The manufacture of jade goods was a long and arduous process that required numerous technological stages and a variety of tools. Unfortunately, the archaeological record is often too fragmentary to allow for the identification of these technologies and tools. Even more difficult is assessing how these tools and technologies impacted and were informed by social structure. In an attempt to address these issues, I combine ethnographic, ethnohistorical, and archaeological data to identify, describe, and interpret the material correlates and social processes surrounding the production of jade at the Late Classic Maya site of Cancuen, Guatemala.

The hardness and rarity of jade made it a valuable tool stone and gemstone in the past. Jade was especially symbolic for ancient Mesoamerican peoples because of its green-blue color, which represented fertility and the vital essence of life (Taube 2005). For these reasons, I begin by describing the properties of jadeite and the conditions under which it forms. I then describe the manufacturing sequence for jade goods using archaeological evidence from the site of Cancuen. Ethnohistorical and ethnographic accounts of jade working communities in other parts of Mesoamerica and Asia provide an important interpretive lens for understanding these data.

The Cancuen dataset is unique in its large size. Fully 3,538 jade artifacts, with a combined mass of 91.6 kilograms, were recovered from residential excavations at the site. Of
these, 3,380 pieces represent the early stages of production and were recovered from simple, earthen mounds in patio groups with limestone laja exterior patio floors. In contrast, ownership of finished products, such as carved jade plaques, earflares, and large beads, seems to have been limited to the residents of masonry structures that often feature vaulted tombs or cyst graves: markers of high status at the site. Despite the large amount of jade present in more humble structures, artifact finishing seems to have been carried out by residents of elite households. I use the word ‘segmented’ to describe a manufacturing sequence in which certain production tasks were performed by distinct social groups.

I argue that the segmented manufacturing sequence of jade artifacts at Cancuen represents the authoritative and allocative power of the elite, who restricted use and final stage production through a monopoly of certain types of technology and esoteric cultural knowledge. Sumptuary laws also may have played a role. Nevertheless, small beads, caches, and termination rituals at more humble households suggest that commoners had some access to jade and that their involvement in the production of jade ornaments was part of their social identity, even if they could not own particular types of final products.

WHAT IS JADE?

The term jade comes from early Spanish accounts, which refer to Mesoamerican greenstones as piedra de yjada (Monardes 1596). The Aztecs told the Spanish of the power of the stone to cure ailments of the spleen, kidneys, and liver. For this reason, the Spanish called it “side-” or “flank-stone.” The English word ‘jade’ is borrowed from the Spanish (Miller and
Ethnohistorical sources often refer to greenstones as *chalchihuites* (more properly, *xalxihuitli*), meaning “herb-colored jewel” in Nahuatl (Foshag 1957:7). Colonial Spanish sources also refer to jade and other greenstones as emeralds. Sahagún notes that the Aztecs used different terms to refer to the color and quality of greenstones. *Quetzalitztli* ("Quetzal obsidian") referred to bright, emerald-green stones appearing like Chinese “Imperial Jade.” *Quetzachalchihuitl* ("Quetzal greenstone") described high-quality, transparent stones without imperfections. *Chalchihuites* were green and of good quality, but opaque. Finally, *Xiuhtomoltetl* referred to opaque stones with a mixed green and white color, but also could mean turquoise. Sahagún also describes poor quality *chalchihuites fingidos*, which were owned by commoners who were not permitted to possess jade (Sahagún cited in Foshag 1957:9; translated as “common turquoise” by Dibble and Anderson [Sahagún 1961:167] although the Nahuatl word is *chalchiuitl*).

Today the general term ‘jade’ refers to the minerals jadeite and nephrite. Nephrite is an amphibole mineral found principally in Asia and not used in Mesoamerica. Jadeite is a pyroxene mineral composed of sodium, aluminum, and silicates (NaAlSi$_2$O$_6$). Depending on its chemical composition, jadeite can be green, blue, lavender, white, or black in color. Green jadeite was highly prized by ancient Mesoamericans and derives its green color mainly from the presence of chromium and nickel (Kovacevich et al. 2005).

Jadeite is a very hard mineral, scoring 6.5 to 7.0 on the Moh’s scale. Guatemala has one of only six known jadeite sources in the world (Foshag and Leslie 1955). Jadeite is extremely rare because it only forms under low-temperature and high-pressure conditions associated with a major tectonic fault, such as the one along the Motagua River valley in Guatemala (Figure 1.1).
Pyroxene minerals such as jadeite, diopside, enstatite, clinoenstatite, augite, aegirine, omphacite, acmite, and calcium aluminum (Tschermak’s molecule), as well as plagioclase feldspars like albite and anorthite, can all form together. Many of these related minerals can be green in color, and have properties similar to those of jadeite. Jadeite, however, was favored by ancient Mesoamericans because of its superior color, luster, and workability (Foshag 1957:24). The other minerals are softer than jadeite, making jadeite much more time consuming and difficult to work (Lange and Bishop 1988), but also resulting in a better and longer lasting polish. The term ‘jade’ is used in this study to refer to various combinations of all of the above minerals, but the geological description of most of the jades at Cancuen could more accurately and verbosely be described as polymineralic jadetite with jadeite as a major component (Ronald Bishop, personal communication, 2002).

POWER THROUGH PRODUCTION

The ideological power of Maya rulers allowed them to extract tribute and labor from their subjects. Cancuen, a medium sized Maya city located between the volcanic highlands and tropical lowlands of Guatemala, was ideally suited for the production of stone goods made of materials exported from the highlands and brought to the Petén (Figure 1.1). The elite restricted access to technological and ritual knowledge in order to legitimate status and control production. The ritual nature of ancient Mesoamerican societies stimulated craft production because ritual paraphernalia and status reinforcing goods were integral to the success of the power strategies of the elite (e.g., Wells 2006; Wells and Davis-Salazar 2007). At the same time, the participation of
non-elites in production served to create a separate social identity for the crafters, conferring some prestige and status despite the fact that they often were not allowed to possess or use the most powerful symbols of the elite.

Archaeological evidence at Cancuen suggests that production of prestige goods for the political economy was segmented. Non-elites or intermediate elites with achieved status conducted the primary stages of production of jade artifacts, involving activities such as percussion, sawing, and drilling. The more intricate final stages of production, involving activities such as incising, were carried out by elites who alienated the primary producers from the product through a monopoly of esoteric knowledge (e.g., the writing system, the calendar, ideology, and ritual; Barber 1994; Childs 1998; Costin 1998; Inomata 2001; Reents-Budet 1998). At Cancuen, it is apparent that certain households had access to certain technologies that were socially prescribed and reflected social identities and relationships within the site.

The control of knowledge can be as powerful as the direct control of raw material or labor (Dobres 2000). A segmented system of jade production like that at Cancuen was also identified by Walters (1982) in the Motagua Valley workshop sites located directly adjacent to the jade source (cf. Rochette and Pellecer-Alecio 2008), and has been recognized for other materials at sites in Mesoamerica and beyond (e.g., Berdan et al. 2009; Costin and Hagstrum 1995; Cross 1993; Urban and Schortman 1999). Segmented production was also noted by Sahagún in his descriptions of Aztec goldworkers:

And the first mentioned are the goldworkers [and] the gold casters. And these goldworkers were each divided, separately classed, as to their workmanship, their
Artisanship. Some were called smiths. These had no office but to beat gold, to thin it out; to flatten it with a stone. Wherever it was required, it was polished, it was thinned. And some were called finishers. These were named the real master craftsmen. And hence they were separate; for their tasks were of two kinds, so that they deliberated separately (Sahagún 1959:69).

The goldcaster [is] a possessor of knowledge, of information. [He is] the final processor, the processor of works of skill. (Sahagún 1961:25).

Segmented production and the use of distinct technologies by certain groups reflect the social structure at Cancuen. There were two manufacturing sequences, one conducted by non-elites and one by elites. The non-elite manufacturing sequence included the initial shaping of the artifact by percussion, sawing, and drilling. Blanks or preforms were finished by elite crafters using incising and polishing. These technologies helped define the crafters as social beings. Evidence that non-elite, early-stage jade producers had elevated status was recovered from domestic refuse and burials within the production areas. This evidence includes exotic and ritual grave goods, such as Chablekal Fine Gray ceramics, figurines, and some evidence of dental modification. At the same time, certain finished products made of jade were not part of the material culture of the non-elites. Architectural, mortuary, ceramic, and lithic data all support a division in social identity and status between those who had access to finished jade products, and those who did not (Kovacevich 2007).
The segmentation of production and restriction of certain technologies may have served as a form of social control at Cancuen and a pathway to power. These technologies were not restricted by the types of tools used or by the restriction of access to raw material (i.e., the means of production), but by the knowledge and skill needed to produce them. Elites surely received special training in order to produce elaborately carved jade plaques. This training was a form of cultural capital that was not available to all members of the society. Certain other objects created for and possessed exclusively by elites, such as earflares, may have been restricted by other means such as sumptuary laws (Kovacevich 2006:114-127).

JADE MANUFACTURING SEQUENCES

Ethnohistorical and ethnographic sources from Mesoamerica and East Asia offer insight into the manufacturing sequence of jade artifacts in prehispanic Mesoamerica. Although many of the tools and techniques may have differed from those used at Cancuen, these descriptions provide a rich source of analogies for understanding preindustrial techniques at Cancuen and other Maya sites. Technological steps can be inferred from the tools and debitage recovered, uncovering a manufacturing sequence or operational chain for the production of jade artifacts.

Ethnohistorical sources discuss jade working and more general lapidary techniques at the time of the Spanish conquest. Foshag translates Sahagún and concludes the following:

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 [sic] 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 eztaçpatl [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.


21. When it is finished it is as if painted, white and green and like fire, similar to a star and like a rainbow (Foshag 1957:45-46).

Sahagún also describes the production of chalchiuities:

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; their light appears (Sahagún 1963:223).

Copper and gold were worked and used in Postclassic Mesoamerica. Other metals were introduced by the Spanish. The Classic Maya did not employ metal tools. Nevertheless, this passage provides important information about Classic period lapidary techniques. Some of the references are to stones other than jade, but again, one can imagine that similar techniques were used for similar stones. The known techniques for Mesoamerica are further discussed below, incorporating some ethnographic and ethnohistorical evidence from other world regions.
Percussion

This technique was the first used in the manufacturing sequence unless a nodule of jade of precisely the desired size and shape was found. The types of stones used in percussion are not much discussed in the literature, but generally they must be hard. Walters (1982:19) defines percussion as “those techniques in which mass reduction was achieved by forcefully striking one body against another.” He goes on to define two percussion techniques: shattering and pecking. He defines the products of these two techniques by the size of the debitage: greater or less than five centimeters across.

Most jade debitage recovered from Cancuen is the byproduct of percussion, probably because many faults and inclusions must be removed to isolate a solid piece of jade to create an artifact. Hammerstones of jade, chert, and quartz materials were recovered at Cancuen. Sixty chert hammerstones were found at the jade-working house with the most debitage yet recovered from the site: some 3,259 pieces. Percussion was a difficult task, because jade is not easily or predictably fractured and not all pieces of jade can be easily fractured by percussion. As in flintknapping, it is probable that a platform was struck at an angle of less than 90 degrees (see Whittaker 1992).

Pecking

‘Pecking’ is a word used to describe a type of free-hand percussion. There is some disagreement among scholars as to the tools, intent, and outcomes of this technique. Foshag
(1957:51) suggests that short, pecking motions were used to shape objects. Chenault (1986:52) and Easby (1968:24) argue that pecking leaves visible – and undesirable – scars on an object, and hence was probably not used to shape jade. Foshag (1957:51) himself notes that such scarring did occur and is observable, but mostly on lower quality jades whose beauty as a finished product was unimportant. Walters (1982:20) considers pecking to be any percussion that creates debitage smaller than five centimeters across. I believe that both techniques were used in the shaping of artifacts, but, contrary to Walters, a single percussion blow could result in debitage of both small and large size. For me, therefore, all reduction techniques that involve “one body forcefully striking against another” are considered to be percussion because it is difficult to determine the desired size of debitage. The term “pecking” should be reserved for clear cases in which the knapper’s intent is somehow readable from an artifact.

Very small hammerstones, often made of jade, were found at Cancuen (Kovacevich 2006:Figure 5.13). These are generally much smaller than those used to remove large debitage by percussion. These very small hammer stones, therefore, probably were used to shape artifacts by pecking rather than to reduce larger nodules by percussion. I have observed scars of the sort described by Foshag (1957:51), and, as he suggests, they occur on artifacts of lower quality.

Sawing

Lothrop (1955:48) notes that there are two ways to cut jade: (1) using a saw of equal or greater hardness than jade; and (2) using abrasives with a saw that is softer than jade. Hard saws can be made of other stones or even some hardwoods, but abrasives are needed with the latter.
Lothrop (1955) argues that hardwood saws were flat, but wedge-shaped cuts observed on jades from Kaminaljuyú suggest that they were tapered (Kidder et al. 1946:119). Cuts from a straight saw are made in both directions until a piece can be broken off. This leaves a visible septum in the middle of the cut.

A second method uses string as a saw with abrasives serving as the actual cutting agent. Strings could have been made out of tough plant fiber. Ethnographic data from Peru and northern Chile demonstrate that leather cords also can be used to saw stone (Lothrop 1955:49). Chenault (1986) suggests that animal sinew could be used because it is more resilient and a bit tougher than some plant fibers. Common quartzitic sand (with a hardness of 7.0, equal to or harder than jade) is the most likely abrasive used by the Maya. It was used by ancient Chinese lapidary crafters (Chenault 1986:39; Treistman 1972:94), who also used crushed garnet and corundum (ruby dust; Rawson and Ayers 1975; Treistman 1972:94). Crushing gems and other stones is time consuming and added another step to the manufacturing process. Sahagún (1961:26) mentions abrasives such as pulverized pyrite, garnet, and what Foshag (1957:50) believes to be specular hematite. Ground flint and piedra recia, or quartz (both of which have a hardness of 7.0), also were used by the Aztecs. Foshag (1957:50) also notes that crushed jade could have been used as an abrasive: a hypothesis given strength by the discovery of pulverized jadeite in a proposed jadeworker’s tomb at Kaminaljuyu (Kidder et al. 1946:85).

A problem with string sawing is that the abrasive must be kept in place. To accomplish this, ancient jadeworkers often used a wet abrasive. Chenault (1986:41; see also Gump 1962:202) notes that the ancient Chinese used a substance called “toad grease,” which was thought to have magical properties that softened the jade. Most scholars believe this was simple
animal fat or lard, which held the abrasive in place and made it easier and faster to cut jade (Wills 1972:25-26).

Cutting with a string saw is difficult, and one wonders why such a technique was used. Chenault’s (1986:64-66) replication experiments found that a piece of string lasts about 20 strokes before having to be replaced, and that it is possible to cut just 1.2 millimeters in 7.5 hours with the use of abrasives and grease. In contrast, he found that the easiest and most efficient way to cut jade was to use a hard saw made of jade and abrasives embedded in grease. Using this combination, he was able to cut 0.4 millimeters in about two hours. Chenault (1986) concludes that string sawing only would have been used for making interior or curved cuts that connected numerous drilled holes (see Easby 1968:25), a pattern not consistent with the Cancuen data.

Lothrop (1955:48) points out that there are five advantages 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 (Lothrop 1955:48).
Lothrop (1955) cites eyewitness accounts of string sawing in the sixteenth century by Las Casas and Ferdinand Columbus. These two observed indigenous people cutting shell in Panamá with string saws.

String saws were used more commonly than hard saws at Cancuen. We recovered string-saw anchors from jade-working contexts at the site (Figure 13.1). Other evidence includes arc-shaped striations on the cut surface of artifacts, which were caused by the bowed motion of string saws. In contrast, hard saws create straight striations. Most of these arc-shaped striations are visible to the naked eye, but wetting a jade with water can make them more visible. Some striations are visible only under magnification. Finally, many cuts on jade artifacts found at Cancuen have rounded septa. Hard saws create straight septa (Figure 13.1a).

Gump describes the process of sawing in the ancient Chinese tradition:

Three men work in sawing the stone. Two work the saw (la-suu-tzu), which consists of a single strand of wire, generally notched, and drawn taut in a bamboo frame. With a ladle a third man supplies the wet abrasive mixture which does the actual cutting. After biting into the jade, the abrasive flows down into a bowl set to receive it, since it will be used again and again, until it contains too much jade dust to grip effectively. Weeks, even months, of constant, persistent, backbreaking sawing may be necessary before the stone is cut into desired pieces (Gump 1962:205).
In Mesoamerica, the string saw could have been operated by a single individual. A second person could have applied the abrasive. The process was, at the very least, time consuming, in part because of the flimsy nature of the string.

I also found large amounts of microdebitage associated with the jade-working structures at Cancuen. This consists of small flakes and chunks of greenstone and quartz that measures less than 1.0 millimeter in length and width. This microdebitage not only was the byproduct of production, but also an abrasive for cutting jade. In a single jade-working mound group at Cancuen, we recovered more than 13 kilograms of broken and pulverized quartz. This was used as an abrasive with a string saw or drill. The quartz was probably crushed and pulverized with the same hammerstones used to reduce jade by percussion. Pulverized jade waste and quartzite river pebbles were probably the most important abrasives used at Cancuen, because ready-made abrasives such as quartzitic sand were not locally available.

Incising

The technique that Sahagún (1961:25) described as “scraping with trimmed flint” could refer to incision, and was interpreted that way by Lothrop (1955:48). Incising leaves fine or thick lines in jade artifacts, and was probably accomplished with a stone at least as hard as jade. Such stones include quartz or quartzite, chert, and jade itself. The most common incising tool, however, was chert because it is most easily shaped by flaking to create the desired thickness. Nevertheless, both quartz and jade incising tools also were used at Cancuen.
Incising was carried out after general polishing. Sometimes the same tool used to create incised lines was used with a fine abrasive to polish depressions in those lines. Other times, such depressions were left rough. Lothrop (1955:49) argues that cactus needles and tropical vines could have been used with very fine abrasives for delicate incision, but evidence of this is difficult to identify on finished jades.

The most common tool used to incise jades at Cancuen was the triangular chert blade (Figure 13.2). We found these blades in great numbers at structures where jade artifacts were manufactured. Chert blades were used both for incising and for drilling jade. Wear patterns on chert incisors and drills are different. Blades used for incising are more rounded and worn, but drills often have characteristic hinge fractures along the turning surface. Nevertheless, a rounded bit surface can also develop when an abrasive is used with a drill. Quartz and jade artifacts likely were used as incising tools at Cancuen, but the wear patterns on them are difficult to analyze macroscopically.

Grinding/Abrading/Rasping

Grinding jade into a desired form is very labor intensive, and probably was used only to slightly modify the shape of an artifact (Foshag 1957:51). Foshag describes two stones in the Robles Collection that have wide grooves that were possibly used for grinding. Evidence that jade was ground includes the presence of long, visible striations on the surface of the artifact. These striations are preserved only if the surface was not later polished. Chenault (1986:61) defines ‘grinding’ as abrading an artifact with a hard stone in order to shape it. Abrasives were
not used. Foshag (1957:52) describes ‘rasping’ as similar, but a file-like tool, called a texcalli in some ethnohistorical sources, was used. Foshag (1957:51) believes that rasping was used to create small mosaic pieces. In Japan, grinding tools were made of granite. They retain marks of the process in the form of circular depressions and long grooves where the grinding took place (Chenault 1986:45-46; West 1963:2-11).

Abrasion techniques also appear to have been used by Cancuen jade workers. Some artifact surfaces retain marks of abrasion, scratching, and rasping. We recovered grinding tools at the site. These are large and flat, and made of greenstone or schist. Possible rasping tools also were found. These are long, rectangular slate artifacts with long scratches and striations on their surfaces. Slate is slightly too soft to abrade true jadeite, but slate tools were found in contexts at Cancuen where jade working was practiced. Further replication studies are needed to determine if these tools were actually used for rasping.

**Drilling**

Drilling jade was accomplished with either a solid or hollow tubular drill. Walters (1982:19) defines drilling as the making of a hole with a rotating motion. Nevertheless, it is important to note that drilling need not perforate an artifact. Drilling, especially with a tubular drill, could be used to create circular or semi-circular design elements (Chenault 1986). The materials used as drills include jade and chert, but wood or bone also could have been used with abrasives. Drills were often pointed and leave a conical hole. Small objects were drilled from one side only, while larger objects were drilled from both sides to meet in the middle. In this case,
holes are biconical (see Kovacevich 2006: Figure 5.18). Foshag (1957:55) speaks of blunt drills. Chenault (1986:58) argues that no stone drills had been encountered in Mesoamerica, but chert blades were perfect tools for drilling and may not have been recognized as such. Ethnographic work among the Maori of New Zealand shows that they used chert or flint drills, and rolled the tool back and forth between their hands or turned it with a cord. Their drilling was also primarily biconical, and whale cartilage was used as a spindle to stabilize the drill (Chenault 1986:48).

Wood and bone, probably from birds (see Proskouriakoff 1947), was used by the Maya to make tubular drills. These were important instruments used to create earflares and long tubular beads (Digby 1964; Kovacevich 2006: Figure 5.20). Mesoamerican drill bits could have been turned by hand or possibly by pump drills (Chenault 1986:60; Digby 1964:16; Kovacevich: Figure 5.19).

Solid and tubular drills were used at Cancuen. Solid drills were commonly made from the same triangular chert blades used for incising. Quartzite and jade drills also could have been employed. Some of these drills may have been turned by hand, but others may have been used in a pump drill. Five spindle whirls were discovered associated with a jade working area. These could have served as flywheels on pump drills. Tubular drills were not recovered at Cancuen, but clearly were used to make an earflare blank (Kovacevich 2006: Figure 5.20). In this case, the blank was discarded because the tubular drilling from two sides of the artifact did not line up properly. A bead from Burial 50, probably a royal interment, had a very large and uniform hole with a small septa in the center of the artifact (Kovacevich 2006: Figure 5.18), which was the result of drilling from either side of the artifact using a large, tubular drill. This technique of jade drilling was very common in Mesoamerica (Sears 2003).
The size of drill holes varies greatly at Cancuen, even on the same object. Many bilaterally drilled beads have different sized holes on each side. A plaque found in a palace cache beneath the royal throne room at Cancuen has drill holes – probably termination or “kill” holes – ranging from ranging 1.5 to 2.5 millimeters in diameter (Figure 13.3). This suggests that there was not a standardized tool kit, and that even the same artisan used multiple tools and drills to work a single artifact. Certainly the variety of natural resources (chert, bone, and wood) used to make drills would have added to this variability. Standardized drilling was not a valued technique of the Classic Maya at Cancuen.

Polishing

Polishing often was the final step in the process of creating a jade artifact at Cancuen. Many tools could be used to polish jade. Sahagún (1961:25) describes the use of wood, bamboo, and emery. Foshag (1957:55-57), using microscopic evidence, argues that hard polishers were used in conjunction with fine abrasives. Data from Cancuen support this argument. We recovered small slate polishers (roughly ten centimeters by five centimeters) from some jade-working structures. These polishers typically have depressions in their center, probably from polishing beads (Kovacevich 2006: Figure 5.23). Slate also was used as a jade-polishing tool by the Japanese (West 1963:2-11). In elite contexts, we recovered limestone polishers that perfectly fit earflares of various sizes (Figure 13.4). A fine abrasive may have been used in conjunction with this tool, although it is hard to differentiate between that abrasive and the surrounding sediments. Indirect evidence for the use of abrasives is the presence of small quantities of gold
dust in the floors of jade-working areas. This gold could be derived from quartzitic sand sediments. The sediments near Cancuen are primarily mud, and are not very useful for cutting or polishing, therefore, the presence of gold dust may indicate that sediments were imported from other regions and used as abrasives (Cook et al. 2006; Kovacevich et al. 2004).

CONCLUSIONS

The distribution of these reduction and finishing technologies across the site of Cancuen reveals an important pattern. Certain households were involved in the early stages of production, characterized by percussion, sawing, and drilling. Other households were more heavily involved with the finishing stages of shaping, polishing, and incising. These differences correlate with the architectural investment of labor within each architectural group as well as with other features of material culture.

Non-elite households were defined by the amount of labor invested in construction and the presence of certain architectural types (Kovacevich 2006:38-41). Typically, a sample of each patio group was excavated. Structure types, considered as a sample from a larger group, were then correlated with the presence or absence of certain portable items of material culture. As expected, the material culture of certain households significantly differed from that of others. Excavated structures in Groups K7-1, N9-1, and N11-1 had masonry architecture, stucco sculpture, tombs, access to hieroglyphic writing, evidence of jade working (usually its late stages), and finished jade artifacts. These last include finely carved jade diadems with iconography of the sort that, at many other sites, correlates well with elite status and even

In contrast, earthen mounds were excavated at Groups K7-24, M6-12, and M10-4. These had simple burials and domestic refuse with evidence of jade working, but only the early stages of production. No finished jade products were found. There also were other differences in material culture, including the presence of higher amounts of Chablekal Fine Gray ceramics associated with early-stage jade production, pointing to a somewhat elevated status and identity for these producers (Callaghan 2004; Kovacevich 2006:453-492; Kovacevich and Callaghan 2005). Cancuen also has mound groups that exhibit even less investment of labor and that lack any evidence of jade production. These possibly represent the humblest residences at the site.

It is difficult to reveal the full range of variation in Maya households through archaeology (Marcus 2005:262). In an effort to understand this range of variation, 107 of nearly 500 mapped structures at Cancuen were subject to excavation during the 1999 to 2003 field seasons. At the very least, three status-levels relevant to jade production are visible in the archaeological record: (1) elite finishers of jade artifacts and the possessors of the products (including royal and non-royal elites [Jackson 2005]); (2) intermediate producers who did not possess finished jade products, but who had other status goods and who made caches of raw jade, implying that they belonged to households involved in jade production (Kovacevich 2006-2008); and (3) non-jade producers residing in perishable structures built on earthen mounds or earthen mounds with retaining walls (and who sometimes had inferior jades in forms such as beads). I argue that the non-elite producers of jade probably formed some type of achieved status, middle stratum of
There is little evidence for an endogamous, true “middle class” in any Mesoamerican society (Marcus 1992, 2004). Therefore, we should ask: Were the people who performed the initial stages of jade production low-status elites or high-status commoners (Marcus 2004:277-278; see also Robin 2003:318-319)? Ethnohistorical sources provide some insight. Aztec society provided several avenues for social mobility: warfare, trade, the priesthood, and craft production (Berdan 2004:34-35, 45-46). Although high status could be achieved through success in these activities, certain rights and items of material culture were reserved for those of elite birth with ascribed status. For instance, a successful warrior was allowed to wear sandals and cotton cloaks, drink pulque in public, consume human flesh, keep concubines, and engage in other elite indulgences (Hassig 1988:45), but he could never wear gold armbands or, especially, the gold diadem of the king, which was similar to the stone diadems of Classic Maya kings. Warriors with high achieved status were not allowed to wear the feathered warrior costume reserved for those with ascribed noble status (Durán 1994:209; Hassig 1988:45; Sahagún 1954:43). Pochteca merchants, who gained wealth through the trade of exotic goods, held great parties and feasts in order to increase their status. On these special occasions they wore distinctive attire, but they were never allowed to wear the cloaks of the nobility in public (Sahagún 1959:6-7). In other words, despite a certain amount of social mobility, the Aztecs had a stratified society.

At Cancuen, early-stage jade producers had a few of the trappings of elite Classic Maya culture: jade beads, dental modification, and exotic ceramics. At the same time, they lacked many more of the defining characteristics of elite material culture, including: stone masonry
structures, corbel-vaulted architecture, tombs, sculpture, hieroglyphic inscriptions, and carved jade plaques made of high-quality jade. The lack of these cultural correlates of elite status leads me to argue that the early-stage producers of jade at Cancuen were high-status commoners. They negotiated and achieved their status and identity through the segmented production of jade artifacts.

Jade, as a material, was not necessarily restricted to the elite of Maya society (Garber 1993:166-172; Guderjan 2006:81-88; Moholy-Nagy 1994:88, 1997:301; Palka 1995:20; Rochette and Pellecer-Alecio 2008). But jade of high quality, and especially certain objects manufactured of high-quality jade, was restricted to the elite (Chase 1992:34-37; Haviland and Moholy-Nagy 1992:52-54). At Cancuen, commoners did have access to jade, but only of low quality and appearing in a limited number of forms. Although jade beads were present in non-elite structures, they often were made of poor-quality jade or of a related green mineral of inferior quality. Many of these beads were found embedded in floors or in middens. We recovered very few jades from simple burials, and it was never found in the form of elaborately incised plaques or face pendants: symbols of kingship and nobility. Jade beads recovered from elite residences are significantly larger than those recovered from non-elite contexts (Kovacevich 2006:186-188), and the difference in quality is readily apparent. Raw or sawn jade was cached by people of lesser status (Figure 13.5), but only by those who were jade producers. This caching relates to the processes of identity formation and maintenance. At Cancuen, some commoners with achieved status identified themselves with the early stages of jade production, and by extension with the divine act of creation. Caching also may have reflected a belief that all stages of jade production were sacred, as were the byproducts of that production (Hruby 2007:76;
Sheets 1991:177; see Mills 2008 for a North American example). The royal cache beneath the throne room at Cancuen contained sawn nodules and finished products, as well as other exotic objects and ritual paraphernalia. Status and identity, therefore, can be seen in the distribution of production technologies, finished products, and ritual treatments of jade at the site of Cancuen.

**Acknowledgments.** This research was supported by the National Science Foundation (BCS-0004364, Arthur Demarest, Principal Investigator). I also thank Vanderbilt University, the Association of Women in Science, the Sigma Xi Scientific Research Society Grants-in-Aid of Research program, and the Robert Penn Warren Center for the Humanities. Finally, I thank Michael Callaghan and Frances Berdan for reviewing drafts of this paper.
Figure 13.1. Artifacts related to stringsawing. Small string-sawn jade nodule recovered on the patio floor of Structure M10-6, note the curved nature of the septum (a); a ceramic string-saw anchor, the string would have been wrapped around the groove and the anchor placed in the hand of the crafter to protect the fingers (b). (Drawing by Laurie Greene.)
Figure 13.2. Triangular chert blade, recovered from midden of Structure M10-4 (drawing by the author).
Figure 13.3. Jade headdress ornament recovered from cache beneath royal throne room (drawing by Laurie Greene).
Figure 13.4. Jade earflare polisher, recovered from fill beneath the floor in the royal palace (photo by the author).
Figure 13.5. Jade boulder showing marks of string sawing recovered from a termination cache in the floor of Structure K7-24, a non-masonry structure (photo by the author).