in the Guatemala's Motagua Valley, just north of the aldea of Manzanal. This outcrop covers approximately 400 sq. ft and contains jadeite as well as albite, serpentine, and green and black amphibole. Experimentation on this jadeite proved it to be identical to that found in some Maya artifacts (Foshag and Leslie 1955; Barbour 1957:411). Research conducted in this area has shown that these outcrops were utilized prehistorically (Walters 1982).

There have been many discussions as to whether or not additional sources of jadeite exist in Mesoamerica. Based on research into the chemical composition of jadeite from the Motagua Valley, Chichen Itza, and Costa Rica, Bishop and his colleagues concluded that the Pre-Columbian people must have used more than one source of jadeite (Bishop et al. 1993:40). Harlow (1993), on the other hand, argued that all the variations in color and composition found in jadeite artifacts could be accounted for by variation within the Motagua Valley. He argued that sampling was to blame for the artifacts and the source not matching and that all of the jadeite must have come from the Motagua Valley as no other area of Mesoamerica has the correct

geological conditions for jadeite to be able to form. Bishop and Lange (1993) argued for multiple sources of jadeite, countering that the chemical compositions of jadeite objects as well as the archaeological record all point to multiple sources.

## The Ancient Maya and Jadeite

Every early culture that had access to jade used it to form celts and other similar objects. More advanced groups additionally used jade for personal adornment and ceremonial objects. These early civilizations admired jade for its toughness and ability to take and maintain a high polish (Foshag 1957:1). In Mesoamerica, the earliest known use of jade dates to 1500 B.C. (Libby 1952:90).

Even though Chinese jade has been studied and written about much more extensively than Mesoamerican jade, the term jade actually originated in Spanish, referring to the American jade. The Spanish called the stones *piedra de ijada*, "loin stone"; jade was used at the time to cure ailments of the spleen, kidney, and liver (Easby 1968:7; Kovacevich 2011:152). Some of the early Spanish chroniclers during the Spanish conquest referred to jade in their writings; these chroniclers included Cortés, Díaz del Castillo, the Anonymous Conqueror, Sahagún, Motilinía, Tezozomoc, and Torquemada (Foshag 1957:3). They often referred to jade as "emerald", likely because jade was unknown to them at the time and only low-quality emeralds had been found from Austria and Egypt; the best jades from Mesoamerica had a better color than those emeralds (Foshag 1957:2-7). Monardes (1569), writing about the medical techniques and products of the Indians from the Americas, was likely the first to mention jade in print. He wrote:

> The other stone, which is called piedra de yjade and which appears to be the finest kind of emerald-plasma, tends toward green with a mixture of white, the deepest greens are the

> best. These are worn in various forms, as the Indians have worn them from ancient times, some like fish, others like bird heads, others like the beak of parrots, also others like round spheres, all perforated for the Indians are accustomed to carry them because of their effect in pains of the side or in the stomach, for which they are supposed to have wonderful effects.

The ancient Maya highly valued jadeite and considered it a precious jewel. Sumptuary laws restricting jadeite have many times been reported; these often state that only the highest levels of society were allowed to wear or own jadeite, but small amounts of jadeite found in caches and in the burials of commoners have shown that individuals from lower levels of society had some access to jadeite (Proskouriakoff 1974:1; Kovacevich 2011:151-152). There are some indications that jadeite could have been used as currency during later periods, but the fact that it is not seen in uniform sizes has led to some argument against this. The extreme value of jadeite to the Aztecs, reflective of the value placed throughout Mesoamerica, is seen in Montezuma's statement to Cortés (Diaz 1632:vol. 2, pp. 136-137):

> I will also give you some very valuable stones, which you will send to him in my name; they are *chalchihuites* and are not to be given to any one else but only to him, your great prince. Each stone is worth two loads of gold.

Due to the immense value of jadeite, the Maya carefully considered the size, quality, and color of jadeite nodules when deciding how they would be modified (Kidder, Jennings, and Shook 1946:119). If the raw jadeite was the correct size to make a single artifact, this would have been done. Otherwise, when the raw material was too large for any single object, the nodule would be subdivided. The quality of the stone was considered when selecting which artifacts could be formed from a jadeite nodule; low to medium grade stone was worked into beads instead of finer objects. The ancient lapidary also considered any color variations in the stone to decide if and how they could be incorporated into the design (Kidder, Jennings, and Shook 1946:119). Proskouriakoff (1974:18) cited the desire to preserve jadeite as the likely

reason for imperfectly shaped jadeite beads. She noted that the Maya were capable of creating precise shapes but were likely reluctant to destroy the extra jadeite that would have been lost if it was trimmed into a perfect shape.

Many worked pieces of jadeite still have patina on their undersides, produced when the jadeite pebbles spent time tumbling through rivers and streams (Lothrop 1955:50). Leaving the original surface on the jadeite would have preserved as much material as possible, as well as cut down on the amount of labor and time needed to shape the object. Although it has been shown that not all jadeite used by the ancient Maya was originally found in riverbeds, Kidder, Jennings, and Shook (1946:118-119) suggested that all jadeite used by the Maya was found in the form of waterworn pebbles.

Additionally tied to the value of jadeite is the fact that any excess pieces cut or broken off during the manufacture of a jadeite artifact would have been reused to make smaller artifacts. Increasingly smaller pieces could be made into irregular beads or mosaic tiles (Kidder, Jennings, and Shook 1946:119). Foshag (1957) also highlighted the preservation of jadeite, noting examples of pieces that had been reworked from completed jadeite artifacts as well as from the remnants of the manufacture of other jadeite artifacts. For Uaxactún he noted broken beads that had been reworked as well as sliced jadeite beads that had been utilized in mosaics (Foshag 1957:49). The objects made from the extra pieces included polished earplug cores from San Agustín Acasaguastlán and "small earplugs made from an earplug core" from Kaminaljuyu (Foshag 1957:49). Digby (1964:15) noted that the cylindrical core left over from tubular drilling was often made into a cylindrical bead.

Dating, as well as locating where a jadeite artifact was manufactured, is difficult because these artifacts are nearly indestructible and would likely have had many owners over the course

of their use, being passed down through generations, traded both locally and over long distances, and even being recovered from burials and returned to use. These issues make it nearly impossible to locate a jadeite artifact's exact date or location of manufacture (Easby 1968:11; Digby 1964:12-13; Joyce 2000:189-210).

As with jadeite, it is apparent that the Maya sought out stones with green hues (Chenault 1986:75) that resembled jadeite, such as actinolite, albite, jasper, metadiorite, amazonstone, muscovite/sericite/fuchsite, serpentine, talc, turquoise, and zoisite (all of which have a greenish color and were worked by the ancient Maya [Bishop and Lange 1993:123; Foshag 1957:24-34]). The hardness of these materials varies between 1 and 7 on the Mohs scale. These materials were used for making the same kinds of objects also formed from jadeite - including beads, buttons, pendants, celts, earflares, mosaic pieces, and figurines. The artifacts made from these materials are often found associated with pieces made from jadeite. Many of the aforementioned minerals are also commonly found combined with jadeite; even when this is not the case, the artifacts made from these jadeite-like materials are sometimes classified simply as jadeite. For example, although classified as jadeite, the button beads from Nebaj are commonly formed from actinolite and the shoe button beads from the same site are often from sericite (Foshag 1957:28). Additionally, the Rossbach collection from the Department of Quiché contains a large number of small earplugs; these are mostly in jadeite, but there are also a few formed from jasper, albite, and fuchsite (Foshag 1957:24-34, 42).

# LAPIDARY TECHNIQUES

The following section examines the lapidary techniques used by the ancient Maya. As most of the polishers presented in this study were likely used in the manufacture of lithic artifacts, this is vital to the understanding of these tools. Although this review of the lapidary process focuses on the production of lithic artifacts and specifically jadeite-working, it is also important to the understanding the process of shell artifact manufacture, which was likely being completed with the other polishers presented. Rochette (2009b:213) stated that "the production of shell ornaments and stone beads involved the same technology as that of jadeite artifacts." Even though this review of lapidary techniques focuses on jadeite, the manufacturing process would have been similar for any of the materials used with the polishers.

To determine the lapidary techniques of the ancient Maya it is useful to examine historic references from the time of the Spanish conquest as well as studying ancient tools and artifacts. Sahagún describes the production of *chalchihuites* (1963:223):

> They are formed in this manner: they are round, reed-like, like a navel, like a tomato, triangular, cut in triangles, formed into triangles, thin formed into squares. They are polished, ground, worked with abrasive sand, glued with bat excrement, rubbed with a fine cane, made to shine. They glisten, they are transparent; there light appears.

Foshag (1957:45-46) presented a translation of Sahagún's description of the lapidary practices of the Aztecs during the period of the Spanish conquest:

> 1. The master lapidary cuts rock crystal, amethyst, *chalchihuitl* [common jade], and *quetzalitzli* [fine jade] which an abrasive and hard copper.
> 2. And he scrapes it with a trimmed flint.
> 3. And he perforates it and drills it with a small metal tube.
> 4. Then he carefully smooths [sic] it, polishes it, gives it luster and so prepares it.
> 5. He polishes it in [or with] wood so that it shines.
> 6. Or the lapidary polishes it with bamboo and so prepares it.
> 7. And in the same manner the amethyst is prepared.
> 8. First he breaks it into pieces and trims it with [a] copper [instrument] because

he works only the good red material.
9. To prepare it in this manner it is not necessary to break it with [a] copper [instrument].
10. And then he grinds it and smooths it and makes it shine, and polishes it with wood, using the polisher with which they clean and prepare it.
11. And the stone called *eztacpatl* [bloodstone] is very hard and is not easily cut with the abrasive.
12. And it is broken by striking with a stone.
13. Also the flawed stone which is no good is thrown away and is not polished.
14. They select and seek only the good [stone], the good [stone] they polish, the blood-colored [stone] and the well-spotted [stone, i.e., bloodstone].
15. It is ground then upon a very hard stone that comes from the country of the Matlatzincatl.
16. It is good for this purpose for the bloodstone is as hard as the stone and they grind each other.
17. Then it is smoothed with abrasive and polished with emery.
18. And then it is prepared and polished with bamboo.
19. And in this manner they make it sparkle and give it the brilliance of the sun.
20. And that [stone] called *vitzitziltecpatl* [hummingbird stone, opal] resembles that bird.
21. When it is finished it is as if painted, white and green and like fire, similar to a star and like a rainbow.
22. It is ground and polished only with sand.
23. And that [stone] called xiuhtomolli [turquoise] is not hard, emery is not used to grind it or to polish it, but worked with bamboo it is made to shine like the sun and to reflect light.
24. And the teoxihuitl [precious turquoise] is not very hard.
25. In the same manner it is polished and cleaned with fine sand, and the good [stone] is given the brilliance of the sun with a turquoise polisher.

In summary, the Aztec lapidary process involved selecting the raw material, trimming off any unsuitable material, shaping the useable stone with a hard rock through grinding and rubbing, and finally polishing with wood or bamboo and an abrasive. The lapidary practices of the Aztecs had without doubt changed over time, as evidenced by the use of copper and emery that were not known to the earlier peoples who first developed these lapidary techniques. Of importance, though, is that these practices had originated with earlier peoples and were likely almost identical, even though the materials being used had in some cases changed (Foshag 1957:48).

Based on a review of the literature on jadeite working, we know that jadeite was worked through lapidary techniques including percussion, pecking, sawing, grinding and rasping, drilling, reaming, polishing, and incising and grooving. Each technique used by the ancient lapidary will be discussed here, but it is important to remember that lapidary skills and techniques changed over time - and not in a unilinear fashion; over time specific techniques would have been expanded as other techniques waned in popularity; contrasting schools would have existed at the same time (Proskouriakoff 1974:8). The use of abrasives, which likely accompanied most of the steps, will be discussed subsequently.

The Maya undoubtedly made many lapidary tools from perishable material. Few lapidary tools have been found in the archaeological record. Perishable tools would have been made from easily worked material that could be resharpened as they were worn down and eventually thrown out (Proskouriakoff 1974:9; Foshag 1957:21). Previously recovered stone lapidary tools will be discussed in the section describing their function.

Many authors have addressed lapidary techniques potentially used in ancient Mesoamerica. The following is a summary of the information relating to the lapidary process presented by previous researchers.

## Percussion

Percussion would have been the first step in working a piece of jadeite. If the piece of jadeite selected was not of the necessary shape or was too large, a stone of equal or greater hardness would have been used to strike the jadeite, thus reducing the jadeite nodule to the general shape and size needed. Many hammerstones used in such an endeavor have been recovered from Cancuen; one residence believed to have been involved in jadeite working

contained more than 60 hammerstones. Hammerstones made from jadeite, chert, and quartzite were all discovered at Cancuen (Kovacevich 2006:160-161). Rochette (2009a:213) also reported the discovery of eight jadeite hammerstones from sites in the Middle Motagua Valley.

## Pecking

Pecking is similar to percussion; here again one stone is used to strike another with the desired result of breaking off a piece. Walters (1982) considered pecking as a type of percussion that resulted in smaller debitage than results from "shattering," the percussion used to initially shape the piece of jadeite. Pecking could have been accomplished by either a direct blow with a hammerstone or by using a stone chisel that was struck with the hammerstone. Foshag (1957:51) noted that pecking was often used when shaping round beads, celts, and round balls from which earflares would eventually be cut. The marks left by the pecking can often be seen when these objects were left unfinished. He also observed percussion scars that were still visible under the polish of lower quality jadeite objects and on top of the polish of some pieces, where controlled pecking was used for creating a design.

The breadth of pecking's use has been questioned in the literature. Foshag (1957:51) argued that percussion scars would have detracted from the beauty of the finished product and would not have been used on pieces of high quality. Kovacevich (2006:162), like Foshag, observed that pecking scars were generally only seen on lower quality jadeite artifacts. Chenault (1986, 1988) argued that pecking was likely not widely used at all; he believed that the force required to break off a piece of jadeite would have been too great for the jade worker to have any control. He also noted that pecking would have left undesirable scars, few of which are evident on the jadeite he has studied. Easby (1968:24) also noted that pecking would have left scars, but

she argued that on most kinds of jadeite the scars would have been removed through the process of grinding, sanding, and polishing, thus not leaving any observable evidence.

## Sawing

Chenault (1988:93) argued that most of the shaping of a jadeite artifact would have been completed with sawing. He also noted that this process might be better called abrading because this step was "where a tool is used to move an abrasive against the stone being worked, wearing away the undesired portions of the material." Sawing was used for general shaping of the material as well as for making decorative designs. Two main types of sawing were used by the ancient Maya and other Mesoamerican people: sawing with a hard object and string sawing.

Sawing with a hard object can be completed in two different ways. The first would be direct abrasion, with a saw made of a material of equal or greater hardness than the material to be cut being rubbed directly against it. The second would be for a material of lesser hardness then the material to be cut to be used with an abrasive. The saw would have to be replaced whenever it was worn out (Lothrop 1955:48). Given the hardness of jadeite, it is more likely that a saw of lesser hardness was used with abrasive material by the ancient lapidary. Foshag (1957:53) stated that the saws were likely made from hardwood or bamboo, and Digby (1964:15) suggested wood or slate would have been used. Digby noted that the saws would have been thin and flat, but Proskouriakoff (1974:9) - as well as Kidder, Jennings, and Shook (1946:120) - argued that the saws would have been a thin wedge shape. Proskouriakoff stated that the sawing edge would have been straight, but Kidder, Jennings, and Shook argued for a slightly convex sawing edge, noting the slightly concave bottoms of sawing marks on the jadeite from Kaminaljuyu. Studying

the Olmec, Stirling (1961:56) stated that jadeite was sawed with thin slabs of sandstone as well as with potsherds, as saws of these materials had been recovered from La Venta.

When sawing with a hard object, small pieces could be cut straight through from one side to the other or at least far enough through one side to break the rest manually. More often though, and necessary if the piece to be cut was of a larger size, cuts were made from both sides of the raw jadeite. The cut from either side rarely aligned; this unsawed septum would then be broken manually or, as suggested by Proskouriakoff (1974:9), the pressure and heat from the abrasives being rubbed against each side might have broken the septum. The unsawed septum was either left as it broke or ground and polished down; either way, a slight ledge left over from this broken septum can be found on most large, flat Mesoamerican ornaments (Proskouriakoff 1974:9; Kidder, Jennings, and Shook 1946:119-121; Easby 1968:24).

String sawing is the process of sawing where a cord is used with an abrasive to do the cutting. The cord would have been held tight between the hands or mounted on a bow and drawn back and forth over the surface to be cut; abrasives would have been coated on the string or continually poured over the area to be cut. The string could have been made from materials such as plant fibers, animal sinew, or leather cords (Proskouriakoff 1974:9; Chenault 1986:56; Lothrop 1955:49). String sawing is useful for making interior openings in a carving, but the Maya were also known to make these openings by drilling overlapping holes and smoothing out the ridges (Proskouriakoff 1974:9). Lothrop (1955:48) noted that string sawing would be better suited for materials softer than jadeite.

Lothrop (1955:48) listed the positive and negative aspects of string sawing:

> 1. With a flat saw, all initial cuts must start on an exterior surface. With a string saw, a small hole may be drilled and the cutting started anywhere.

2. By string sawing it is possible to cut curved interior lines which could not be made with a flat saw.
3. Conversely, as is the case with a narrow jigsaw, it is not easy to cut straight lines.
4. It is characteristic of sawing away from a drilled hole that the cut is narrower than the hole, because the string, when pulled tight, becomes narrower.
5. To obtain enough pressure, the string must be bent across the surface to be cut. The end of the cut, therefore, will not be flat but rounded.

Both Digby (1964:15) and Foshag (1957:53) stated that no evidence for string sawing had been recovered, but Chenault (1986:56) stated that it was used on a small number of Maya jadeite artifacts and Foshag later points out a few artifacts on which string sawing might have been used. Evidence has since been found on many artifacts to prove that the Maya used string sawing. Lothrop (1955:48) cited eye-witness accounts of string sawing in Panama from the early 16th century: Ferdinand Columbus (1744:590) wrote that the natives used string to cut tortoise shell into hooks for fishing and Las Casas (1951:Book 2, Chapter 26) added that string was also used to cut iron. Squier (1870:248) reported that early chroniclers had reported natives using agave thread to cut stone and iron; he indicated that "the thread was held in both hands, and drawn right and left until worn out by attrition, and then changed for a new one, fine sand and water being constantly supplied."

Chenault (1986) experimented with string sawing. Working with jute twine and quartz-filled sand, he found that smaller sand particles worked best because they were not as readily pushed out of the groove and did not cause the string to break as quickly as the larger particles. He also found that an abrasive mixture of lard and sand worked the best as it stayed on the string better than dry sand or sand wet with water. Chenault (1986:64-67) concluded that string sawing was a slow and laborious process which was likely only used by the Maya when necessary for making internal openings or curved cuts.

Most researchers have pointed out the Maya's preference for hard saws over string sawing. Lothrop and Easby both argued, similarly to Chenault, that string sawing of jadeite was primarily used by the Maya only if the job could not be done in some other way. Conversely, Kovacevich stated that string sawing was used more often than hard saws at Cancuen, evidenced by the recovery of string saw anchors as well as visible striations on the jadeite artifacts (Kovacevich 2006:164).

## Grinding and Rasping

The process of grinding involves the jadeite object being abraded against another hard stone to provide slight modifications to the shape of the object. Foshag noted that this process would have been time-consuming and require much labor, stating it would have been used only on objects pre-formed to the correct shape and needing little modification. He also stated that grinding was not widely used (Foshag 1957:51).

Rasping is similar to grinding. With rasping, a narrow file-like tool was used to abrade specific areas. Rasps were used to rub down smaller areas than the flat surface of grinding stones. According to Foshag, rasping was frequently used to reduce the thickness of mosaic plates, but does not appear to have been often used on any other types of artifacts (Foshag 1957:52). Chenault (1986:61) notes that both grinding and rasping are done without the use of an abrasive.

Grinding can be observed on flat stones with wide grooves (West 1963:11). Foshag noted two flat stone artifacts with wide grooves indicating their likely use as grinding stones, one in the Robles Collection and the other in the collection of the Instituto de Anthropologia (Foshag 1957:47). West (1963) noted analogous objects from the Idzumo Province of Japan; granite

grindstones were recovered from a site along with unfinished and broken beads, some of which were jadeite. The grindstones had "parallel grooves and large circular depressions" (West 1963:11). Flat polishing stones of schist were also recovered from the same site. Foshag stated that grinding was used for shaping earflares, noting striations on the stem and edges of flares as well as on the face of flat flares. Striations from grinding are also often found on the ends of large, heavy beads (Foshag 1957:52). Kovacevich reported that some artifacts from Cancuen have striations consistent with grinding and rasping. She also reported possible grinding stones made from greenstone or schist and possible rasps made of slate (Kovacevich 2006:167).

## Drilling

Drilling was used to make a hole or depression in the jadeite object. The Maya used both solid and tubular drills. Solid drills created a conical depression that could be used to make perforations as well as nonperforating depressions. Tubular drills cut out a cylindrical core of the stone as it formed a hole in the object; they were not able to produce holes as small as those possible with solid drills. It has been posited many times that bow or pump drills were likely employed by the Maya for drilling, but no definite evidence to prove this has been found.

"Both solid and tubular drills were apparently in use from the earliest time of which there is any information" (Proskouriakoff 1974:9). In the earliest times, drilling was most likely all done by hand, but later innovations are thought to include use of the bow or pump drill as well as improvements in steadying the object and drill (Digby 1964:16; Proskouriakoff 1974:9). Most of the early beads made by the ancient Maya were drilled biconically, from both sides, which left an hourglass shape on the inside of the bead, large openings on the ends, and a small opening in the center where the drill holes met. The hourglass shape of the bore shows that most early beads

were drilled by hand, as evidenced by the wide openings left from the drill moving side to side (Proskouriakoff 1974:10). By the Late Classic and Early Postclassic Periods, most bores had become very fine and straight, showing they were likely no longer drilled by hand. Another advancement made during these late periods was the use of the double tubular drill to be able to make concentric circles (Proskouriakoff 1974:18).

Several materials have been presented by researchers as possibly having been used to make drills; the Maya would have used different materials depending on what was available and needed for the project at hand. Kidder, Jennings, and Shook (1946:122), as well as Chenault (1986:58), argued that as no stone drills have been found, they must have been made from perishable materials. Proskouriakoff (1974: 9) noted that bird bones and those of small animals would have been useful as drill bits. Holmes (1895-97:304-309) reported the discovery of a hollow bone drill and abrasives inside the drill hole of a plaque found at Ixtapaluco near Chalco, Mexico. Digby (1964:15) suggested that bird bones or hollow reeds would have been used for tubular drills and wooden bits used for solid drills; he noted that both types of drills would have been used with an abrasive of sand or powdered obsidian. Easby (1968:20-21) reasoned that bamboo could have been used as a tubular drill because it was hollow and contained natural abrasives. Kovacevich (2006:168) stated that chert blades, which have been recovered in the Maya area, could have functioned as drill bits. West (1963) stated that solid drills could have been jadeite-tipped while tubular drills were likely reed, bamboo, or bird bone. Finally, Rochette (2009a:213; 2009b:208-209) reported the discovery of 401 chert drills from the Middle Motagua Valley; he concluded they were associated with jadeite drilling based on their capability to drill jadeite as well as similar drills' “association with jadeite production debitage at Cancuen” (Rochette 2009b:209).

Tubular drills were doubtlessly used to make earflares, which were sometimes perfectly circular, as well as beads with cylindrical perforations (Proskouriakoff 1974:18). The cores left from tubular drilling would have been fashioned into tubular beads as well as other artifacts (Digby 1964:15).

Drilling was also used for making grooves, designs, and holes for string sawing internal openings. For making grooves, a drill would have been used to make a row of shallow depressions that could then be rubbed down into a solid groove (Digby 1964:15). When making designs using drills, tubular drills could be used to make circles, concentric circles, arc impressions, and wavy lines, and solid drills could be used to make single points as well as depressions for ornamentation and inlays (Kidder, Jennings, and Shook 1946:121-123). For string sawing internal openings, drilling could be used in two different ways. The first was to simply drill starting and finishing points for the string; this allowed a way for the string to get into the center of the object to them be able to make the necessary cuts. The other function was to drill holes close to each other all along the internal area to be cut; a string would then be used to cut all the small areas between the drill holes and unite then into one internal opening in the carving (Chenault 1986:56).

Of importance to this study is the order of the steps in the production of beads regarding drilling and polishing. After studying jadeite from the Middle Motagua Valley, Rochette (2009b:208) noted that the steps in bead production varied. By examining hollow drilled cores, broken beads, and complete beads, he was able to determine that bead production order varied in three ways. Beads were either smoothed and polished before drilling, not polished but smoothed on one end before drilling, or not polished or smoothed before drilling (Rochette 2009b:208).

This is interesting as one of the bead polishers was clearly used on beads that had already been drilled and the other appears to have been used on beads not yet drilled.

## Reaming

Foshag (1957:55) described reaming as the process of smoothing drilled holes. He also included the possibility that reamers could have been used as polishers, as they would have been of the correct shape and hardness, so it is possible that the definition of reaming should also include polishing. With the addition of a fine abrasive, many of the artifacts identified as reamers would have made the perfect tools to be able to polish the throats and faces of earflares and the ends of the bore-holes and outer surfaces of beads. Foshag noted that reaming was common on the throats of earflares, citing two pairs of earflares from Kaminaljuyu where distinct angled planes were added to the throats through reaming (Kidder, Jennings, and Shook 1946:fig. 145, a, b).

Reamers take the opposite shape from whatever they were used to polish. Reamers used to smooth the throats of earflares are shaped like the curved inner faces of the earflare throats (Easby 1968:21). Some also have the area that mirrors the face of the flare, if they were also being used to smooth this area. Reamers used to broaden the ends of the holes of beads are smaller with central points to fit a short distance into the beads' bore-holes. The process of reaming likely involved polishing as well as smoothing; the smoothing effect of stone against stone would have produced a polish on both objects if worked for long enough. As the reamers to be discussed exhibit polished surfaces on the areas where they were being used against another stone, it is extremely likely that these tools were also functioning to polish these harder to reach areas of stone objects.

As all lapidary tools are extremely rare in the archaeological record, only a few examples of conical reamers/polishers have been recovered (Easby 1968:21). An artifact fitting the definition of a reamer was recovered from Kaminaljuyu (Figure 1, e). This tool was formed from a hard, dark colored stone and "is exactly the reverse, in shape, of the face and throat of a flare" (Kidder, Jennings, and Shook 1946:124, fig. 153, a); the bottom of the tool is intended to fit in the palm of the hand and is unworked except for having been "smoothed by long handling. The upper part which, save for the blunt top of the central protuberance, is highly polished." Kidder, Jennings, and Shook (1946:124, fig. 153, a) wrote that this tool had been used to finish the face and upper portion of the throats of earflares "by increasingly careful grinding . . . It was evidently rotated back and forth with a very fine abrasive or a polishing paste". Foshag (1957:55, Plate 1, fig. 2, a, b, c, e) presented four reamers, including the reamer already discussed from Kaminaljuyu. The first reamer (Figure 1, a) is made of jadeite and is found in the Nottebohm Collection. It has a "drilled hole with central pointed core." As it is much smaller than the other reamers and has a thin, pointed central area, it was likely used for beads (Foshag 1957:55, Plate 1, fig. 2, a). The second reamer (Figure 1, b) is also from the Nottebohm Collection but is made of chloromelanite. It would have been used for smoothing the throats of earflares (Foshag 1957:55, Plate 1, fig. 2, b). The third reamer (Figure 1, c) is also of chloromelanite and from the Nottebohm Collection. Foshag noted that this reamer was "of general utility" and was likely also used as a polisher (Foshag 1957:55, Plate 1, fig. 2, c). The fourth reamer (Figure 1, e) is the artifact from Kaminaljuyu. No mention was made of the material from which this reamer is composed. Foshag notes that this reamer fits the throats of some earflares and was "almost certainly a reamer" (Foshag 1957:55, Plate 1, fig. 2, e).

Additionally pictured in Figure 1 (d, f) are two polishing celts (Foshag 1957:55, Plate 1, fig. 2, d, f).

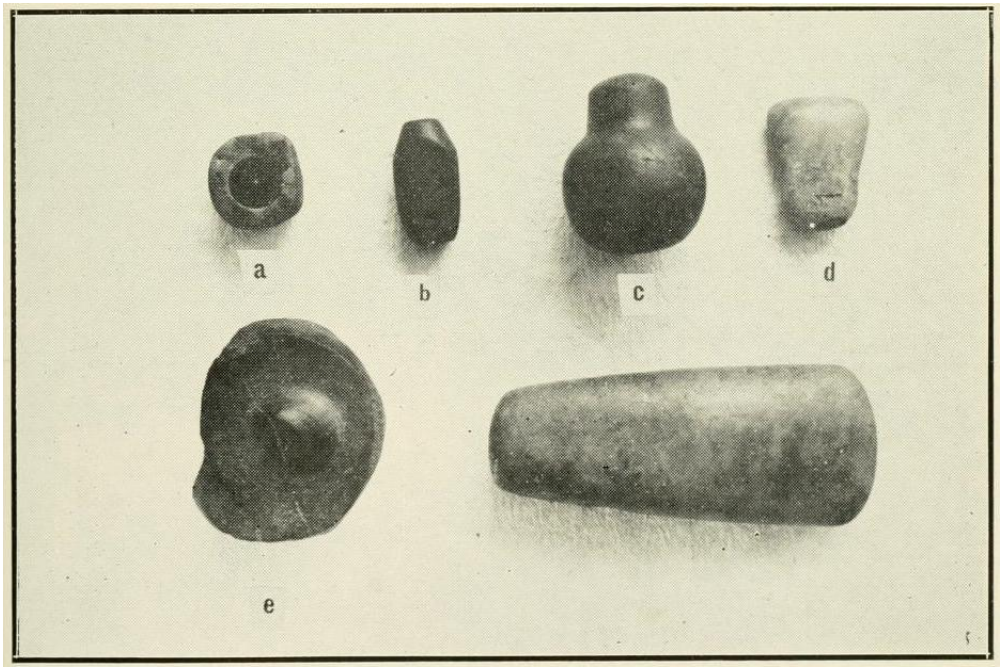


*Figure 1: Reamers and Polishers*

"a. Jade, drilled hole with central pointed core, Nottebohm collection; b. chloromelanite reamer, Nottebohm collection; c. Chloromelanite reamer and polisher (?), Nottebohm collection; d. jadeite polishing celt; e. earplug reamer, Kaminaljuyu; f. large polishing celt"
(Foshag 1957:55, Plate 1, fig. 2)

## Polishing

Feldman (1973:94) translated a passage from the Zuniga's (1608) Pokom-Spanish dictionary in which a Guatemalan community of lapidarists involved in polishing stone was mentioned.

> Xoy is the name of the site at the ford of the great river which we cross in going from San Cristobal to Zacatula, and the river is often called Chixoy. . . The inhabitants of the site are called Ah Xoyib. Xoyib means to polish in various colors, as the lapidarist polishes a

> stone. . . and Ah Xoy the official of polishing. The old Indians of the capul of Xoyib in San Cristobal say that formerly those of that site by the river had the office of polishers (Zuniga, 1608).

Polished jadeite appears luminescent and glassy, with the color and luster similar to that of jadeite pebbles when wet (Chenault 1988:92; Foshag 1957:14). Several methods for polishing jadeite have been offered by different researchers, and it is likely that jadeite was polished using different methods depending on the time period and location of the work. Experiments on polishing conducted by several researchers will be discussed; they confirm the efficacy of hand polishing with wood, in particular bamboo, as well as with fine, hard stones that could be used without abrasives (Easby 1968:25).

Easby (1968:20-21) noted that bamboo is a particularly useful material. The large bamboo *Arundinaria* grows throughout the Mesoamerican area and was used in sixteenth-century Mexico to polish jadeite. This bamboo contains particles of silica that would function as an abrasive. These canes used by themselves or in conjunction with other abrasives could have been used as large tubular drills as well as for polishing.

West (1963:11) stated that polishing would have either been done with a hard tool, likely of jadeite, used without an abrasive or with hardwood or the outside of bamboo in combination with an abrasive. Digby (1964:16) believed that powdered jadeite was most likely used to polish jadeite pieces because it would smooth down any rough areas without scarring the jadeite surface, but he also suggested that hematite might have been used. Kovacevich presented possible jadeite bead polishers from Cancuen; these small objects were formed from slate, and each had a depression in the center, worn down from use. Slate polishers were also used by the Japanese (West 1963:11). Sahagún listed wood, bamboo, and emery as being used for polishing.

M'Guire (1892) experimented with pecking, carving, polishing, rubbing, and boring; he found that stone tools were quite efficient for working stone. When experimenting with polishing, M'Guire ground nephrite against wet granite for five hours followed by wet and dry quartzite for six hours. He then attempted to further polish the nephrite with wood and buckskin, but no effect was produced. He also polished a piece of kersantite with sand and water rubbed with a piece of quartzite and found that this technique took much less time. M'Guire concluded that quartzite used with sand as an abrasive was the most efficient method for polishing. Second most useful was the granite and quartzite without an abrasive. Finally, the wood and buckskin did not produce any observable polish on the nephrite (M'Guire 1892:166-168).

Foshag (1957:56) determined that Mesoamerican jadeite was most likely polished with a hard tool. This determination was made by analyzing ancient and modern polished jadeite under a microscope and under a hand lens. On ancient polished jadeite, the high spots are polished with the intergrain depressions left unpolished, resulting in bright spots separated by dull areas. On modern polished jadeite the depressions, as well as the eminences, are polished, leaving a completely polished surface. There are also minute orientated ridges left from the polishing process. These differences in surface polish between ancient and modern polished jadeite are caused by the different materials used to complete the polishing. Ancient jadeite would have been finely ground with a hard tool which would have been unable to polish the intergrain depressions. Modern jadeite is polished with a felt lap and polishing powder; the soft felt is able to penetrate and polish the depressions leaving the entire surface polished; the felt lap also leaves the fine ridges (Foshag 1957:56).

Foshag believed that early jadeite was likely polished with jadeite tools, and he experimented with polishing jadeite with small jadeite celts. He found that properly prepared

jadeite surfaces could be efficiently polished with jadeite celts. He also noted that it produced the same characteristics of polished eminences and non-polished depressions as seen on ancient Mesoamerican polished jadeite. He concluded that there was no evidence of a polishing powder except that produced by the jadeites being rubbed against each other. Foshag additionally found that a similar polish could be created with bamboo or hard wood when used with an abrasive; the outer surface of bamboo used with an abrasive was found to be more efficient at polishing than a hard wood surface with abrasive (Foshag 1957:47, 56).

## Incising and Grooving

Shallow, fine lines were often added to jadeite artifacts. These lines could have been scratched or chiseled into the jadeite (Proskouriakoff 1974:9). Incising was often completed after the piece had been polished, evidenced by the fact that the depressions frequently lack polishing.

Again, many materials have been offered by researchers as having been used for incising. Digby (1955:15) suggested that this might have been done with a piece of obsidian, but Foshag (1957:56-57) believed jadeite or chloromelanite would have been used. Sahagún listed the use of trimmed flint for scrapping an object, likely referring to incising. Lothrop (1955:49) argued for the use of cactus needles and tropical vines with an abrasive, noting the cactus needles would have been able to produce extremely thin incised lines. Kovacevich (2006:166; 2011:158) argued for the use of chert, quartz, and jadeite for incising, noting indicative wear patterns on blades of these materials found in association with jadeite working material from Cancuen.

Similar to incising, grooving was used to make designs on an object. What made grooving different from incising was that it involved the use of an abrasive; the abrasive was

rubbed against the jadeite with a pointed object to produce a groove. Digby (1964:15) suggested that grooving was done with sand and a pointed stick.

## Use of Abrasives

"The hardness of jade, 6-7 on the scale of hardness of Mohs, requires an abrasive of equal or greater hardness to cut or polish it" (Foshag 1957:49). To be able to work hard, resistant material such as jadeite, ancient lapidaries would have had to use tools made of equal or greater hardness or use abrasives in combination with tools made from softer material. The ancient lapidaries, without doubt, traditionally relied heavily on abrasives. The abrasives used would have varied between sand-like or powdered in composition and fineness, depending on the material being used and increasing in fineness with each step in the lapidary process (Easby 1968:19, 24-25). Although materials harder than jadeite and quartz sand were available in Mesoamerica, they were likely not used by the ancient lapidaries (Foshag 1957:50).

We know from Sahagún (1961:25) that the Aztecs used abrasives. Based on his descriptions, we know that they most likely used garnet or rouge, pyrite, specular hematite, and quartz; the hardness of these materials varies between 6.5 and 7.5. Specular hematite, also known as polishing rouge, has been found in tombs at Kaminaljuyu.

The Maya likely employed quartzitic sand as an abrasive. Quartz has a hardness of 7, so it would have been useful to work jadeite which has a hardness of 6-7 (Chenault 1986:39). Quartzitic sand would also have been chosen because it was available to the ancient lapidary in many areas and required no preparation before use. Chenault (1986:41) also mentioned "toad grease" that was used by the ancient Chinese. This substance was considered to have magical powers that aided jadeite carving. "Toad grease" is generally considered to be a mixture of

animal lard and abrasives. The lard in the mixture would have helped keep the abrasives where they were needed for cutting.

As noted by Foshag (1957:50), crushed jadeite was likely also used by the Maya. He mentions, though, that crushing the jadeite would have been an additional time-consuming step. We know from Kaminaljuyu's Minor Grave 7 that crushed jadeite was almost certainly being used as an abrasive (Foshag 1957:50; Kidder, Jennings, and Shook 1946:85, 120; Kovacevich 2006:162).

Minor Grave 7 of Kaminaljuyu is thought to be a jadeworker's tomb. This tomb contained abrasives and 66 beads, 56 of which were unpolished, as well as two polished but unperforated pieces of jadeite. The abrasive material, enough to fill two teacups, was revealed to be a concentration of crushed jadeite, specular hematite, feldspar, quartz, augite, hornblende, olivene, muscovite, biotite, and magnetite, with a few inclusions of cinnabar, andesite, and mica schist. Given the concentration in one small area and that the material was not mixed with the soil, it is likely that this abrasive material was originally contained in a small sack or pouch made from perishable material such as cloth or hide. The feldspar, quartz, augite, hornblende, olivene, biotite, and magnetite are commonly found in the volcanic ash of the area; this material was likely gathered from the bottom of local arroyos. Not available locally though is the jadeite, specular hematite, muscovite, and mica schist which would have necessarily been brought from a different area. The cinnabar, like the aforementioned minerals, is foreign to area; as it does not have any useful lapidary purposes, it was likely a contaminant from the burial. These materials could have functioned as a useful abrasive for assisting with sawing, grinding, and polishing (Kidder, Jennings, and Shook 1946:85, 120; Foshag 1957: 50).

# JADEITE ARTIFACT FORMS

Tatiana Proskouriakoff (1974), writing about the jadeite artifacts from the Cenote of Sacrifice at Chichen Itza, Yucatan, provides descriptions of all forms of jadeite artifacts used by the Maya. Particularly useful are the ranges of sizes she provides for these artifacts, as many publications do not specify the size of the artifacts being presented. To better understand the differences between the types of artifacts possibly worked with the polishers presented in this study including earflares, ear-discs, round perforated discs, miniature earflares, buttons, and beads, I am going to provide a synopsis of her definitions and descriptions of these items. Useful information about earflares can also be found in Digby (1964) and Kidder, Jennings, and Shook (1946); this information will also be included. Artifacts such as plaques and figurines will not be presented, even though they are commonly found in jadeite. Based on the shapes of the depressions found on the stone polishers, there is no possibility these artifacts were worked with the tools to be presented and, thus, they are not relevant to this study.

## Earflares

There are two main types of earflares from the Cenote of Sacrifice at Chichen Itza; those with a wide opening at the throat and those with throat openings of less than 15 mm. They can be further divided based on throat curvature, neck height, and form of the face. The throat curvature is divided between flares with the throat curvature sloping all the way to the edges of the flare and those where the curvature stops at the end of the throat with the flare opening up to a flat face. Neck differentiation is divided between cylindrical, squarish, or completely absent.

Facial forms can be circular, squarish, or irregular, with or without decorations (Proskouriakoff 1974:29-30).

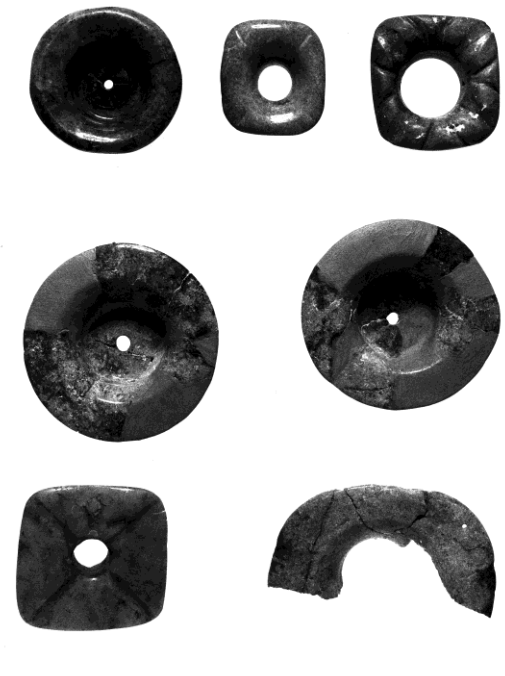

*Figure 2: Earflares from the Cenote of Sacrifice at Chichen Itza, Yucatan*

Courtesy of the Peabody Museum of Archaeology and Ethnology, Harvard University, [Peabody ID# 2004.24.26287 + digital file # 137570076]
(c) President and Fellows of Harvard College, Peabody Museum of Archaeology and Ethnology, [Peabody ID# 2004.24.26287 + digital file #137570076]

Proskouriakoff wrote that earflares are metrically limited by three of the flares recovered from the Cenote with diameters between 20 and 30 mm (Proskouriakoff 1974:30). Any earflare with a smaller diameter was designated as a miniature earflare. It is also noted that it can be difficult to identify earflares from some forms of rings, discs and buttons because earflares seem to form a continuous spectrum with these other forms (Proskouriakoff 1974:29). This difficulty

is apparent, especially given the confusion in the literature with different researchers alternately naming smaller artifacts similar to earflares as miniature flares, buttons or earflares.

Two main forms of earflares were also identified from Kaminaljuyu (Kidder, Jennings, and Shook 1946:106). Type A is characterized by a narrow face curving gently into a wide throat and perforations through either the neck or face. They also have a relatively short neck and a thinned lip. They are often found with throat-discs. Type A is the standard form of earflares found in the Maya highlands. Type B earflares are characterized by a relatively wide face tending more towards flat than curved, a little throat, and long slender necks. Perforations in the neck or throat are uncommon, only being found in one pair of specimens that appear to have been formed from the reworking of a large bead, and Type B flares do not have throat-discs. Type B is the most common form of earflares in the Maya lowlands.

Earflares from Kaminaljuyu were made from many different materials. The finest flares were cut from a single piece of jadeite, but examples were also recovered made of a jadeite mosaic, shell, copal, and pyrite. The stem, found between the flare and backing, was commonly made from perishable materials, but examples made from a cylinder of jadeite and one of a cylinder of shell were also found. The backing was also commonly made from perishable materials, but examples of backings of shell, slate, and jadeite mosaic were also recovered (Kidder, Jennings, and Shook 1946:106).

Digby (1964:18, fig. 3) described three main forms of earflares. The first type (fig. 3, A) is a flare with a circular throat plate of jadeite, shell, or some other material, placed over the throat opening of the flare; the throat plates were sometimes inlaid. In the second type (fig. 3, B), a tassel is attached from the back of the flare and hangs through the front opening of the flare. The third type (fig. 3, C) is the most elaborate. These flares have a long tubular bead

emerging from the opening of the flare; the tubular bead is topped with either a miniature flare or jadeite bead.

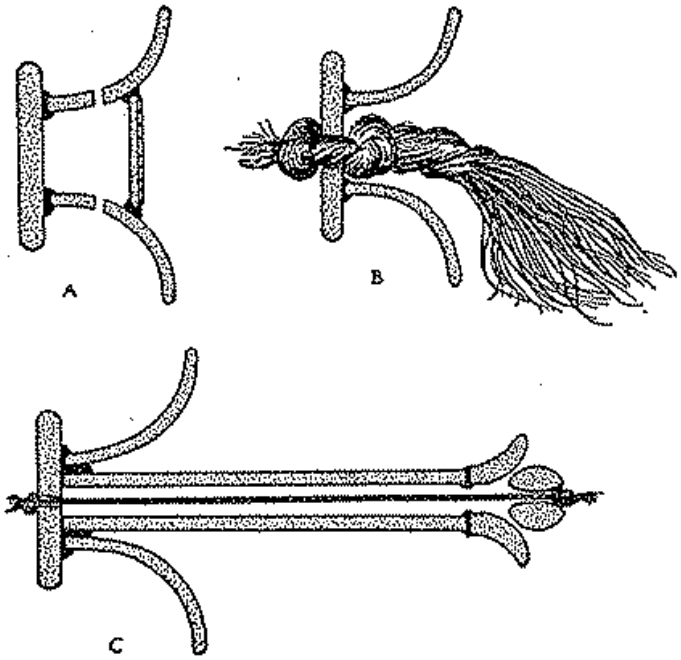


*Figure 3: Types of Earflare Assemblages*
(Digby 1964:18, fig. 3)

Bowl-shaped flares were noted by Proskouriakoff as representing a marginal form of flares. These artifacts are characterized by having constricted openings in the neck similar to buttons which often contain only a small perforation. It is noted that intermediate forms in size and shape are seen between these bowl-shaped flares and buttons and seem to form a continuum between the two. "At several points, the definition of what is an "ear-flare" becomes an arbitrary choice" (Proskouriakoff 1974:30).

Miniature Earflares

Miniature earflares are defined by Tatiana Proskouriakoff as little earflares less than 20 mm in diameter. These miniature earflares replicate forms of earflares normally seen on a much large scale. Five were described from the Cenote of Sacrifice. Three have perforations in the neck, while the other two are neckless forms similar to bowl-shaped earflares. Three were decorated with a petal design. It is possible that they might have all been formed from buttons as they greatly resemble buttons only with enlarged perforations (Proskouriakoff 1974:32).

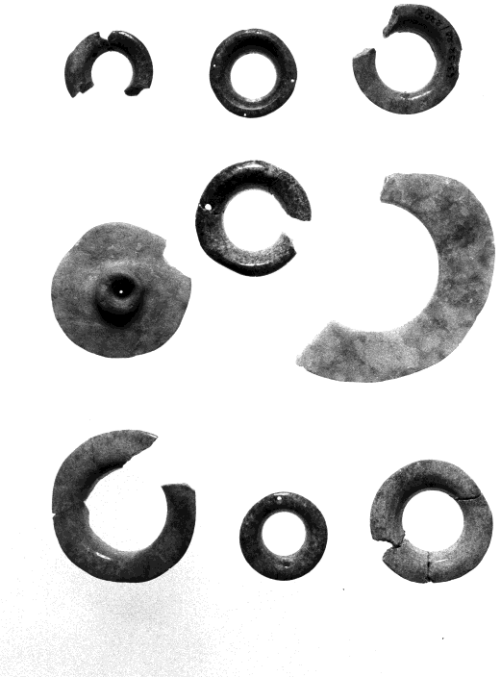

*Figure 4: Artifacts from the Cenote of Sacrifice at Chichen Itza, Yucatan*

Top Row: All Miniature Earflares; Middle Row (left to right): Ear Disc, Miniature Earflare, Flared Ring; Bottom Row (left to right): Earflare, Miniature Earflare, Miniature Earflare

## Discs

Round perforated discs are flat to slightly convex discs with at least one small perforation. Those from the Cenote of Sacrifice at Chichen Itza range in size from 14 mm to 48 mm. Round perforated discs likely served many different functions, including throat-discs for earflares, sequins on clothing, decorations on pectorals, or as part of a diadem or headband. (Proskouriakoff 1974:34).

## Ear Discs

Ear discs are artifacts that take the form of round, square, or rectangular discs often with a protuberance on the back through which a small perforation could be made through the front of the disc. Proskouriakoff notes that these cannot be easily separated from discs used in other contexts. The presence of the rear protuberances with the perforation through the front of the discs as well as a similar pair found on either side of a skull in a burial at Piedras Negras make it fairly likely that these artifacts functioned as disc-flares (Proskouriakoff 1974:31).

## Buttons

Tatiana Proskouriakoff uses the term “button” to describe small objects with a greater diameter than thickness which are usually round. Their defining feature is a central perforation drilled through a protuberance created by a drilled ring around the center (Proskouriakoff 1974:32). Buttons take many different forms including types that are flat, rectangle, square, or even lacking the central protuberance. Even though the term button implies a type of use, this is not what is meant by the name - merely that they take the general form of buttons. Most artifacts

resembling buttons have been recovered from lowland Maya sites in contexts dating to the Late Classic and Early Postclassic Periods. There is a definite concentration of buttons during this time in the Maya lowlands, but a wider distribution is also possible (Proskouriakoff 1974:33).

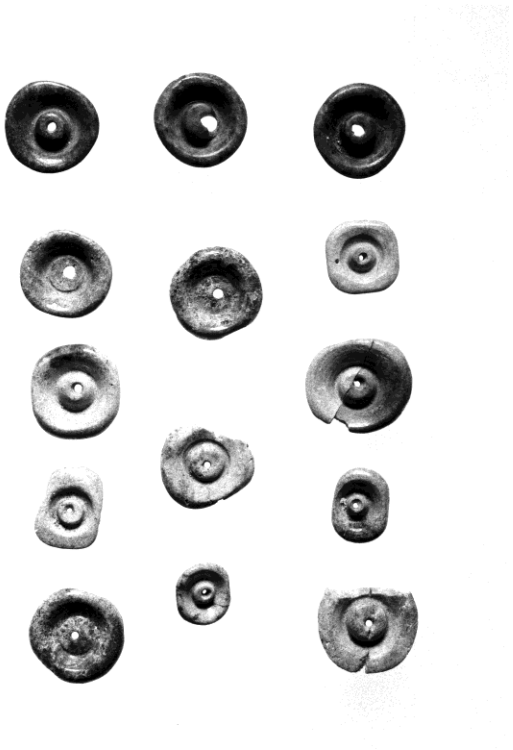

*Figure 5: Buttons from the Cenote of Sacrifice at Chichen Itza, Yucatan*

Courtesy of the Peabody Museum of Archaeology and Ethnology, Harvard University, [Peabody ID# 2004.24.26283 + digital file # 137570072]
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There are several different basic forms of buttons including flared buttons, rounded-base buttons, flat buttons, and square buttons. They are classified mainly by the form of their underside. Flared buttons resemble many earflares because their underside includes a protuberance resembling the neck of a flare. These buttons are also similar to miniature earflares

with constricted necks. Rounded-base buttons, as the name implies, have a rounded underside; they resemble miniature versions of bowl-shaped earflares. Flat buttons have undersides which are flat or very slightly convex. Square buttons are squared both in their overall shape and the shape of their underside (Proskouriakoff 1974:33).

Proskouriakoff notes that "the use of small buttonlike objects, which were very common and have a wide distribution, also remains problematical" (1974:4). Some buttons are found as pairs leading to the assumption that they could be part of earflare assemblages. However, this does not rule out the possibility that they were used for other types of adornment. Given their range of size (14.5-40 mm) it is likely that they functioned in many different types of assemblages. An important final note is that many of the buttons in the Cenote of Sacrifice collection have two small holes near the lip of the button likely used to attach the button to another material; this would provide additional security against accidental loss of the button (Proskouriakoff 1974:33).

## Beads

Beads are the most common objects of adornment. They range greatly with a continual spectrum of variability seen between all sizes and shapes. Categorizing beads based on shape is fairly arbitrary since there are always beads that fall in between the shapes, but a general description of the basic forms of beads will be provided to show the range of shapes utilized by the Maya (Proskouriakoff 1974:18-19).

Spheroid beads are beads that are close to spherical; they are the most common type of beads. The average diameter of the spheroid beads from the Cenote was 14.3 mm with a range of 4 mm to 50.2 mm. Discoidal beads take the form flattened spheroid beads, circular discs with

a central perforation. In this collection, their diameter ranges from 7 mm to 12 mm with thicknesses between 2 mm and 6 mm. Spool-shaped beads tend toward an hourglass shape, basically a cylindrical bead with a slightly constricted area in the middle. Oblong beads are elongated spheroid beads; they often tend more towards oval or barrel-like shapes. They are no more than 2 ½ times longer than their thickness in the other direction. Their diameters vary between 2.5 mm and 22 mm. Tubular beads are more than 2 ½ times longer than their width. Their sides vary from perfectly straight to curving in just at the tips to completely curved sides similar to a barrel-like shape. Rectanguloid beads have rectangular sides; the examples from the Cenote collection are all fairly large with the largest measuring 77 mm by 42.5 mm by 36 mm (Proskouriakoff 1974:19-24).

Double-drilled beads are a variant form that needs to be mentioned. I will not cover other types of decoration on beads, but double-drilled beads are relevant to this study as they are similar to the form of buttons. Double-drilled beads were often made from the ends of tubular beads; a section from the end of the tubular beads was cut off and then drilled around the original perforation with a tubular drill. This would leave a countersunk protuberance in the center. These appear extremely similar to buttons except that they are generally smaller in diameter and their drilled groove is deeper (Proskouriakoff 1974:28-29).

# MINIATURE EARFLARES VS. BUTTONS

Which varieties [of jade artifacts] may have been used in earplug assemblages is a question to be answered, not by formal analysis, but by the observation of their actual use in grave deposits (Proskouriakoff 1974:29).

The following review of the archaeological record of miniature earflares and buttons is presented to highlight issues with the terminology used for these objects. I am presenting all instances of miniature earflares and buttons from the Maya area I could find in the academic literature; any left out from this sample have been unintentionally overlooked. These artifacts are discussed with the goal of clarifying the terminology used for these objects. It will also demonstrate that these objects were rarely, if ever, used on their own as earflares. They were much more likely to be used as other types of personal adornment, but when they were included in earflares assemblages, it was often as a topper for a rod protruding from the center of the earflares. Descriptions of other artifacts from these sites are included when it is useful to the understanding of the miniature earflares or buttons or the context from which they were recovered.

## Piedras Negras

Mason (1933) was the first to report a fillet/headband from Piedras Negras. He stated that twenty small, fine jadeite ornaments were around the forehead of a young man's skeleton within a burial vault. There were ten pairs, each "of the shape of ornaments presumed to have been employed as ear-plugs" leading the researchers to believe they were originally used as "ear-ornaments" and were only later repurposed as ornaments for the headband (Mason 1933:55-56)

Coe (1959:49) reported the fillet as well, writing that it was "composed of 20 partially paired re-used small earplugs (?) found across the forehead and beneath the head of Skeleton B, Burial 5." I have included this quote of his description to show that he was not certain of the classification of these artifacts as small earplugs, just as Mason had noted that they were only presumed to have been used as ear-plugs. The descriptions of the artifacts will explain the confusion.

All of the jadeite objects from the fillet are highly polished. Sixteen of the artifacts are well paired with the remaining four resembling others already paired off. Of the artifacts, ten have fairly wide openings in the center; these resemble miniature flares. The maximum diameter of these miniature flares is 2.3 cm, but there is considerable difference in size within the group. Many of the necks in this group have horizontal conical bores which could have originally been used to attach the flares in earflare assemblages but also could have served to sew the flare to the headband in this context. The other ten objects have highly constricted central perforations much more similar to the form of buttons. Several different forms are seen within the group with constricted holes. These include two with the characteristic central protuberance of buttons, two resembling miniature ear discs, three cup-shaped flares, and three dish-shaped flares; the dish-shape has a much shallower central depression than the cup-shaped (Coe 1959:49, figs 47, i-x, 48, a-t). Coe (1959:50) noted that these small flares could have functioned as earflares possibly for a child but are more often used on clothing, with cup-shaped flares rarely seen anywhere else.

Earplugs (characterized as such by Coe) were additionally recovered from Piedras Negras Burial 5. These actually appear to have been ear discs based on their form. They have flat square faces with rounded edges. They also have no throats, only tiny perforations drilled from

the back through a small, rear central protuberance. Their maximum widths were 5.4 and 5.5 cm. These ear discs were found on either side of Skeleton B's skull (Coe 1959:49, fig. 47 g, h).

## Kaminaljuyu

Kidder, Jennings, and Shook (1946:111) described small flares from Kaminaljuyu that resembled miniature replicas of Type A earplug flares. They stated that these flares had the same shape as Type A flares, as well as having throat discs and neck or face perforations. Their diameters ranged from approximately 2 cm to 3 cm. They also noted that these small flares were likely not parts of earflare assemblages; this designation was based on the artifacts' locations within the tombs as well as their association with other artifacts not related to earflare assemblages.

Two of the small flares from Kaminaljuyu were found attached to the ends of slender cylinders made from copal; these assemblages resemble depictions on many Maya sculptures showing short, thin poles with flared ends (Kidder, Jennings, and Shook 1946:111, fig. 147, h). A. V. Kidder (1947:43) suggested that these small flares would have been mounted on copal tubes and formed part of the earflare assemblages from this burial, Tomb A-IV. He further suggested that the copal tubes were likely mounted with adhesive in the throats of the earflares that were found nearby in the tomb.

Eleven of the small flares identified from Kaminaljuyu were from Burial B-I; ten of the eleven were pairs. These eleven artifacts were found in association with four pairs of long tubular beads at the head of the principal skeleton, Skeleton 1. The researchers proposed that the flares might have been mounted on the beads because traces of adhesive were found inside the necks of the flares. They also suggest that the flares and beads might have been attached to a

headband as was observed at Piedras Negras (Kidder, Jennings, and Shook 1946:111, fig. 146, a-f, 150, b).

A final pair of small flares was found in Burial A-III. They were found with stems and backings which would suggest their use as earflares except that they "were without much doubt attached to the face of a pyrite-incrusted plaque" (Kidder, Jennings, and Shook 1946:111, fig. 143, e).

Kidder, Jennings, and Shook suggested that small flares likely served several different purposes, with individual pieces serving different functions overtime. This is evidenced by the fact that the neck perforations found on most of these pieces had been plugged with tightly fitting pieces of jadeite on two of the artifacts, showing that the perforations once used to hold an attachment-pin were no longer needed. Their diversity of uses is also seen in the fact that all three contexts where small flares were located suggest a different type of use for the flares.

Interestingly, the pair of small flares from A-III was found with "shoe button" beads in the place of throat-discs (Kidder, Jennings, and Shook 1946:111). "Shoe button" beads were first identified at Kaminaljuyu. These objects were cut on the underside so that a ridge was left along the middle. A cylindrical perforation was then drilled through this ridge. Eight of these artifacts were found in Tomb A-I, between the pelvis and elbow of Skeleton 3. They ranged in diameter from 0.5 cm to 0.7 cm. Eleven more were found in Tomb A-II, near the hands of Skeleton 1, grouped with other jadeite and shell beads; these ranged in size from 0.6 cm to 1 cm. The authors suggested these might have been sewn to or used as fringe for wristlets (Kidder, Jennings, and Shook 1946:115).

## Nebaj

Five pairs of jadeite earflare assemblages were recovered from Nebaj. These are important for demonstrating the use of miniature flares in earflare assemblages; miniature flares were not recovered from any other contexts at Nebaj. Unless specified, all pieces were of jadeite (Smith and Kidder 1951:37-40).

The first pair of earflares was discovered in Mound 2, Tomb I, in contact with Skeleton A's skull. Each consisted of a large flare with a flat face and cylindrical stem. Likely originally attached with adhesive was an almost cylindrical rod coming from the center of the flare. These rods were topped by a still attached miniature flare. Each miniature flare also had a slate throat-disc (Smith and Kidder 1951:37-40).

The second pair of earflares, also from Mound 2, Tomb I, was found on either side of the skull of Skeleton B. These assemblages included perfectly circular flares. Jadeite rods were found associated with the flares; these were likely held in the flares with adhesives. Miniature flares were found on top of the rods (Smith and Kidder 1951:37-40).

The third pair of earflares came from either side of Skeleton L's skull in Mound 1, Tomb I. These earflares each included a highly polished flare, a tubular bead, and small bead. The small bead was attached either between the flare and tubular bead or at the end of the tubular bead (Smith and Kidder 1951:37-40).

From Mound 1, Tomb I, the fourth pair of earflares was found with Skeleton K. These earflares were recovered with only the flares and throat-discs (Smith and Kidder 1951:37-40).

The fifth pair dates to the Late Classic, the rest having been from the Early Classic. Located within Mound 2, Tomb IV, these earflares were badly crushed but appear to have originally been 4 cm square (Smith and Kidder 1951:37-40).

Jadeite beads were recovered from all the important burials at Nebaj. The authors note that although tubular beads were likely used in many different ways, their contexts at Nebaj show that the longer tubular beads were most often utilized in earflare assemblages at this site and, likely, at others (Smith and Kidder 1951:40-43).

A unique artifact form found at Nebaj was their form of a button. These were named so because they were intended to be attached to cloth or hide. They consisted of a convex upper polished side and an unpolished flat underside drilled at an angle so both holes are on the underside. They ranged in diameter from 1.5 cm to 2 cm, and their shapes vary from round to barrel-shaped (Smith and Kidder 1951:40-43).

## Uaxactun

A pair of miniature jadeite flares was discovered in Burial A-29 located on either side of the individual's skull. These flares were found associated with backing made from slate discs glued to shell discs and covered with jadeite mosaic. Kidder suggested that these miniature flares were likely mounted on the ends of perishables tubes which would have been mounted in the throat of perishable flares which would have been mounted to the jadeite mosaic backings. This is based on the near identical similarities of these miniature flares and associated backings to the earflare assemblages from Kaminaljuyu's Tomb A-IV (Kidder 1947:43). It also appears possible that these miniature flares might actually have been worn as the earflare.

Other miniature flares were found unassociated with earflare assemblages. Seven of these were found in Burial A-34. It was suggested that these were likely attached to a headband similar to the fillet from Piedras Negras. This collection of flares had one that was considerably larger than the rest at 35mm; this artifact had a thin face and cylindrical neck with two holes

opposite each other near the base of the neck. Kidder suggested that this flare might have originally been used as an earplug for a child. Two of the other flares appear as smaller versions of earflares with their necks removed. They are vaguely rectangular with their greatest lengths being 24 and 25 mm. One other flare in this assemblage also had the neck removed. This flare is triangular with a constricted central perforation. The other three miniature flares appear more similar to discs or buttons because they have small central perforations. These are fairly flat ovals that range in diameter from 4 to 6 mm. That six of the seven flares in the grouping having had their necks removed or never had necks provides support to the idea that these objects were attached to a perishable material backing (Kidder 1947:45, figs. 32 a, c-e, 80 e, 1-3).

Six other miniature flares were found at Uaxactun. The first two were recovered from Burial A-29; one is trumpet-shaped with a narrow neck and a diameter of 25 mm, and the other is rectangular and considerably smaller at 16 mm by 19mm. Two miniature flares were also found in Burial A-23. Their diameters are 23 to 27 mm and 24 to 25 mm. These flares have narrow faces and wide necks, each with two perforations on opposite sides. It is posited that these two miniature flares might have been mounted on rods because of their neck perforations (Kidder 1947:45, figs. 80 e, 32 b, 80 d, 4-5). The last two miniature flares were found in Cist 2, found under the floor of the south room of Temple E-I. They were found within two dishes set lip-to-lip along with nine jadeite beads and a jadeite animal-head pendant (Ricketson 1937:150, 196, Pl. 67; Kidder, Jennings, and Shook 1946:111).

Jadeite ear discs were found near the skull in Burial A-66. These discs had diameters of 72 and 73 mm. These discs were flat with rounded edges and were well polished. Each had small conical perforations in the center. No rear protuberance was noted, and it is assumed they would have included backings made from a perishable material (Kidder 1947:44).

## Baking Pot

Burial 15 at Baking Pot was located within a stone vault. A pair of small earflares was found with this individual, one on either side of the mandible. Other burial goods included two tripod pots, five jadeite beads, two small, shell rosettes, pieces of worked bone, eleven pieces of pyrite, eleven small, thin fragments of jadeite, and fourteen small round pieces of jadeite. No dimensions were given for the size of the earflares (Ricketson 1929:15-17, pl. 18; Kidder, Jennings, and Shook 1946:111).

## Nohmul

Mound 1, located a half mile east of Nohmul, contained a chamber in which was buried a single individual. Along with other grave goods, including a fine jadeite pendant and fragments of jadeite, two shells buttons were found, both positioned near the individual's right knee. The first button is 3.5 cm in diameter and lacks decoration, but the second button, at 2.5 cm in diameter, has the characteristic central protuberance (Hammond 1985:135). This individual additionally had a string of 13 small, red, perforated disks made from spondylus shell; the necklace also contained one jadeite earflare, 3.5 cm in diameter (Hammond 1985:136).

Mound 21 is located about 2 miles southeast of Nohmul. Although little was found within this mound, it was notable for the small ceramic vase found at the summit. This vase, formed to resemble a human face, had a headband of small flat beads (also of ceramic). These likely represent the buttons or miniature earflares often found decorating headbands, as seen in the archaeological record as well as artistic representations (Hammond 1985:155-6).

## Caracol

Many buttons have been recovered at Caracol, Belize. All of the following examples are made from either shell or jadeite. The buttons from Caracol highlight the importance of differentiating between buttons and other artifact forms. All but one of the following examples of buttons was originally categorized as some other artifact form; only through review of the excavation drawings were they realized to actually be buttons.

An unspecified number of shell and jadeite buttons were recovered from a nonpenetrating excavation on the terrace in front of Structure B36. These objects were initially categorized as beads, but they are actually buttons as they are small and have the characteristic depression surrounding a central protuberance with a small central perforation (Chase and Chase 2004b:5, fig. 22, a, b).

A shell button was recovered from S.D. C169B-1, which was located under the plaza floor in front of Structure B53. This burial contained two individuals and an additional subadult skull as well as a partial pottery vessel, 1 worked *olivella* shell, and 2 shell tinklers. This shell button was originally categorized as a bead (Chase and Chase 2004b:7, fig. 22, h).

Another shell button was recovered from S.D. C171B-2. This burial was located in front of and partially underneath the first step of Structure B42. It likely contained seven individuals along with many ceramics, a pair of moon snails, a drilled animal tooth, the shell button, two shell discs, and an obsidian blade. The shell button was originally categorized as a shell disc (Chase and Chase 2005:4, fig. 12, f).

On Structure A63, cleaning operations on a looters' trench that had penetrated at least one burial produced a jadeite button. Minimally five individuals had been buried in the disturbed

area. Additional artifacts located near the jadeite button included two bone pins. This object was identified as a button (Chase and Chase 2006:4, fig. 18, a).

A shell button, notched around the edges to resemble a flower, was recovered immediately under the ground surface of the Northeast Acropolis plaza. The button was originally classified only as worked shell (Chase and Chase 2010:8, fig. 9, f).

Two small shell buttons were associated with S.D. C184B-7. This Late to Terminal Classic burial included one individual accompanied by 3 adornos (2 of which can be categorized as buttons) and 4 vessels (Chase and Chase 2010:20, fig. 73, a, b).

Late Classic Tomb S.D. C184D-6 included a small shell button originally labeled as a carved shell. This tomb included three individuals accompanied by 8 ceramic vessels (1 of which is a small perfume bottle), a jadeite "bib-head" pendent, a piece of jadeite, a quartzite bead, a shell adorno, and a partial limestone bar. (Chase and Chase 2010:23, fig. 95, c).

The last shell button was among the artifacts recovered from S.D. C188B-8. This Late Classic tomb, among the largest at Caracol, was located in a residential group beneath the front portion of Structure K19. At least 10 individuals were interred in this tomb. Additional artifacts associated with this burial included "26 complete and 1 partial vessel… 4 jadeite beads, 1 jadeite earflare, [1] shell beads, 2 drilled shells, 1 shell fragment, 2 partial bone hairpins, 1 partial bone needle, 1 piece of worked bone, 1 hematite ball, 1 obsidian inlay, and 6 obsidian blade fragments" (Chase and Chase 2012:9-10, fig. 25, i). This button was originally categorized as a shell bead.

## Mountain Cow

Mountain Cow, Belize is located 8 km east of Caracol and is part of that site, connected by causeways radiating from Caracol's epicenter (A. Chase and Chase 2007). Early research by Thompson (1931) defined Mountain Cow as four groups located within relatively close proximity: Tzimin Kax, Cahal Cunil, Cahal Pichik, and Hatzcap Ceel (see also Morris and Ford 2005:95).

A votive cache was recovered from Pyramid M at Hatzcap Ceel. Located inside a large urn, the cache was found to contain a small jadeite earflare as well as nine jadeite beads, two jadeite figurines, two shell beads, a shell figurine, sea shells, one piece of coral, and a square piece of ceramic (Thompson 1931:274, pl. XXXV).

At Cahal Pichik, a votive cache recovered from Pyramid A was found to contain a pair of miniature earflares. Contained within a cylindrical vessel, the earflares were found along with nine jadeite beads, a small triangular jadeite artifact incised with a face, three or four shell beads, and two halves of a bivalve (Thompson 1931:277, pl. XXXVII).

Another cache was located within Cahal Pichik's Pyramid Q. This cache, set inside a coarse bowl, included a small jadeite earflare, a jadeite bead, and two perforated shells (Thompson 1931:277).

Vaulted Chamber II, located in the center of Tzimin Kax's Mound A, was a burial chamber with stairs leading down into a room with walls formed of flat limestone slabs and a vaulted roof. Burial goods from this chamber included a small jadeite earflare, a jadeite button, thirteen shell buttons, two tiny jadeite beads, a shell necklace, a granite ax, a flint spearhead blade, fragments of obsidian blades, and twenty-five vessels.

The small earflare from this burial actually appears to be a button, as it exhibits the characteristic tiny perforation through a central protuberance. It is slightly larger than the other button from this burial, but based on its form, it does appear to be a button. As the small earflare from the votive cache located in Pyramid Q at Cahal Pichik was not pictured, the identification of the second button from Tzimin Kax opens up the possibility that this artifact might also have been misinterpreted (Thompson 1931:296, 298, pl. XLVI).

## Dos Pilas

At Dos Pilas, a Late Classic tomb was identified as being the burial of the "Lady of Cancuen" who was the wife of Dos Pilas Ruler 3 (Kovacevich 2006:13, 157). The tomb included a carved hieroglyphic funerary throne and was located in her palace that was built in Cancuen style. Recovered from the tomb were two jadeite buttons located near the neck. There was also a jadeite disc, two jadeite rings, four jadeite beads near the left ankle, a necklace of 56 beads of an undetermined greenstone, and a necklace of 76 *Spondylus* beads. Additionally, the "Lady of Cancuen" had the only jadeite inlaid teeth at Dos Pilas; she had six hematite inlays, four jadeite inlays, and two missing inlays presumed to be of jade (Kovacevich 2006:13, 157).

## Copan

Seven jadeite ear ornaments were reported from the Harvard excavations at Copan. Although they all appear to take the form of buttons, given the larger size of some of these objects, it is likely that some would have been used as earflares. The smaller objects, especially

the smallest two at 1.5 cm, were more likely used as buttons for other types of adornment (Willey et al. 1994:252).

The first artifact is circular and 2.7 cm in diameter with a maximum thickness of 6 mm in the center. Both sides of this object are highly polished. One side is flat while the other is concave and has a central protuberance with a depression through which a 1 mm hole was drilled (Willey et al. 1994:252, fig. 194, a).

The second artifact is 2.9 mm in diameter and 6 mm thick. It is saucer shaped. The concave side has a flattened central protuberance with a 2 to 3 mm central perforation drilled from the convex side (Willey et al. 1994:252, fig. 194, b).

The third ornament is roughly circular with a diameter of 2.9 cm and thickness of 6 mm. It is saucer-shaped with a flattened central protuberance on the polished concave side. A central perforation was drilled from the unpolished convex side; it tapers from 3mm to 1 mm (Willey et al. 1994:252, fig. 195, c).

The next two ornaments were thought to be a pair. Both are 1.5 cm in diameter and 3mm thick. These are slightly cup-shaped. Each has a flat side that is highly polished and a slightly convex side which is only smoothed, not polished. The central perforation was made from the unpolished side; it tapers from 5 mm to 2 mm (Willey et al. 1994:252).

The last two ornaments were also thought to be a pair. These are dish-shaped and larger than the rest of the ornaments at 4.7 cm in diameter and 1.1 cm in thickness. The top side is highly polished and has a raised central protuberance. The bottoms are less polished; they retain evidence of string sawing, revealing that the objects were sawed from both sides leaving a small raised ridge that was partially ground down. Although they have the characteristic central

protuberances, given the size of these objects, it is likely they functioned as ear ornaments (Willey et al. 1994:252, figs. 194, 195).

## Guaytan

A pair of jadeite buttons was recovered from Guaytan Structure 4, Tomb III. This burial chamber had a bench, which along with the walls, was painted red. Thirty-seven adult individuals were interred in this tomb. Some of the long bones and one of the skulls were also painted red. Additionally found in Tomb III were twenty-six ceramic vessels (including some incense burners and miniature vessels containing paints of various colors), pyrite mosaic plaque backings, shells, shell beads, jadeite beads, and obsidian lancets (Smith and Kidder 1943:126-127, 165, fig. 54, c).

During excavations at Guaytan 4, on the southern periphery of the site of Guaytan, a shell button was discovered. Also recovered from the site were a shell earflare and shell fragments broken during production, over 2,500 jadeite artifacts, over 250 chert drills, 920 obsidian blades and fragments, and 245 exhausted obsidian cores. All steps in the process of jadeite artifact production, except for incising, were seen in the archaeological record as well as the production of shell artifacts and artifacts made from lithics other than jadeite. (Rochette 2009a:212; Rochette 2009b:213-214).

## Chichen Itza

A button was found within a masonry box used to hold a cache at the Mercado located at Chichen Itza. The button was roughly circular at 2.3 cm by 2 cm and was 0.2 cm thick. Ruppert

(1943) noted that a tubular drill had been used to make a central area of 0.7 cm. From the drilled circle around this central area, the stone sloped slowly upward toward the outer edge (Ruppert 1943:257; Coe 1959:50).

# ARTISTIC REPRESENTATIONS OF BUTTONS

The following depictions of buttons are from various Maya sites. Although the sample is likely incomplete, and based only on selected monuments presented by other researchers, it is adequate to demonstrate the abundance of buttons depicted in Maya art. The widespread presence of artistic representations of buttons demonstrates that they were commonly used, at least by the elite. Buttons are most commonly seen on headdresses and headbands, but are also used as adornment for other areas of the body. Proskouriakoff (1974) noted that most buttons had been recovered from Late Classic and Early Postclassic contexts; as the following representations date to the eighth and first half of the ninth century, they verify that buttons were popular during this time.

## Copan

The western figure from the north facade of the Late Classic Copan Structure 9N-82 has a headband across the forehead, slightly covered by the bottom of the headdress. The headband is formed from circular objects with a concave, drilled-out ring surrounding a central protuberance. Bands of these objects are also seen throughout the headdress. These objects are about one half the diameter of the earflares represented on this figure (Fash 1991:60-61). Another example is the southwest portrait panel from Structure 10L-18 depicting Yax Pahsaj, the 16$^{th}$ ruler of Copan. The headdress in this portrait contains objects near the end of each tassel that appears similar to the earflares shown on this ruler, with a drilled, concave ring and central protuberance. Covering the bottom half of the headdress are objects of the same shape, just much smaller at about one-

half to one-third of the diameter of the larger ones. Structure 10L-18 was dedicated in 800 AD (Fash 1991:170, Looper 2003:180, fig. 5.33).

The east side of Stela C, representing Ruler 13 as a young man, contains representations of the same objects with countersunk protuberances. They are found encircling the clothing of the ruler near the bottom above what appears to be fringe. Ruler 13 was in power from 695-738 AD (Fash 1991:113).

Stela 11, a columnar drum, dates to the Late Classic ca. 720-800 AD. The figure is carved in low relief and is shown carrying a ceremonial bar. Four buttons are located on the ceremonial bar; one at each end of the two mat elements. Buttons are also found on the tassels hanging from the figure's waist, one on each (Greene et al. 1972:366-367).

## Piedras Negras

Stelae 8 and 9 at Piedras Negras were noted by Coe (1959) as containing objects similar to the ones composing the headband found with Skeleton B from Burial 5 at Piedras Negras. These objects, appearing to represent buttons, are found bordering the headdresses just above each figure's forehead. Coe also mentioned that Stela 7 contained a central element on the figure's headband that was countersunk; this element definitely represents a button. There are other elements on this stela that also likely represent buttons, including the rest of the objects forming the headband as well as the objects decorating the chest. These elements are circular with a thin circular ring drilled around the central circular section. Stelae 7 and 8 both depict Ruler 3 who ruled from 687 to 729 AD; Stela 7 was dedicated on October 9, 721, and Stela 8 dates to 724-729 AD. Stela 9 represents Ruler 4; it was dedicated on July 22, 736 AD (Coe 1959:50; O'Neil 2012:92, 129-135).

The front of Piedras Negras Stela 12 depicts Ruler 7 with warriors and captives. Buttons are found adorning the warriors as well as one of the captives. Three of the headdresses contain a row of buttons, and one of the warriors and one of the captives have a headband composed of buttons. Stela 12 was dedicated on September 11, 795 AD (O'Neil 2012:42, 145-146).

The front of Stela 14 depicts Ruler 5, K'inich Yo'nal Ahk III, and his mother. A border of button-shaped objects can be seen under the seated ruler. A row of buttons is also found near the end of the mother's headdress. Stela 14 dates to ca. 761 AD (O'Neil 2012:35, 143).

A stucco head dated to the eighth century was found in Structure K-5. Across the forehead was a band of slightly overlapping buttons (Herring 2005:177).

## Seibal

Seibal Stela 11 was located at the base of Structure A-3. The male figure on this stela wears a headband composed of square buttons (Graham 1990:26-27, fig. 8). Reconstructions by Proskouriakoff suggested the individual pictured on this stela to be the same individual depicted above one of the doorways on Seibal Structure A-3. The headband from the doorway portrait, resembling the one on the stela, had been painted green (Smith 1982:31-32, fig. 47, a).

## La Mar

Stelae 1 and 2 feature headbands composed of buttons (Coe 1959:50).

## Quirigua

The north face of Stela D depicts the ruler K'ak' Tiliw as the lightning deity Yo'at/Yo'pat; it was dedicated February 19, 766 AD. Just below the bottom of the headdress overlapped almost halfway by it, is a band across the rulers forehead composed of flat, circular objects with central protuberances, likely buttons. These objects are miniscule when compared to the earflares being worn by the ruler (Looper 2003:140-41, 146).

## Naranjo

Stela 30 depicts a ruler dressed as the Jaguar God of the Underworld. There are two different groupings of objects on this stela that are likely representations of buttons. The first are tiny objects many times smaller than the ruler's earflares. These are located as a band bordering the headdress with a row of short feathers emerging from underneath these buttons. Another band of buttons can be seen on the collar of the ruler. These are considerably larger than the buttons depicted on the headdress, but are still only about half the diameter of the earflares (Guernsey 2006:86-87).

## Yaxchilán

Yaxchilán Stela 9, dating to appropriately 731 AD, depicts an ornately dressed male. The figure has a headband of buttons across his forehead and additional buttons appear to be suspended from either side of the headdress. All of the buttons have countersunk protuberances (Greene et al. 1972:118-119).

Stela 18, ca. 731 AD, depicts a ruler and a bound captive. On the ruler's jacket, three buttons are visible with more likely underneath his scarf. Buttons also form a belt at the ruler's waist and a headband across the ruler's forehead. Two more buttons are seen just behind the ruler's jaw, apparently suspended from the headdress (Greene et al. 1972:126-127).

Lintel 26 is from the eighth century and depicts Lady K'abal Xook and her husband Itzamnaaj Bahlam III. On the husband, there are eight representations of buttons, each with the diagnostic countersunk central area. Six buttons are found bordering each side of the man's chest and two buttons are across the man's head, as in a headband, visible only on the side of the head depicted (O'Neil 2012:114).

The upper step from the southeast doorway of Yaxchilán Structure 44 is decorated with hieroglyphics pertaining to the reign of Shield Jaguar and portrays a figure with arms bound behind his back. The front half of the figure's headdress is decorated with buttons with countersunk protuberances (Greene et al. 1972:134-135).

Lintel 45, ca. 750 AD, is from Yaxchilán Structure 44. Shield Jaguar, the predecessor of Bird Jaguar, is depicted with a captive bowed before him. Buttons with countersunk protuberances are seen in a headband at the bottom of Shield Jaguar's headdress (Greene et al. 1972:92-93).

Lintel 7 located in Yaxchilán Structure 1 is from ca. 750 AD. Bird Jaguar and a ceremonially attired woman stand facing each other. At the bottom of Bird Jaguar's headdress, near the top of his head, is a band of buttons with the countersunk protuberances (Greene et al. 1972:70-71).

Lintel 5 also located in Structure 1 is dated to ca. 750 AD. This lintel depicts Bird Jaguar facing a woman holding a bundle. A long line of buttons with countersunk protuberances is seen descending from Bird Jaguar's waist (Greene et al. 1972:66-67).

Lintel 42 located in Yaxchilán Temple 42 was dedicated in 752 AD. The lintel shows Bird Jaguar forming a family alliance with an ally. Buttons can be found descending from the center of Bird Jaguar's belt as well as in bands near his knees. There are also buttons on the headdress of the ally, in a band near the man's forehead. These buttons all exhibit the countersunk protuberances (Ranney 1974:41, 45; Greene et al. 1972:90-91).

Lintel 41 is also located in Temple 42; it likely dates closely with Lintel 42, dedicated in 752 AD. In this lintel, Bird Jaguar is seen facing a woman. The woman has a band on the bottom of the headdress that appears to be formed from square buttons with countersunk protuberances. Bird Jaguar also has a headband made from buttons; his buttons are the more common circular shape; a pendant is in the center of his headband. There are also buttons on Bird Jaguar's headdress near the ends of the plumes (Greene et al. 1972:88-89).

Yaxchilán Stela 13, ca. 752 AD, depicts an elaborately dressed man. On his loincloth apron is a section decorated with three buttons with countersunk protuberances (Greene et al. 1972:122-123).

Yaxchilán Stela 11 from 756 AD records the ascension of Bird Jaguar to office in 752 AD. On this stela, two men are facing each other, each holding a round shield and a torch staff. Two buttons are decorating the loincloth of the man on the left and one button is on the loincloth apron of the man on the right. All have countersunk protuberances (Greene et al. 1972:120-121).

Lintel 1 from Yaxchilán Structure 33 dates to 756 AD. This lintel depict a ruler and a woman both facing to the left. Numerous buttons are located throughout this lintel. Buttons are

seen on the ruler near the end of the plumes on his headdress, hanging suspended from the center of his waist, and as bands on his legs near his knees. On the woman, buttons are found near the ends of the plumes of the headdress and as a headband across her forehead (Greene et al. 1972:62-63).

Lintel 3 located in Structure 33 dates to 756 AD. On this lintel, Bird Jaguar and an ally are holding manikin scepters. Buttons can be found in a row near the bottom of Bird Jaguar's headdress just above his forehead (Ranney 1974:47).

Yaxchilán Stela 1, possibly dating to 761 AD, depicts a large figure with circlets falling from his hands down towards a smaller figure with upraised hands. The larger figure has buttons decorating his loincloth apron. The object highest up in this section is many times larger than the other buttons and could be representing an earflare. All the objects in this section of the clothing have countersunk protuberances (Greene et al. 1972:106-107).

Yaxchilán Stela 5, dated only to the Late Classic Period, depicts an ornately dressed principle figure with two smaller fragmentary figures looking up at him. The principle figure has buttons near the ends of the plumes on his headdress; each button is followed by a tassel (Greene et al. 1972:112-113).

Lintel 52 from Yaxchilán Structure 55 dates to 766 AD. Bird Jaguar is shown facing a smaller male, possibly the descendent of Shield Jaguar. Both figures wear headbands of buttons with countersunk protuberances (Greene et al. 1972:100-101).

Lintel 53, ca. 766 AD, is also from Structure 55. Shield Jaguar is shown facing a woman carrying a bundle. Both figures wear a headband of buttons with countersunk protuberances. Buttons are also seen descending from the head at the center of Shield Jaguar's belt (Greene et al. 1972:102-103).

Lintel 16 located in Yaxchilán Structure 21 dates to ca. 770 AD and shows Bird Jaguar with a captive. A belt of buttons is at his waist, and six buttons are adorning the clothing covering his chest, two of which are partially covered by his headdress. These all have clearly depicted countersunk protuberances (Miller 1999:126; Greene et al. 1972:80-81).

Lintel 17 located in Structure 21 dates to ca. 770 AD and depicts a man and woman performing a blood-letting ritual. Two buttons with countersunk protuberances are seen on the man, just behind and a little below the visible earflare (Greene et al. 1972:82-83).

Lintel 13 from Yaxchilán Structure 20 was likely carved ca. 800-850 AD, but it represents a ceremony near the beginning of Bird Jaguar's reign in the mid-eighth century. Bird Jaguar is depicted standing on the right, a woman on the left, and a serpent in the center with a human head emerging from its open jaws. All three human figures have headbands of buttons across their foreheads, all with the characteristic countersunk protuberance. Additional buttons can be found in a band draping down from the center of Bird Jaguar's waist and on the bracelets of Bird Jaguar and the woman (Greene et al. 1972:74-75).

Lintel 14 is almost exactly the same as Lintel 13. From the same building, just spanning a different doorway, it dates to the same period and depicts the same ceremony. In this depiction of Bird Jaguar, the woman, and the serpent with emerging human head, buttons are only found on the headdresses. The row of buttons across the bottom of the headdresses near the foreheads is again present as well as additional buttons adorning other areas of the headdresses. Buttons are not found on the bracelets in this depiction or on Bird Jaguar's clothing (Greene et al. 1972:76-77).

An unprovenienced, late eighth century panel featuring a warrior, three captives, and a lord might be from Yaxchilán; this is likely because the lord is sitting on a throne inscribed with

the Yaxchilán king's title. Located on the warrior's headdress is a row of three buttons near the end of the plumes (Miller 1999:156).

## Yaxchilán Vicinity

A lintel from the Yaxchilán vicinity depicts two principle figures facing a kneeling prisoner. This lintel is somewhat unusual in that the prisoner is depicted as being the same size as the principle figures. Three buttons are seen on the headdress of the figure on the left in front of an "X" design. A band of buttons is seen on the head of the figure on the right, near the bottom of his headdress. All of these buttons have countersunk protuberances (Greene et al. 1972:144-145).

Another lintel, whose original location is unknown, has been suggested to be from the Yaxchilán vicinity. On this Late Classic lintel, two figures are seen presenting a headdress to a lord sitting on a throne; this representation is similar to that on Yaxchilán Stela 15. Buttons are found as a headband across the ruler's forehead and on the plumes of his head ornament just before the final tassels. Buttons are also seen decorating the headdress being given to the ruler; these are spaced along a band running through the middle of the headdress. The countersunk protuberances are not well defined on this piece (Greene et al. 1972:146-147).

## Bonampak

Bonampak Stela 2 was dedicated in 785 AD. It depicts a ruler with a woman on each of his sides. Buttons are found as a headband across the forehead of the ruler. These are squarish with incised lines from the depressed ring around the center radiated out to the corners. A few

more buttons, these round, are found throughout the ruler's headdress as part of the decoration. Both women also have headbands made with buttons; these are round unlike the buttons on the ruler's headband. Buttons can also be found on the headdress of the woman to the right; these are being used as a headband for the mask on her headdress. Both of the headdresses worn by the women also have buttons near the ends immediately before a final row of tassels (Ranney 1974:54, fig. 40; Greene et al. 1972:150-151).

The lintel from Structure 6 at Bonampak depicts a ruler and a vision serpent. On the ruler's headdress are three depictions of buttons; two are tiny and have only a thin line distinguishing the central protuberance, and one is slightly larger and has the defined countersunk protuberance. On the plumes of the vision serpent, eight of the larger buttons with the countersunk protuberances are depicted. All of the buttons shown on this lintel are only fractions of the size of the ruler's earflares (Guernsey 2006:85-86).

## Aguateca

Aguateca Stela 7 from 790 AD contains an elaborate headdress. The plumes on the headdress each have a button near the end (Greene 1972:192-193).

## Dos Pilas

Dos Pilas Stela 1 dates to 706 AD. Depicted is a single principle figure carrying a manikin scepter and a shield edged with feathers. Buttons are seen in three bands running up and down through the center of the figure's headdress. A button is near each end of a bar just above

the figure's waist, and there is also one near the end of his loincloth apron (Greene et al. 1972:194-195).

Dos Pilas Stela 2 tentatively dates to 736 AD. The figure on this monument is depicted carrying a spear and a rectangular shield. On the figure's headdress one button can be clearly made out with another one likely on the other side of an "X" design. Another button is seen near the figure's waist (Greene et al. 1972:196-197).

Dos Pilas Stela 16 is from the Late Classic. A woman is depicted carrying a large ceremonial bar. A button is seen near the top of the figure's headdress as well as one suspended from the side of the figure's belt. Three buttons are found on the ceremonial bar; two near the higher end just below the serpent head end and one near the lower end (Greene et al. 1972:198-199).

## El Cayo

A panel carved in the Usumacinta polity of El Cayo during 795 AD depicts a ruler with panels of hieroglyphics on either side. Buttons are found on this panel in two places. The first is a row of buttons across the ruler's forehead, slightly covered by the headdress. The second is on the plumes of feathers extending from the top of the headdress; the buttons are found near the ends of these plumes followed by several short feathers extending from each button (Herring 2005:3).

## Kaminaljuyu

Kaminaljuyu Stela 10 is fragmentary and partially depicts three individuals. The headdresses are visible on the upper two individuals and buttons are numerous on both. Both headdresses have a row of buttons near the ends of the headdresses each followed by a row of tassels. The headdress on the right also features buttons decorating it throughout. The individual on the left additionally has three buttons just below his chin, each with a feather suspended from it (Parsons 1986:fig. 175).

Silhouetted relief fragments 8, 12, and 13 at Kaminaljuyu all feature buttons. Each has a row of buttons followed by tassels (Parsons 1986:figs. 180, 181).

## Chocola

A stela fragment from Chocola, Suchitepequez, Guatemala depicts a figure with trophy heads. The bottom of this figure's headdress is decorated with a row of buttons followed by a layer of tassels (Parsons 1986:fig. 176).

## Tikal

Tikal Stela 16 was dedicated in 711 AD and depicts Hasaw Chan K'awil celebrating the completion of fourteen katuns. Two buttons are located on the side of the central area and rows of buttons are located near the ends of all the headdress plumes followed by small feathers (Miller 1999:129).

Lintel 3 from Tikal Temple 1 dates to ca. 720 AD. This elaborate lintel depicts a “jaguar protector” looming over the top of a high-back throne with an ornately adorned figure sitting in

it. Two buttons are found near the top of the figure's headdress. Three buttons are located near the top of the high-back throne. An additional button is found under the ceremonial bar being held by the figure, but it is not possible to see where it would have been attached (Greene et al. 1972:300-301).

Tikal Stela 21 dates to 736 AD. This stela is fragmentary, showing a figure's lower torso as well as the backmost portion of the headdress. Buttons are found on the tassel hanging from the front of the figure and the tassel hanging behind the figure. These buttons have only incised lines showing the depressed ring around the central protuberances (Greene et al. 1972:270-271).

Lintel 3 of Tikal Temple IV depicts Yik'in Chan K'awil celebrating a military victory in 743 AD. A headband composed of buttons is located across the ruler's forehead; these are depicted with the characteristic countersunk protuberances. Several other buttons are located throughout the headdress as decoration. Rows of buttons are also seen near all the edges of the ruler's headdress (Miller 1999:131: Greene et al. 1972:303).

Tikal Stela 22 dates to 771 AD. The figure is depicted with a huge, ornate headdress and a ceremonial bar. Two buttons are located on the tassel hanging from the front of the figure's waist (Greene et al. 1972:272-273).

## Puuc Region

On a painted capstone from an eighth century Puuc building, a K'awil is depicted spilling the Maize God's sack of seeds. Across the forehead of the K'awil, a headband of buttons is shown (Miller 1999:182-183).

## Bilbao

Bilbao Monument 8 dates to the Late Classic. This stela features a celestial being underneath a Tlaloc; underneath the deity is a ball player with one hand extending up towards the deity. The deity is wearing a large collar formed with several rows of large buttons, about two-thirds the size of the deities earflares. Three small buttons are also on top of the ball player's left sandal (Greene et al. 1972:402-403).

# STONE POLISHERS

The following section discusses artifacts used by the ancient Maya as polishing tools. This is limited to a specific type of polisher; the type of polishers presented includes those with multiple circular depressions which were made from any type of stone material. As discussed earlier in this study, other types of polishers were additionally utilized by the ancient Maya, and this should not be considered a review of all polishers used by the ancient Maya. These polishers were used in the manufacture of ornamental objects, so the preceding review of jadeite, lapidary techniques, and artifact forms will aid in the discussion of these tools.

## Cancuen Jadeite Polishers

Brigitte Kovacevich (2004, 2006, 2007, 2011, 2013), working at the Classic Maya site of Cancuen located in Guatemala, identified two artifacts as earflare polishers. The first polisher was made of limestone; it was recovered from the southern corner of the outset stairway on the east side of the M9-1 platform. M9-1 was a large six-room structure with masonry walls and corbelled vaults. Also recovered from the same unit were a barkbeater and a cut piece of pyrite. A midden was excavated on the southeast corner of this building revealing high concentrations of ceramics. "In addition, lithic materials (including chert, obsidian, and green stone), ground stone (including large and finely made examples), shell, worked shell and bone, and figurine fragments were found.(Jackson 2002:9-10; Kovacevich 2007:80). The second polisher (Figure 6) was made of sandstone; it was discovered in fill beneath the floor of Structure L7-9, also known as the House of the Portraits and located within the royal palace complex.


*Figure 6: Polisher from Cancuen Structure L7-9*
Photo by Brigitte Kovacevich (Kovacevich 2006:208, fig. 5.24)

Based on the locations for these polishers, Kovacevich concluded that the elite of Cancuen were involved in polishing and possibly other final stages in the production of jadeite artifacts (Kovacevich, Cook, and Beach 2004; Kovacevich 2006:170, fig. 5.24 and 5.25, fig. 3.10; Kovacevich 2007:80, fig. 3.10; Kovacevich 2011:160-161, fig. 13.4; Kovacevich 2013:265). Kovacevich also noted that these polishers might have been used in conjunction with abrasives. However, she wrote that there was no way to distinguish between the matrix in which the polishers were located and any possible abrasive material (Kovacevich 2011:161).

There are issues with the identification of these two Cancuen artifacts as earflare polishers. These issues involve the sizes and shapes of the depressions found on these polishers. Neither the size nor shape of the depressions corresponds to that of a typical earflare.

The depressions have diameters ranging from around 11 mm to 25 mm. It is unlikely that the depressions, especially those toward the bottom of the range, would have been made from earflares, which are typically much larger. Although the larger depressions do fall within the bottom metrical limit of earflares, identified by Tatiana Proskouriakoff (1974) as between 20 and 30 mm, they are considerably smaller than usual earflares, especially when compared to the size of earflares depicted in Maya artistic representations of the elite.

The main issue, though, is with the shapes of the bottoms of the depressions. All of the depressions on the artifact from L7-9 and half of those on the artifact from M9-1 have a concave central area in each depression that would have corresponded with a central protuberance. No forms of earflares, as presented by previous researchers, have these central protuberances, although they are found on a common form of button. The other depressions on the limestone polisher from M9-1 have convex central areas that would have corresponded with a sunken area on the artifact that made the hole. Although these sunken areas could correspond to the throats of small earflares, it is more likely they are the slightly sunken areas on the small objects, called "earflares" but actually resembling "buttons," recovered from the same group of structures. These stone polishers appear to have been used in the manufacture of buttons.

Given that jadeite-working has been found in numerous locations throughout Cancuen, it is likely these polishers were in fact being used in the manufacture jadeite artifacts. It is possible, though, that they could have been used with other materials, either exclusively or in addition to use with jadeite. This supposition is based on the fact that neither polisher was

located with debitage associated with the tool's use, as well as the fact that the polisher from Cancuen M9-1 was recovered from a group containing evidence of worked shell, bone, and pyrite (Jackson 2002:9-10).

## Vargas IIA Bead Grinder/Polisher

A tool used to grind or polish beads was recovered from Structure 1 at Vargas IIA in the Middle Motagua Valley, Guatemala. Vargas IIA was occupied from the Late Preclassic through the Late Classic. Behind the largest structure, evidence was found of all stages of jadeite bead production, including over 250 jadeite artifacts and chert drill bits, as well as evidence for the production of jasper and other unidentified stone beads. The stone tool was collected from the walls of a looter's trench dug into the walls and platform of Structure 1; this building is part of a large, possibly civic-ceremonial center (Rochette 2009a:211; Rochette 2009b:111-115).

*Figure 7: Bead Grinder/Polisher from Vargas IIA*
(Rochette 2009b:115, fig. 4.13)

This bead polisher has one large, oval depression with a diameter of approximately 11x14 cm and three smaller, round depressions with diameters of approximately 2.5 to 3 cm (Rochette 2009b:111-115). Based on the shapes of the depressions, it appears this tool was being used to grind or polish spheroid beads. Beads would have been rolled around in these depressions to give the beads a smooth rounded surface, as well as possibly being used to produce a polished surface. Based on the recovery of evidence for the production of jadeite, jasper, and other unidentified stone artifacts in the area, it is likely that this tool was being used to work one or more of these materials.

## Caracol Bead Polisher

A bead polisher (C186C/9-1) made of limestone was recovered from Structure F9 at the ancient Maya site of Caracol, located in central Belize. Structure F9 is part of a residential group, the Chalpat Group, which was occupied from the Early Classic to Terminal Classic Periods. Excavations in the Chalpat Group failed to recover any ceramic material from the Terminal Classic palace ceramic sub-complex (Chase and Chase 2004), so it is likely that this was not a high status household. Caracol Structure F9 is located on the north side of the Chalpat Group. It was built during at least three different construction episodes, reaching an elevation of 1.2 m above the plaza. Based on the archaeological record, it appears that Structure F9 was first built during the Early Classic and continued to be utilized through at least the Late Classic Period. The limestone bead polisher was uncovered in the upper portion of the building fill along with sherds ranging from the Late Preclassic through the Late Classic Periods (Chase and Chase 2011:15-18).

Since the polisher was located in a secondary context, being used as part of dry core fill, other artifacts found associated with this structure cannot be considered connected with this artifact, but some of possible interest include a jadeite inlay, marine shells, a carved slate fragment, and a broken spindle whorl. Of possible importance are the results of the excavations of the eastern and western structures from the Chalpat Group. Caracol Structure F11 to the east contained burials with indicators of individuals of higher status. Burial C186B-3 contained the disarticulated bodies of three individuals, at least two of which had inlaid teeth of jadeite and hematite (Chase and Chase 2011:16). Burial C186B-4 included offerings of three vessels, a small perfume bottle, a *spondylus* bead, a fragmentary bone awl, shell inlay pieces, and a set of two small jadeite earflares (Chase and Chase 2011:17); jadeite earflares are usually associated with high status individuals at Caracol. Caracol Structure F14 to the west might be important to this bead polisher if the building fill used on both this building and Structure F9 originated as refuse from this residential group.

> The core of the building [F14] also contained a relatively large amount of chert, obsidian, shale, and quartzite tools, indicating that much lithic production debris had entered the building fill. Worked shell was also recovered from the fill and may represent one of the items manufactured in Chalpat (Chase and Chase 2011:19).

Shell-working has been documented in many locations throughout Caracol. Small chert tools were found in excavations at the Mosquito and Midway Groups, as well as in at least seven other groups. "These chert tools were most likely used in the cutting and carving of marine shells to make jewelry and ornamentation" based on a preliminary wear-pattern analysis (Pope 1994:148). Excavations at the Mosquito and Midway Groups revealed the presence of lithic debitage from all steps in the process of lithic tools production; this indicates at least some stone tools were produced in the area as well as retouching of the tools. At the Mosquito Group, lithic

debitage was found "associated with marine shells manufacturing debris . . . which consisted of deliberately cut pieces and jewelry fragments abandoned after being broken in the manufacturing process . . . [This] included partially worked rings, beads, and adornos" (Pope 1994:148-149). Similar amounts of lithic debitage were found in the Midway Group but much less shell debris was recovered. The smaller amount of shell might indicate the tools in the Midway Group were utilized for other tasks such as wood-working in addition to shell-working. Complete drills were recovered from both groups; analysis of these drills showed the tips had been worn down through rotation, indicating their use in boring holes through the shells (Pope 1994:152). Based on this evidence from the archaeological record, it can be concluded that some of the inhabitant of Caracol were involved in the manufacture of shell ornaments (Pope 1994:148). The types of shell artifacts that have been found at Caracol include pendants, beads, inlay pieces, disks, rings, buttons, anthropomorphic figures, stars, earflares, earflare pins, carved pieces, tweezers, celts, and trumpets (Cobos 1994:141).

It is highly possible that the Caracol bead polisher was used to polish shell. First, shell manufacturing is seen in many locations at Caracol. Secondly, even though the polisher cannot be definitively tied to being used in the Chalpat Group, it is important that worked shells and lithic tools were recovered from the excavations in this group; marine shells (worked and unworked), a *spondylus* bead, and shell inlay pieces were found as well as chert, obsidian, shale, and quartzite tools. These artifacts indicate shell was likely being worked in the Chalpat Group.

There is no way to determine exactly what materials were being polished with this tool. Although no definite evidence of jadeite-working has been recovered, it is extremely likely that people of Caracol were also working jadeite (Chase and Chase 2000:6; Chase and Chase 1998). This polisher also could have been used with many other materials.

*Figure 8: Bead Polisher from Caracol, Belize*

*Figure 9: Bead Polisher from Caracol, Belize (view of opposite side)*

The bead polisher is made of limestone with a Munsell color of 5 YR 8/1. It has a length of 66 mm width of 54 mm and thickness of 21 mm and weighs 123 g. This artifact has fifteen man-made depressions in it. The depressions in the stone are cylindrical with straight walls that show some evidence of rings where the walls are not entirely smooth but have slightly higher and lower areas. The bottoms of the depressions slope up to convex central areas. Some of the depressions have high, defined protuberances in the center showing even more clearly that the center was not being ground down at the same rate as the outer ring of the bottom surface. The diameters of the depressions range from 5 mm to 8 mm. Of the depressions, twelve are complete and were ground only partially through the stone. Three incomplete depressions are found along the broken off edges of the stone; one goes completely through the stone, but the other two cannot be determined because of the cleavage angle. The twelve depressions that go only partially through the stone are split evenly between the top and bottom; it is obvious that the craftsman took care to space the holes out in the relation to the holes on the other side, knowing they would be ground past the center of the stone. In only one instance did a depression meet with another; this led to the abandonment of this depression, which is the shallowest found on the stone.

The depressions on this stone mirror the shape of tubular or possibly oblong beads, which is most likely what was polished with this stone. With diameters of the depressions only ranging from 5 to 8 mm, no other artifact type besides beads could have been used in conjunction with this stone. The shape of the depression bottoms and walls also rules out all other bead forms besides tubular/oblong; other shapes of beads would have left distinctly different depressions. Bead forms such as spheroid or barrel shaped would have left rounded areas in the bottom near the walls as well as rounded walls. Irregularly shaped beads would not have worked well with

this type of polishing because they would not have been easily twirled given their irregular shapes and also would not have left the smooth circular depressions found on this stone. Discoidal beads could have been polished in this manner, if it was done before they were sawed off the bead core.

## Nohmul Polisher

A polisher made from marbleized limestone was recovered from Operation P1E/18 in Structure 9 at the ancient Maya site of Nohmul in Northern Belize. Located in the east central plaza of the site, Structure 9 stands by itself at the junction of two adjacent plazas blocking access between the two. Its orientation is at odds with the other structures in the area except Structure 20, dated to the Terminal Classic/ Early Postclassic Period. Based on excavations and surface collections, Structure 9 also dates from the Terminal Classic to Early Postclassic; it was also revealed that Structure 9 had a round substructure and superstructure (Chase 1982:111-112; Chase and Chase 1982). As no deposits of domestic refuse were found associated with Structure 9, it was likely only used ceremonially (Chase 1982:123: Chase and Chase 1982). The marbleized limestone polisher was found in a secondary context, being used as part of the fill within this structure.

The polisher from P1E/18 is made of marbleized limestone and is a pinkish cream color. It is 110 mm long by 83 mm wide by 69 mm thick and weighs 709 g. There are at least twenty-three man-made depressions on this stone. The depressions all have circular openings and descend into the stone to depths varying between 3 mm and 20 mm. The bottom surface of each depression is highly polished. This object appears to have been a multipurpose polisher used to polish many different types of artifacts.

As with the Caracol polisher, we cannot determine what materials were used with this polisher. No evidence of jade-working has been found at Nohmul. Additionally, the polisher was found in a secondary context, so there was no possibility of finding debitage from the artifacts worked with this tool. This polisher could have been used to work materials such as jadeite, other stones, shell, or bone, but this cannot be determined currently.

*Figure 10: Polisher from Nohmul, Belize*
(Photo by Rachael Landry)

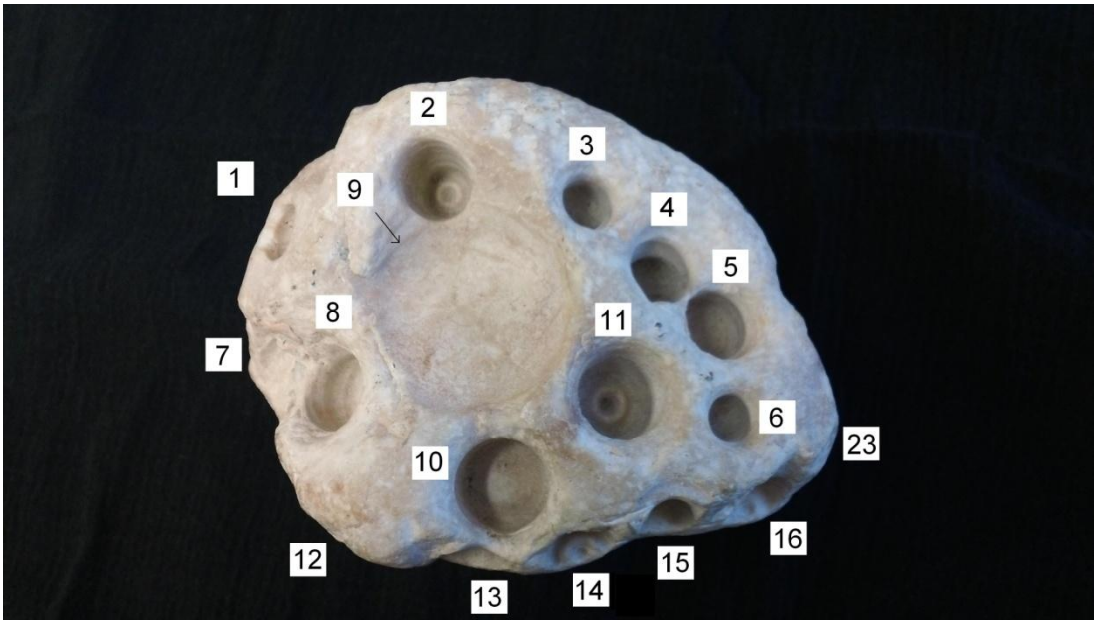


*Figure 11: Polisher from Nohmul, Belize with depressions numbers*
(Photo by Rachael Landry)

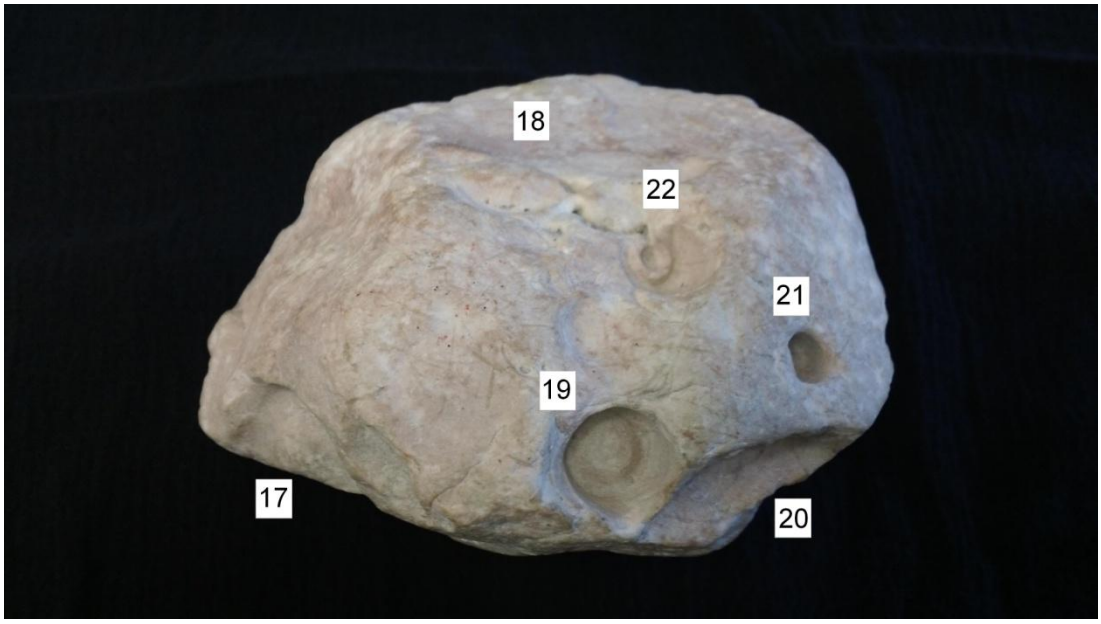


*Figure 12: Polisher from Nohmul, Belize with depressions numbers (view of other side)*
(Photo by Rachael Landry)

*Table 1: Descriptions of Depressions on Polisher from Nohmul, Belize*

| Depression | Diameter | Maximum Depth | Bottom Surface Shape |
|---|---|---|---|
| 1 | 11 mm | 3 mm | Flat |
| 2 | 14 mm | 20 mm | Concave outer ring/convex middle ring/concave center |
| 3 | 9 mm | 14 mm | Flat |
| 4 | 11 mm | 19 mm | Flat |
| 5 | 12 mm | 15 mm | Flat |
| 6 | 8 mm | 11 mm | Flat |
| 7 | 20 mm | 14 mm | Flat |
| 8 | 14 mm | 16 mm | Concave outer ring/convex middle ring/concave center |
| 9 | 35 mm | 15 mm | Concave outer ring sloping up to slight convex center |
| 10 | 16 mm | 19 mm | Concave outer ring sloping up to convex center |
| 11 | 16 mm | 17 mm | Concave outer ring/convex middle ring/concave center |
| 12 | 16 mm (incomplete) | 16 mm | Concave outer ring sloping up to convex center |
| 13 | 15 mm (incomplete) | 19 mm | Flat |
| 14 | 13 mm (incomplete) | 16 mm | Concave outer ring/convex middle ring/concave center |
| 15 | 10 mm | 13 mm | Flat |
| 16 | 13 mm | 17 mm | Concave outer ring/convex middle ring/concave center -all very slight |
| 17 | 21 mm | 12 mm | Concave outer ring sloping up to convex center |
| 18 | 15 mm (incomplete) | 5 mm | Concave outer ring sloping up to convex center |
| 19 | 14 mm | 8 mm | Concave outer ring with a flat center |
| 20 | 32 mm (incomplete) | 11 mm | Flat |
| 21 | 7 mm | 9 mm | Flat |
| 22 | 10 mm | 9 mm | Concave outer ring/convex middle ring/concave center |
| 23 | Not enough to determine | Not enough to determine | Flat |

The shape of the bottom surface of the depressions is diagnostically important for determining the shape of the objects that caused these depressions. Eleven of the depressions have a flat bottom surface. Five depressions have bottoms that slope up to convex centers from the rounded concave areas near the walls. One of these is only slightly convex in the center. Six depressions have a concave outer ring, convex middle ring, and concave center. One of these is only very slightly convex and concave, but the elevation changes are still visible. One has a concave outer ring with a flat center. Based on the diameters of the depressions, as well as the shape of the bottom surface, this stone was being used to polish several different artifact types.

The two largest depressions, with diameters much larger than the rest at 35 mm and 32 mm, were likely being used to polish discs. At 32 mm, the large depression partially broken off at the edge is indeterminate, but the large central depression with a diameter of 35 appears to have been used to polish a slightly concave disc. The other type of artifact that could have plausibly been polished in this depression would have been an earflare, but this is unlikely. If it had been used to polish an earflare, the center of the depression would have been much more convex as it would have not been in contact with the material being polished; this depression is only slightly convex. Additionally, all areas in the bottom of the depression are highly polished, not just toward the edges. Again, if an earflare had created these depressions, it would not have been in contact with the center of the depression and would not have produced polish in the center of the depression. A disc that was used as an ear ornament could have been polished in these depressions. Ear-discs were described by Proskouriakoff (1974: 31, 69) as flat discs with a small perforation through the center of the front leading through a central protuberance in the back. As with buttons, these small perforations through the center would have been made after polishing, so the depression left from the polishing of discs and ear-discs would be identical.

The smaller depressions range in diameter from 7 mm to 21 mm; this only takes into account the size of those that are complete. These smaller depressions would have been used to polish beads, cylinders, discs, miniature earflares, double-drilled beads, or buttons.

Depressions 1, 3, 4, 5, 6, 7, 13, 15, and 21 all have flat bottoms. Ranging in diameter from 7 mm to 20 mm, these would have been used to polish small cylindrical objects or tubular beads that had not yet been drilled. Of these, only the shallowest depressions could have been used to polish discs. Depressions 10, 12, and 17 have convex central areas; these correspond to concave central areas on the objects that were polished in these depressions. These were most likely made from polishing miniature earflares. It is possible they could have been used to polish beads but only if these beads had fairly large bore holes as these depressions do not show the sharply convex centers seen on the bead polisher from Caracol but rather have proportionally large gradually convex, central areas.

Depressions 2, 8, 11, 14, 16, and 22 range in diameter from 10 mm to 16 mm. These depressions have a concave outer ring, convex middle ring, and concave center; one of these is only slightly convex and concave. These would have formed from polishing buttons, especially as buttons have the exact reverse of the depressions shape.

Depression 19 is different from the rest of the depressions. It has a diameter of 14 mm and descends 8 mm into the stone to a bottom surface with a concave outer ring that slopes up to a large, flat central area. The shape of the bottom is unique on this stone. The corresponding artifact that made this depression is likely a variant form of a standard Maya button lacking the central protuberance. This depression is also similar to the "shoe button" beads reported from Kaminaljuyu. These "shoe button" beads ranged in diameter from 5 mm to 10 mm (Kidder, Jennings, Shook 1946: 112; figs. 46 d-f, 148 c). The artifacts are disc shaped and featured a

small outer ring surrounding a raised, flat central area. They featured a hole drilled through the undecorated back side. Although similar, the artifact that formed this depression was slightly larger at 14 mm and had a convex outer ring, similar to the normal button form, just lacking the central protuberance.

# CONCLUSIONS

This study has shown that the Ancient Maya used stone tools to polish objects of adornment. All five polishing tools presented have circular depressions on them from objects being rotated against the tool to produce a polished surface. Based on the shapes of the depressions, it has been established that the Ancient Maya used these tools on artifact types such as beads, miniature earflares, and buttons. Finally, this study has highlighted the necessity of categorizing buttons and miniature earflares into their own types instead of combining them with other artifact forms.

The issue of artifact terminology is important. Reviewing the archaeological record of Ancient Maya miniature earflares and buttons has shown that these artifacts are often categorized as other artifact forms. Without the aid of a photograph or drawing, miscategorized objects cannot be correctly understood by other researchers. This study has also shown that buttons need to be a separate artifact class from earflares and miniature earflares. These artifacts are different in form and usage, which necessitates having their own category; this is vital for clearly communicating to other researchers exactly what type of artifact is being described, especially if there are no pictures provided to show the differences. Although no direct evidence has yet been found to conclusively show that buttons were or were not used as ear ornaments, their common use on headbands, seen in both burials and artistic representations, should be adequate enough to show that these objects were often used for other types of adornment. Additionally, the category of miniature earflares is one that should be utilized more often. As shown through the archaeological record, these smaller flares are often utilized differently than their larger counterparts, commonly being found on headbands and atop tubes or tubular beads projecting

from the center of normal sized flares. As with buttons, it does not appear that miniature flares were commonly used as earflares on their own.

The polishing tools recovered to date show that this technology for polishing artifacts was used at many different sites over a wide area; given this fact, it is likely that more stone polishers will continue to be recovered in the future. The inconsistent distribution of these artifacts as well as the fact that these tools were all found in secondary contexts without any related debitage likely indicates that this was a technology that was only used for a short period of time, having fallen into disuse as it was replaced by another method of polishing. The polishers presented in this study also show that stone polishers were being used to polish a variety of artifacts types and likely a variety of materials. The question of whether abrasives were used in conjunction with these stone polishers cannot yet be answered conclusively, but given the common usage of abrasives with other lapidary tools, it is definitely possible.

There are several directions for future research on this topic. The first topic would be determining what polishing techniques were commonly used by the Ancient Maya before and after these polishing tools were utilized. This would be usefully for understanding the transition in polishing technologies over time. The second topic would include testing whether abrasives would have been used with these tools. Although it cannot be determined conclusively if the polishing tools presented in this study were used with abrasives, experimenting with polishing different materials against stones made from the same materials as the presented polishers could be useful in understanding if abrasives would have been beneficial or possibly even necessary to produce the desired polished surface. A final area for future examination would be to research if similar polishing tools were used by any other peoples.

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Foshag 1957:55, Plate 1, fig. 2



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---
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I would love to read your thesis when you are finished. Would you mind sending along a link to it? I have been trying to gather more evidence on polishing tools.

If I can be of further assistance please let me know.

All the best,
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