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TEXTILE PRODUCTION IN POSTCLASSIC CHOLULA, MEXICO

Sharisse D. McCafferty and Geoffrey G. McCafferty
Department of Archaeology, University of Calgary, Calgary, Alberta, T2N 1N4, Canada

Abstract

Colonial chroniclers marveled at the quality and variety of textiles produced at the Postclassic center of Cholula. As a principal market center, textiles were produced for tribute and exchange, and other woven goods were manufactured for local consumption. This paper examines ethnohistorical and archaeological evidence to interpret the technology, materials, scale, and social relations of textile production. Original spindle-whorl data from the UA-1 domestic compound is contrasted with other whorls from Postclassic Cholula and from other sites in central Mexico. Results of this analysis indicate the complexity of pre-Columbian textile production and the significance of spinning and weaving in economic and social reconstructions of the past.

As the Spanish *conquistadores* marched inland to Tenochtitlan, they were given many exotic gifts, including elaborate textiles of brightly colored cotton decorated with intricately woven designs and embellished with feathers and rabbit fur (Cortés 1986 [1519–1521]:45–46; Figure 1). Cortés' detailed descriptions of these woven goods indicate his high regard for their quality; their inclusion among gold, jade, and other treasures implies that fine textiles were considered a valued commodity by the indigenous people of Mesoamerica. Upon arriving at the religious center of Cholula, Cortés (1986 [1519–1521]:74–75) noted the richness of the city and its inhabitants. In reference to local costume, Cortés' secretary recorded that: "they were better dressed than any Indians our men had thus far seen" (López de Gómara 1964 [1552]:130).

Due to the economic, ritual, and social importance of cloth in Mesoamerica, there has been growing interest in textile production and consumption (Anawalt 1981a, 1990, 1998; Berdan 1987; Bruhns 1988; Brumfiel 1991, 1996; Hendon 1997; Hicks 1994; Joyce 1992; McCafferty and McCafferty 1991, 1999; Parsons 1972; Parsons and Parsons 1990; Pohl 1994; Smith and Hirth 1988; Stark et al. 1998; Voorhies 1989). Textiles were of enormous importance in Postclassic central Mexico to the extent that *quachtlis* (capes) were a common unit for tribute payment (e.g., Sahagún 1950–1982:9:48; see also Hicks 1994). Textile production was considered women's work and, as such, was closely related to the domestic sphere (Brumfiel 1991; McCafferty and McCafferty 1991). Other evidence indicates temple and/or workshop level production, perhaps for ritual or elite consumption (e.g., Motolinía 1951:202, 246; Pohl 1994).

This paper addresses the production and use of textiles at pre-Hispanic Cholula, including the cultural context of spinning and weaving activities. Information is derived from ethnohistorical sources and archaeological data. Analysis of textual descriptions and representations from pictorial manuscripts reveal variation in costume use relating to cultural identities such as gender, status, religious rank, and possibly ethnic affiliation. Archaeological data relate to textile production and specifically to the materials and techniques used in spinning. This study of Cholula's textile production provides a basis for comparative analysis with other areas in central Mexico where both production and consumption differed, and therefore highlights the dynamic significance of costume as "social fabric."

ETHNOHISTORIC SOURCES FOR CHOLULA TEXTILES

Located in the Puebla/Tlaxcala Valley of central Mexico, Cholula was an important pre-Columbian religious and economic center (McCafferty 1996a; Paddock 1987). In the Postclassic period (A.D. 900–1520) Cholula had a multi-ethnic population of between 30,000 and 50,000 (Sanders 1971), including Tolteca-Chichimeca from central Mexico and Olmeca–Xicallanca with ties to the Gulf Coast (Carrasco 1971a; Olivera and Reyes 1969). Postclassic Cholula was the cult center for Quetzalcoatl, god of the wind, the planet Venus, and sacred knowledge (Durán 1971:128–139). Nobles from central Mexico made pilgrimages to the Temple of Quetzalcoatl for confirmation of their authority and to offer tribute (Rojas 1927). *Pochteca* merchants associated with the cult of Quetzalcoatl brought exotic merchandise to the marketplace at Cholula from throughout Mesoamerica (Durán 1971:129), and in exchange distributed ideologically charged objects in the Mixteca–Puebla stylistic tradition (McCafferty 1994; Nicholson 1982). Highly decorated Cholula polychrome pottery, for example, was used by the Aztec king Moctezuma II at Tenochtitlan (Díaz del Castillo 1963:226). In sum, Cholula was a hub of religious and economic activity, with high-quality craft production used to communicate ideological messages relating to religion, ethnicity, and status. It is in this context that a study of Cholula textiles is embedded.

Colonial accounts provide detailed information on the clothing styles of Contact-period Cholula, including those of the common people, priests, and even the costume of the patron deity, Quetzalcoatl. The *corregidor* Gabriel de Rojas recorded the costume style of Cholula during the early Colonial period:

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Figure 1. Woven patterns on Aztec *huipiles* (after Sahagún 1950–1982:8:Figure 72).

> [Men's] costume in peace time was a *tilmatl*, or square white cotton cloth knotted at the right shoulder, and a narrow [loin] cloth, and shoes like the canvas sandals used by the ancients . . . the women wore a highly painted cotton underskirt down to the foot, and on this were diverse square borders and paintings that they call *nahua*, and over the petticoat [the women wore] *huipiles* similar to a sleeveless surplice [long clerical outer garment] with its hems or borders embroidered in colored cotton with a fringe of rabbit fur and embellished with duck feathers for effect. These *huipiles* have two square "shields" [*escudos*], one on the breast and the other one on the back, that were colorfully embroidered with diverse motifs such as birds, fish, and animals [Rojas 1581:15, quoted in Bandelier 1976:120–122; authors' translation].

Juan de Torquemada (1975-1983:1:387) added:

> The poor people would dress in henequen, which is a thick thread made of maguey, and the rich people would dress in cotton, with an embroidered border of feathers and rabbit fur [authors' translation].

Priests of the temple of Quetzalcoatl wore black capes with different colored trim depending on their rank (Rojas 1927:161). The idol of Quetzalcoatl in the temple wore an "elaborate feather mantle done in black, red, and white, designed like the jewel—a butterfly wing. His splendid breechcloth was of the same hues and pattern, and it ended below his knees" (Durán 1971:130). This costume was changed, however, for special occasions (Durán 1971:131). López de Gómara (1964:130–131) described the costume of Quetzalcoatl as a "white cotton robe, narrow and long, over it a cloak strewn with red crosses."

Pictorial manuscripts provide an additional source for inferring costume traditions from Postclassic Cholula. The *Borgia*-group codices (*Codex Borgia* 1993) represent pre-Columbian cosmology and religious practices, and the vivid depictions include details of material culture. Debate over the provenience of the *Borgia*-group codices has generally placed them in the Puebla/Tlaxcala area (Anawalt 1981b; Chadwick and MacNeish 1967; Nicholson 1966, 1994; Sisson 1983). Recent discoveries of *Borgia*-style murals from Tlaxcala (Contreras Martínez 1994) and Tehuacan (Sisson and Lilly 1994) support this provenience. Because Cholula was the principal religious center for the Puebla/Tlaxcala area, the *Borgia*-group codices probably represent religious beliefs and practices—and material culture—shared by inhabitants of the city.

Costumes from the *Borgia*-group codices feature women in skirts and both a rounded and triangular *quechquemitl* (Anawalt 1981a; Figure 2). Female costume is often elaborated with woven decoration in geometric patterns and in a diversity of colors. Men generally dressed in a simple loincloth with hip skirt or kilt, and occasionally with a cape or *xicolli*.

Early Colonial manuscripts such as the *Historia Tolteca-Chichimeca* (Kirchhoff et al. 1976) and the *Lienzo de Tlaxcala* (1979) also depict costume styles from the Cholula region at the time of the Conquest. Clothing more closely resembles that described above by Rojas (1581, cited in Bandelier 1976). Males wear

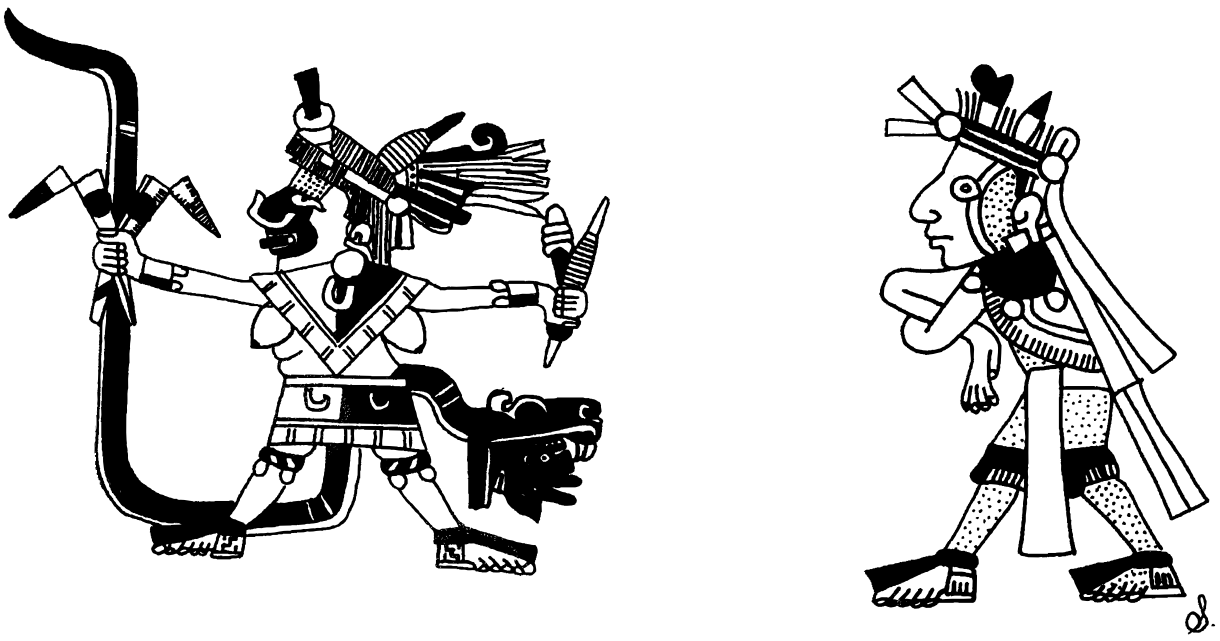


Figure 2. Female and male costumes from *Borgia*-group codices (after *Codex Borgia* 1993).

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a loincloth and long cape (often of animal skin) tied at the shoulder, and women are shown in a long *huipil* over an underskirt (Figure 3). The *huipiles* feature decorated borders and have a square *escudo* on the chest.

The contrasts between these two sources may relate to ritual practice or temporal differences, including ethnic change. *Borgia*-group images generally depict supernatural beings or deity impersonators and may represent a thematic distinction from the more secular nature of the Colonial manuscripts. Alternatively, accounts of ethnic change at Cholula in the Middle Postclassic period (ca. A.D. 1200) suggest at least a partial replacement of the Olmeca–Xicallanca group by the ethnic Tolteca-Chichimeca from central Mexico (Carrasco 1971a; Davies 1977:106–123; McCafferty 1994, 1996a; Olivera and Reyes 1969). Costume evidence supports the possibility that at least some of the *Borgia*-group codices represent Gulf Coast styles (Anawalt 1981b) because of (1) the depiction of bare-breasted women, suggesting a more tropical climate than the temperate highlands, and (2) the prevalence of the *quechquemitl*, a garment commonly worn on the Gulf Coast. Because it is likely that both Olmeca-Xicallanca and Tolteca-Chichimeca populations were present in the multi-ethnic urban center at the time of the Conquest, it is possible that both styles of clothing were used simultaneously.

In addition to information on the costumes worn by the ancient Cholultecas, the ethnohistorical sources also provide accounts of textile production. Rojas (1581:33, cited in Carrasco 1971a:64) noted that:

> they were particularly good dyers of whatever color, and they had much business dying wool thread in diverse colors to make rich *huipiles* and valuable *tilmas*; they make thread from rabbit and hare fur and wool that maintains its color perfectly until worn out [authors' translation].

Some textile products were made locally, whereas others were imported from Guatemala and the Soconusco region in the Mexican state of Chiapas. Merchants often traveled for years at a time throughout these lands acquiring great wealth and exotic goods (Durán 1971:138–139; Piñeda 1970; Rojas 1927). Consequently, the marketplace of Cholula was renowned as the center for imported "jewels, precious stones, and fine featherwork" (Durán 1971:278). Imported garments were also sold in the market:

> Cotton cloth for clothing was not made [in Cholula] but they brought it to sell in the market from diverse parts where it was made; they particularly consumed those from Campeche that are common, although they use *tilmas* and *huipiles* that are polished and curious for their dress; generally their costume is white upon which they paint and weave diverse colors [Rojas 1581:30, cited in Carrasco 1971a:64; authors' translation].

In summary, the documentary sources provide abundant information on costume and textile use at the time of the Conquest. The textile industry continued through the historical period (A.D. 1700–present) as an important commercial enterprise with numerous wool and cotton mills located along the Atoyac River between Cholula and Puebla (Bandelier 1976). Bonfil Batalla (1973:77) concluded that "the manufacture of textiles has been a constant in the economic history of Cholula from the prehispanic epoch until the present" (authors' translation).

From this survey of the ethnohistorical literature a number of research questions arise that can be addressed using archaeological evidence:

1. To what extent was Cholula an important textile production center in the Postclassic period?
2. Do archaeological remains indicate the use of different materials and techniques for textile production? Specifically, were cotton textiles produced in Cholula?
3. What information is provided by archaeology for the social dimensions of textile production? Were gender stereotypes relating to textile production the same in Cholula as in the Valley of Mexico and other Mesoamerican areas?

ARCHAEOLOGICAL EVIDENCE FOR TEXTILE PRODUCTION

Based on ethnohistorical sources, fiber materials used for Cholula textiles included cotton, maguey, and more exotic materials such as feathers and rabbit fur (wool was a post-Conquest introduction). Other materials that may have been used include *chichicaztle* (a nettle known as *mala mujer*) (García Valencia 1975; MacDougall and Johnson 1966), tree silk (probably *pochotli* = *Bombex ceiba*), milkweed, and human hair (McCafferty and McCafferty 1999). At more than 6500 feet (2000 m) in elevation, Cholula is too high to grow cotton, but this material could have been imported from the Gulf Coast or southern Puebla (Berdan 1987). Maguey was locally available (Díaz del Castillo 1963:201; Rojas 1927), as were feathers from migratory water fowl hunted in the nearby marshes (for a description of the ancient lake located northeast of Cholula, see Mountjoy and Peterson 1973).



Figure 3. Male and female costumes from the *Historia Tolteca–Chichimeca* (after Kirchhoff et al. 1976).

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Spindle whorls found in archaeological contexts can be used to infer the kinds of fibers spun (McCafferty and McCafferty 1999; Parsons 1972). Mesoamerican spindle whorls are generally baked-clay disks each with a center hole that are used in hand-spinning as counter-weights on a wooden spindle. They function to maintain rotational inertia on the spindle while raw fiber is twisted into thread. Contemporary hand-spinners have described the specific kinds of whorls used to spin different materials (Hochberg 1980; Linder and Linder 1977; Raven 1987), and Parsons and Parsons (1990) conducted ethnoarchaeological studies of modern maguey utilization in central Mexico with reference to the kinds of whorls used to spin fiber. Fiber can be spun using different techniques, including supported-, thigh-, and drop-spinning. Supported-spinning involves the placement of the spindle tip on a surface (usually in a small bowl) for support, while thigh- and drop-spinning allow the rotating spindle to fall freely, with the rotation either applied by rubbing against the thigh (thigh-spinning) or by twisting between the thumb and forefinger before releasing (drop-spinning). These methods in turn require particular types of whorls and whorl placement on the spindle (McCafferty and McCafferty 1999). The type of fiber used and the end-product desired determine the technique of spinning and the tools utilized.

Spindle whorls are a potentially valuable artifact class for interpreting the materials used in textile production as well as a range of pre-Columbian cultural processes (e.g., political economy, gender-based division of labor, etc.). Whorls from the Postclassic Valley of Mexico fall into two general size and weight categories, which Parsons (1972) interpreted as relating to cotton spinning (small whorls) and maguey spinning (large whorls). This distinction has been adopted as a "rule of thumb" for subsequent spindle whorl analyses (e.g., Brumfiel 1991; Smith and Hirth 1988). Small whorls have been found most often at known cotton producing areas in western Morelos (Smith and Hirth 1988) and southern Puebla, whereas large whorls were common at Tlaxcala (García Cook and Merino Carrión 1974), an area noted for its fine maguey-cloth textiles and lack of cotton at the time of the Conquest (Díaz del Castillo 1963:173; see also Parsons 1972). Brumfiel (1991) has documented the shifting frequency of small and large whorls at sites in the eastern Valley of Mexico as evidence for changes in female labor strategies and material availability relative to the rise of the Aztec state.

Spindle whorls are rare at Cholula from Formative-period and Classic-period contexts but became abundant in the Postclassic. Only a single whorl made of bone was found at the Middle Classic R-106 house in Cholula (McCafferty and Suárez Cruz 1994). Unbaked-clay whorls, such as those still used in coastal Oaxaca, may have been used during these early periods but would not have preserved in the archaeological record; modern spinners use such expedient materials as small apples and potatoes as whorls. Baked-clay whorls do not offer much functional advantage over unbaked clay, so the shift to baked whorls in the Early Postclassic (A.D. 900–1200) may relate to symbolic significance associated with female gender identity (McCafferty and McCafferty 1991, 1995).

Archaeological data suitable for interpreting Postclassic textile production are available from several site loci at Cholula (Figure 4). Excavations at the Universidad de las Américas (UDLA) produced extensive collections of baked-clay spindle whorls from domestic contexts. Other whorl assemblages come from burial and ritual contexts, indicating that spindle whorls were charged with symbolic as well as functional significance. Unfortunately, other tools relating to spinning and weaving were usually made of wood or bone, and therefore are rarely preserved in the archaeological record (but see Johnson 1971; McCafferty and McCafferty 1994).

The UA-1 excavation at the UDLA campus encountered three structures and associated features (McCafferty 1992a; Wolfman 1968; Figure 5). Structure 1 was interpreted as a residential compound consisting of four rooms, porches, a *temazcal* (sweatbath), and an associated trash midden. Polychrome ceramics associated with the house floor date the structure to the Middle and Late Tlachihualtepetl phases (A.D. 900–1200) (McCafferty 1996b). The other structures were only partially exposed: Structure 2 was interpreted as an Early Cholollan-phase house (A.D. 1200–1400), and Structure 3 was probably a Terminal Formative-period ceremonial platform (200–0 B.C.). The UA-1 excavation recovered 129 spindle whorls. The majority were from primary depositional contexts, defined as those areas such as house floors, middens, and wells in which artifacts reflect their systemic context (cf. Schiffer 1972). UA-1 Structure 1 floor deposits and the associated trash midden accounted for 42 of these spindle whorls. A unique find was a possible spinning and weaving tool kit that included a bone whorl, a spindle-whorl mold, a ceramic vessel filled with powdered dye, bone tools, and deer antlers in a storage room (Room 2) of Structure 1 (McCafferty 1992a:585).

The UA-79 excavation (Lind 1979) was located approximately 100 m north of UA-1. Seventy-seven spindle whorls were recovered from several domestic midden deposits dating to the Postclassic period, with most from the Late Cholollan phase (A.D. 1400–1520). Feature f-10 was a Late Cholollan-phase midden that contained domestic debris, including 27 spindle whorls (Barrientos 1980).

Other whorls have been recovered from Postclassic burial contexts. A Late Cholollan-period mass burial of more than 50 individuals from San Andrés Cholula (Suárez Cruz 1989) included 31 whorls together with possible spinning bowls among the grave goods. Most of the individuals were interred around a central adult male, suggesting that they may have been servants or slaves sacrificed to accompany a nobleman into the afterlife. The human remains included adult males and females as well as children and infants.

Finally, more than 500 burials were excavated at the ceremonial center surrounding the Great Pyramid, with the great majority dating to the Postclassic period (López Alonso et al. 1976). Spindle whorls were occasionally included among the grave goods.[1]

Spindle whorls can be used to interpret the level of intensity of textile production at Postclassic Cholula. The UA-1 (n = 129) and UA-79 (n = 77) loci rank among the highest concentrations of spindle whorls excavated in Mesoamerica. In contrast, Parsons (1972:45) found 228 whorls from the entire Teotihuacan Valley, including both surface and excavated collections, and another 245 from the Texcoco Valley survey. Intensive site surveys at Huexotla, Xaltocan, and Xico in the southeastern Valley of Mexico produced 102, 22, and 7 whorls, respectively (Brumfiel 1991:233). Lynette Norr (1987) recovered 20 whorls from the Tetla-11 Postclassic household and midden at Chalcatzingo, with another 44 whorls from surface collections at the site. Smith and Hirth (1988) found 85 complete whorls during their surface surveys of cotton-producing areas of western Morelos. To the extent that raw counts

[1] Nearly 600 spindle whorls were excavated at the ceremonial center surrounding the Great Pyramid by the Proyecto Cholula in the 1960s and 1970s (Marquina 1970; Müller 1978). These were "rediscovered" in one of the abandoned tunnels of the Great Pyramid, along with many other objects from the project. This new corpus of whorls promises to provide additional information on Cholula's fiber production.

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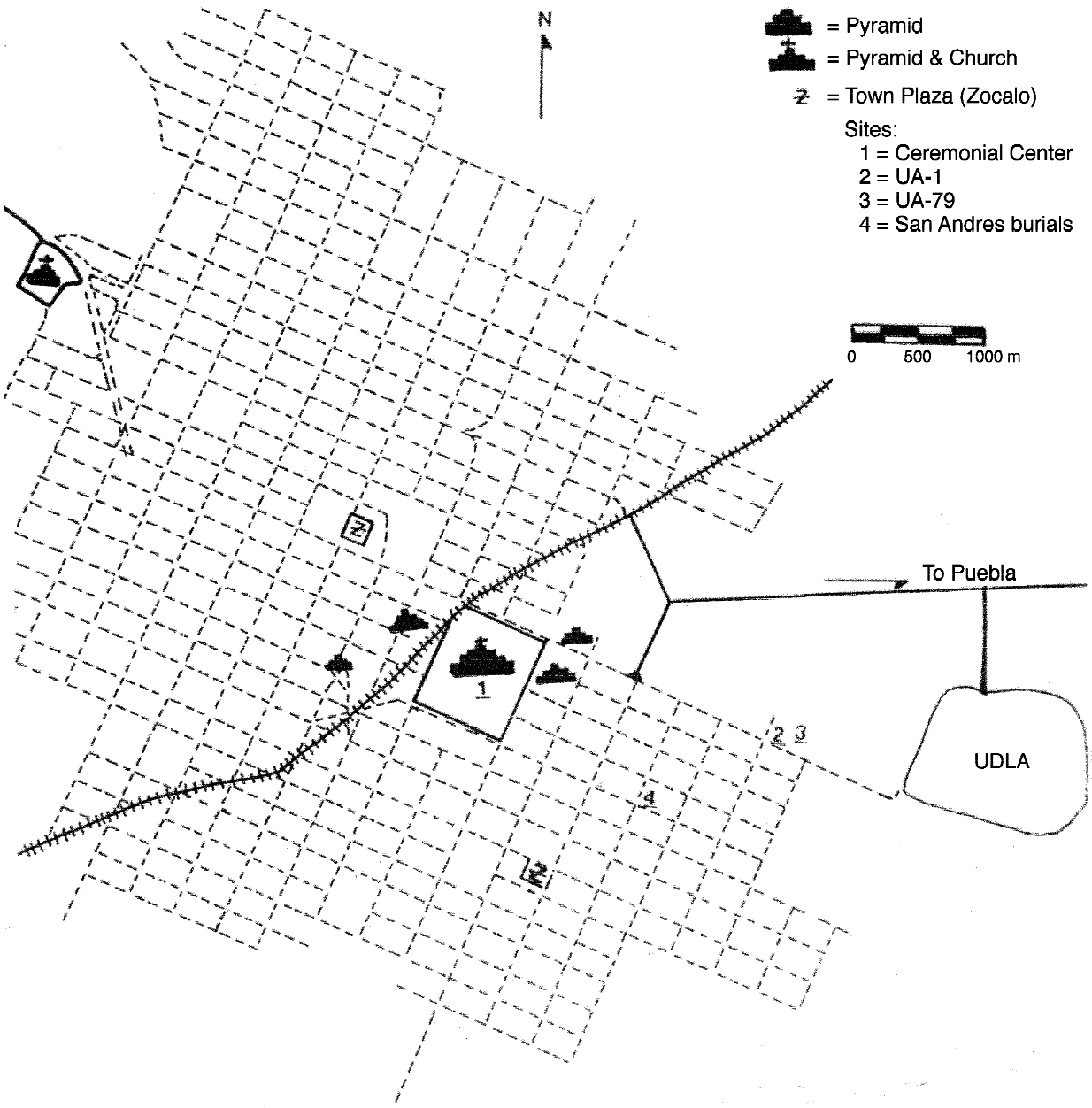


Figure 4. Cholula archaeological zones. Drawing by Sharisse McCafferty.

of spindle whorls reflect intensity of production, these data suggest that Cholula was intensively involved in fiber processing.

The Cholula whorl assemblage discussed in this study consists of the combined whorls from UA-1, UA-79, and the San Andrés burials, totaling 237 whorls. The Cholula totals provide a general baseline for comparison to specific site feature assemblages (UA-1 Structure 1, UA-79 f-10, and the San Andrés burials), as well as to other regions such as the Valley of Mexico, Morelos, and Tetla-11.

WHORL ANALYSIS

Spindle whorls can be measured in a variety of ways, including diameter, height, weight, and hole size. Each of these variables controls functional properties of whorl rotation and, therefore, relates to the quality of thread that is produced. For example, a wider, disc-shaped whorl will produce a slower spin for a longer period; a taller, bead-like whorl will produce a faster rotation that will not last as long. As an illustration of this principle, consider a figure skater revolving slowly with arms outstretched, but accelerating as he or she brings his/her arms in toward the body. Hole size, which is related both to spindle diameter as well as placement on the spindle, relates to tightness of twist as well as staple length of the fiber. Note, however, that whorls relate most directly to thread quality, including such criteria as thickness and degree of twist, and only indirectly to spinning method (supported vs. drop-spinning) and fiber material.

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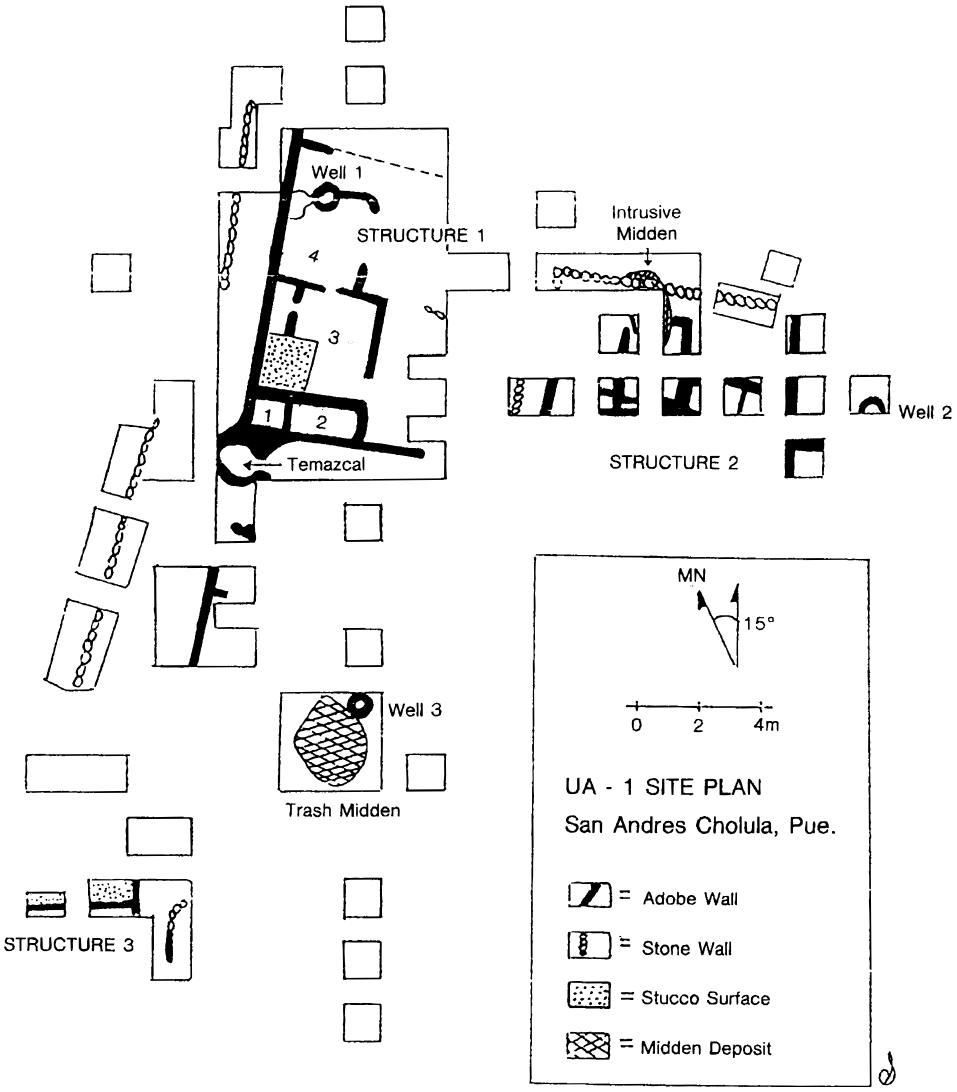


Figure 5. Plan of UA-1. Drawing by Sharisse McCafferty.

Cholula spindle whorls range in diameter from 19 to 80 mm and fall into two clusters (Table 1). The first, between 23 and 37 mm, is the most prominent among the Cholula totals and is particularly prevalent (80%) at UA-1 Structure 1. A second, dispersed mode ranged from 43 to 67 mm. Significant differences appear when site specific features are considered; for example, both UA-79 f-10 and the San Andrés burial had high concentrations of these larger whorls, but they were almost absent from the UA-1 Structure 1 assemblage.

In comparing the Cholula patterns to those of the Valley of Mexico (Parsons 1972), the bimodal structure is reversed, with the greatest concentration found among the larger whorls. Another difference is that the smaller whorls (Parsons' Type 3) have a diameter that is somewhat less (20–30 mm) than the maximum peak found at Cholula, and the 33–37-mm size category is almost absent in the Valley of Mexico.

Whorl height relates to the speed of rotation, and therefore the tightness of the twist. Whorls from Cholula range from 5 to 30 mm in height, with the greatest concentration between 7 and 12 mm (Table 2). Specific assemblages have discrete concentrations within this range. The UA-1 Structure 1 whorls cluster from 5 to 18 mm,

Table 1. Diameter

Size (mm)	Cholula totals (n/%[a])	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés burials (n/%)
18–22	3/1	0	0	1/3
23–27	26/13	2/7	4/15	5/16
28–32	43/21	7/23	8/30	6/19
33–37	57/28	15/50	6/22	1/3
38–42	5/2	0	0	0
43–47	12/6	2/7	0	3/10
48–52	14/7	0	0	2/6
53–57	19/9	1/3	4/15	6/19
58–62	15/7	2/7	5/18	3/10
63–67	8/4	1/3	0	4/13
68–72	1/.5	0	0	0
73–77	0	0	0	0
78–82	1/.5	0	0	0
Totals	204/100	30/100	27/100	31/100

[a]n = number of examples, % = percentage of total.

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Table 2. Height

Size (mm)	Cholula totals (n/%[a])	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés burials (n/%)
5–6	11/5	5/12	1/4	3/10
7–8	45/20	12/29	3/11	2/6
9–10	62/27	12/29	7/26	5/16
11–12	31/14	6/15	6/22	5/16
13–14	15/6	2/5	2/7	1/3
15–16	17/7	1/2	1/4	2/6
17–18	10/4	2/5	0	2/6
19–20	7/3	1/2	1/4	0
21–22	6/3	0	0	3/10
23–24	7/3	0	3/11	1/3
25–26	12/5	0	1/4	4/13
27–28	2/1	0	1/4	1/3
29–30	3/1	0	1/4	2/6
Totals	228/100	41/100	27/100	31/100

[a]n = number of examples, % = percentage of total.

with a pronounced peak between 7 and 10 mm. Whereas both UA-79 f-10 and the San Andrés burial assemblage have their maximum concentrations within this same range, they also have a second mode between 21 and 26 mm.

The combined characteristics of diameter and height affect the speed and duration of the spindle's rotation. To quantify this relationship, the "shape" measurement is defined as the ratio of height to diameter (h/d), with a lower value representing a more disc-like whorl and a higher value representing a more bead-like whorl. The shape ratio for the Cholula totals is generally less than 1:2, with the greatest concentration between .23 and .27, indicating a predominance of shallow, disk-shaped whorls (Table 3). This cluster was particularly strong at UA-1 Structure 1, where 84% of the whorls had a shape between .18 and .32. Whorls from UA-79 f-10 and the San Andrés burials were generally higher in terms of their shape ratio, with additional concentrations at .38–.42 and .48–.52, respectively.

Table 3. Shape

Height/ Diameter (mm)	Cholula totals (n/%[a])	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés burials (n/%)
.08–.12	1/.5	1/3	0	0
.13–.17	5/2	1/3	0	0
.18–.22	22/11	5/17	3/11	4/14
.23–.27	51/26	11/37	3/11	7/24
.28–.32	33/16	9/30	5/18	0
.33–.37	26/13	1/3	1/4	5/17
.38–.42	31/15	2/7	10/37	4/14
.43–.47	9/4	0	2/7	1/3
.48–.52	14/7	0	3/11	5/17
.53–.57	5/2	0	0	2/7
.58–.62	2/1	0	0	0
.63–.67	2/1	0	0	1/3
Totals	200/100	30/100	27/100	29/100

[a]n = number of examples, % = percentage of total.

Table 4. Hole size

Size (mm)	Cholula totals (n/%[a])	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés burials (n/%)
1–2	4/2	0	2/9	0
3–4	31/16	0	9/41	5/16
5–6	33/17	3/10	2/9	8/26
7–8	58/30	20/64	3/14	0
9–10	31/16	5/16	1/4	2/6
11–12	20/10	3/10	1/4	8/26
13–14	12/6	0	4/18	5/16
15-16	0	0	0	0
17-18	3/2	0	0	3/10
Totals	192/100	31/100	22/100	31/100

[a]n = number of examples, % = percentage of total.

Hole size is the most distinctive measurement of the Cholula whorls. It ranges from 2 to 18 mm, and the concentrated mode is from 3 to 12 mm (Table 4). Contrasts exist between the specific feature assemblages, with UA-1 Structure 1 reaching its greatest peak at 7–8 mm, whereas UA-79 f-10 has its maximum concentration at 3–4 mm. The San Andrés burial assemblage has two modes: 3–6 mm and 11–14 mm. Parsons' (1972) data from the Valley of Mexico showed the highest concentration at 3 mm in whorls belonging to Type 3. The larger types (Types 1 and 2) had their peaks at 8–9 and 10 mm, respectively. Whorls from Tetla-11 had hole diameters usually ranging from 3 to 7 mm, with the peak at 5 mm (Norr 1987). Hole size relates to whorl placement on the spindle, as well as tightness and thickness of the thread. The differences reflected between site loci at Cholula and the other sites therefore indicate production choices in thread quality.

Weight is the measurement most often recorded for spindle whorls from Mesoamerica, although in modern practice it is but one of several factors involved in choosing spinning tools. The majority of Cholula whorls weighed less than 10 g, with the remaining whorls ranging to a maximum weight of 93 g (Table 5). Among the UA-1 Structure 1 whorls the concentration was even more pronounced, with 83% of the whorls weighing less than 10 g. In UA-79 f-10 the greatest concentration was again in the less than 10-g category, but there was a weak second mode of heavier whorls ranging from 60 to 99 g. In the Valley of Mexico (Parsons 1972), Type 3 whorls were concentrated between 1 and 10 g, whereas Type 1 peaked between 30 and 50 g and Type 2 peaked between 50 and 80 g. The majority of whorls from Tetla-11 clustered between 2 and 18 g, with the greatest peak at 11 g, but with occasional outliers to 52 g (Norr 1987). Smith and Hirth (1988) found a similar pattern from Morelos.

Detailed analyses of the Cholula whorls indicate that they do not conform well with the big/little "rule of thumb" developed for the Valley of Mexico because of a general lack of fit with the types identified by Parsons (1972). Though of comparable weight, the majority of Cholula whorls were larger in diameter than the "small" Type 3 whorls, and had a larger hole size. Based on the Cholula

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Table 5. Weight

Weight (g)	Cholula totals (n/%[a])	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés Burials[b] (n/%)
.1–9	70/62	15/83	12/54	5/54
10–19	15/13	1/6	3/14	0
20–29	4/4	0	1/4	0
30–39	4/4	1/6	0	0
40–49	5/4	0	0	0
50–59	4/4	1/6	0	1/9
60–69	2/2	0	1/4	0
70–79	2/2	0	1/4	1/9
80–89	4/4	0	2/9	4/36
90–99	2/2	0	2/9	0
Totals	112/100	18/100	22/100	12/100

[a]n = number of examples, % = percentage of total.
[b]Some whorls from the San Andrés burial were not available at the time of analysis.

assemblage, hand-spinning tools require a more complex model to account for the observed variations. For example, whereas Parsons (1972) defines the small Type 3 whorls as "cotton" whorls, no consideration is given to the quality of the thread produced. To incorporate thread quality as a factor, Brumfiel (1996) has recently suggested that the use of slightly lighter whorls indicates the production of a "finer" thread during the Late Postclassic Aztec III period (A.D. 1350–1520).[2]

Contemporary spinners in the United States recommend a "walnut-sized" spindle whorl weighing about 37 g for drop-spinning cotton (Linder and Linder 1977). Mixtec spinners from Jamiltepec, Oaxaca use clay whorls that average 24 mm in diameter, 25 mm in height, 7 mm in hole size, and 12 g in weight for support-spinning brown and white cotton. A slightly heavier (15 g) and taller (31 mm) whorl is used to ply two threads of cotton. The shape ratio for both of these whorl types exceeds 1:1, about four times the typical Cholula ratio, suggesting that the thread produced has a tighter twist. These data suggest a wide range of shapes and sizes for whorls used to spin the same material (i.e., cotton) with the changing variable being the intended quality of the finished product. In addition to cotton, however, other fiber materials were available to pre-Columbian spinners, including a variety of maguey species, yucca/palma, *chichicaztli* nettles, rabbit fur, feathers, and even gold (García Valencia 1975; McCafferty and McCafferty 1999).

We have defined 10 types (plus additional subtypes) based on the multi-dimensional criteria discussed above (Table 6) to accommodate the variation in Cholula whorls. Four types (B, D, E, and J) occur in frequencies greater than 10% among the Cholula totals, with Type D as the most abundant (31%; Table 7). The UA-79 f-10 assemblage most closely approximates this normative distribution because it has all four of these types in significant amounts (<10%). The San Andrés burial assemblage has significant concentrations of two of these types, with Type J as the most abundant (35%), but it only had a single example of Type D. UA-1 Structure 1 has a large concentration of Type D whorls (67%), but relatively few of the other major types and none of the Type J whorls. These data indicate differences between specific assemblages within Postclassic Cholula that suggest functional distinctions in spinning technology. The UA-79 f-10 and the San Andrés burials' whorl assemblages both date to the Late Cholollan phase and were more similar to one another than to the UA-1 Structure 1 assemblage. There were, however, significant differences between the two collections, probably indicating distinct specializations in thread production.

Types B and E would both be considered "small" whorls in the Valley of Mexico and Morelos. They differ in diameter and height, with Type E being slightly larger that Type B. Both would produce a thin, tightly twisted thread using a short staple fiber such as cotton or rabbit hair. Type J whorls are the largest in the Cholula assemblage and were probably used for drop-spinning maguey and other fibers to produce a thick thread, perhaps for cordage.

Table 6. Cholula whorl types

Type	Diameter (mm)	Height (mm)	Shape[a] (mm)	Hole Size (mm)	Weight (g)
A	29–36	4–7	.17–.19	6–8	5–7
B1	21–28	7–11	.28–.43	4–6	4–7
B2	22–29	7–12	.29–.48	4–6	4–8
B3	28–29	8–11	.32–.43	7–8	6–8
C	23–25	12–17	.50–.87	2–4	5–10
D1	30–37	8–11	.21–.33	7–9	8–11
D2	30–35	7–11	.24–.33	4–6	7–10
D3	39–53	8–11	.16–.28	6–9	10–13
E1	28–31	10–14	.33–.40	4–5	5–8
E2	28–32	10–13	.32–.43	3–6	5–10
E3	28–34	11–13	.30–.46	7–8	5–9
F1	30–35	10–16	.35–.47	4–6	10–15
F2	32–43	10–14	.32–.43	7–9	10–14
G	40–55	12–22	.24–.49	8–11	20–40
H	42–60	8–10	.13–.19	7–9	20–36
I	57–72	12–20	.19–.33	10–14	50–69
J1	48–56	19–22	.35–.48	9–12	40–59
J2	52–57	22–26	.37–.45	11–13	60–79
J3	58–64	24–28	.32–.52	11–12	80–106

[a]Shape is defined as the ratio of height to diameter.

[2] Brumfiel (1996) examined spindle whorls from Morelos and the Valley of Mexico in search of evidence for resistance among textile producers against tribute demands of the Aztec Triple Alliance. She found a slight decrease in spindle-whorl weight and diameter between the Middle and Late Postclassic periods, corresponding to the rise of the Aztec state. This she used to infer the production of "finer" (from the perspective of thinner) thread, and she extended this to imply finer quality *cloth* and therefore rejected the idea of resistance. The ultra-light-weight whorls she used in the analysis are about half the weight of whorls used to spin cotton in Jamiltepec, Oaxaca, indicating that they would have produced a significantly thinner thread, perhaps corresponding to the "gauze" described by Colonial sources. In contrast, we suggest that the production of finer/thinner thread requires less raw fiber, and although its production would be more labor intensive the minimization of expended raw material would evade tribute demands. Furthermore, a more effective form of resistance would be the production of loosely woven textiles (i.e., with relatively fewer threads in the weft), and this is, in fact, reflected in the ethnohistorical record when Spanish auditors demanded more tightly woven cloth (Riley 1973:43, 47, cited in Brumfiel 1996:454). Counting the number of threads per inch is still one way of assessing quality in Mexican textiles. By skimping on the amount of fiber, and then producing loosely woven capes, the spinners were indeed cheating the tax collectors.

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Table 7. Type[a]

Type	Cholula totals (n/%)	UA-1 Structure 1 (n/%)	UA-79 f-10 (n/%)	San Andrés burials (n/%)
A	6/3	3/12	1/4	1/3
B	30/17	2/8	4/17	8/26
B1	(5/17)	0	(2/50)	0
B2	(20/67)	0	(2/50)	(8/100)
B3	(5/17)	(2/100)	0	0
C	4/2	0	0	1/3
D	55/31	16/67	3/13	1/3
D1	(41/75)	(15/94)	(1/33)	0
D2	(11/20)	0	(2/67)	(1/100)
D3	(3/5)	(1/6)	0	0
E	23/13	1/4	7/30	2/6
E1	(12/52)	0	(5/71)	(2/100)
E2	(6/26)	(1/100)	(2/29)	0
E3	(5/22)	0	0	0
F	3/2	0	1/4	0
F1	(2/67)	0	(1/100)	0
F2	(1/33)	0	0	0
G	14/8	1/4	1/4	1/3
H	5/3	0	0	0
I	12/7	1/4	0	6/19
J	27/15[b]	0	6/26	11/35
J1	(6/22)	0	0	(1/9)
J2	(5/19)	0	0	(1/9)
J3	(8/30)	0	(2/33)	(2/18)
Totals	179/100	24/100	23/100	31/100

[a]Numbers in parentheses represent quantity (n) of subtype present and the percentage (%) within the type.
[b]Some whorls for which no weight could be determined were classifiable as Type J but could not be divided into subtype.

The Type D whorls recovered at Cholula are shallow, disc-like whorls, similar in weight to the cotton whorls used in the Valley of Mexico and western Morelos, but with greater whorl diameters and a relatively large hole size. Sahagún (1950–1982:8:49), describing the equipment of women, listed "the shallow spindle whorl when they spun with feathers," and also a basket and earthen bowl for storing feathers during spinning.[3] A feather seller was a woman who "spins feathers—spins them into an even thread, trims them. She spins them loosely, she spins them firmly; she uses the spindle, turns them loosely about the spindle, turns them firmly about the spindle" (Sahagún 1950–1982:10:92).

Feathers were available from exotic, imported birds, but also from ducks, geese, and turkeys (Sahagún 1950–1982:9:89–90). Because the UA-1 site is located near the shore of Cholula's marshy lake, it is likely that waterfowl were an abundant resource, providing meat as well as feathers for spinning. More than 400 spherical clay balls were discovered at UA-1, each measuring about 1.5 cm in diameter, and these "fowl balls" may have been used as blowgun projectiles for hunting small animals or birds[4] (see McCafferty 1992a:552–555; Sahagún 1950–1982:8:30).

Based on this discussion, we suggest that feathers collected from the local marshes were spun using the Type D whorls to produce a feather thread for specialized textile production involving bright colors as well as plush texture. A shallow whorl would produce a slow, controlled rotation that would be well suited for the creation of a thick, loosely twisted thread. Subtypes D1 and D2 are distinguished on the basis of hole size, allowing the spinner to "turn them loosely . . . turn them firmly about the spindle" (Sahagún 1950–1982:10:92).

CHARACTERISTICS OF DESIGN AND USE

Spindle whorls provide additional information on spinning practices based on stylistic embellishment, manufacturing technique, use-wear, and spatial distribution. By considering these additional characteristics, whorl data offer important insights into religious significance of spinning, as well as practical qualities of fiber production.

Cholula spindle whorls were often decorated, either with mold-impressed motifs or post-firing incision. Occasionally, mold-impressed whorls were further elaborated with the application of bitumen paint. Design motifs found at UA-1 feature a variety of geometric motifs, including hatched semi-circles that form a star pattern (Figure 6a–b). Other motifs include zoomorphic and complex geometric patterns (Figure 6c–f).[5] In contrast, at UA-79 the predominant motif is floral, particularly in patterns resembling marigold flowers (Figure 7). Since there is a temporal difference of about 400 years between the two site loci, these diachronic differences in whorl iconography may relate to social and/or religious changes during the Postclassic period (discussed in greater detail in McCafferty and McCafferty 1999).

The use of bitumen coating on spindle whorls has often been noted in Mesoamerica. Since bitumen, or *chapopote*, originates on the Gulf Coast, it has been suggested that whorls with this coating indicate exchange with the coast (Parsons 1972:57). The whorl assemblage from UA-1, however, provides evidence for the local application of bitumen. One group of five whorls had an identical mold-impressed pattern, probably made from a single mold at or near the Structure 1 compound. The pattern and dimensions of a whorl mold found in Structure 1, Room 2, matched those of the whorls.[6] The five whorls showed differential use of bitumen: three members of the group had bitumen coating but two others did not. In this case, at least, the bitumen was probably applied locally, although the use of bitumen may imply cultural affiliation with the Gulf Coast.

[3] Thread made of blended cotton and feather down has been identified in an archaeological context from the Upper Ruin, Tonto National Monument (Teague 1996).

[4] The identification of clay balls as blowgun projectiles contrasts with the more common identification of similar objects as playing pieces for *patolli* or as marbles (McCafferty 1992a:552–555). Clay balls occurred as grave offerings at the Cholula ceremonial center, often with children (López Alonso et al. 1976:Appendix 2). At UA-1 they were most common in non-structural areas, especially in association with compound walls, perhaps where they were used in target practice or for hunting lizards.

[5] In an interesting article, Dorothy McMeekin (1992) identified whorl patterns as depictions of the floral and fruit structure of specific plants, including tomato, pepper, squash, and cotton. Several examples from Cholula may correspond to this association.

[6] The identification is based on a sketch and measurements on the Object Card in the UDLA Archaeology Lab archive. The whorl mold could not be located at the time of our study, so it was impossible to verify this association.

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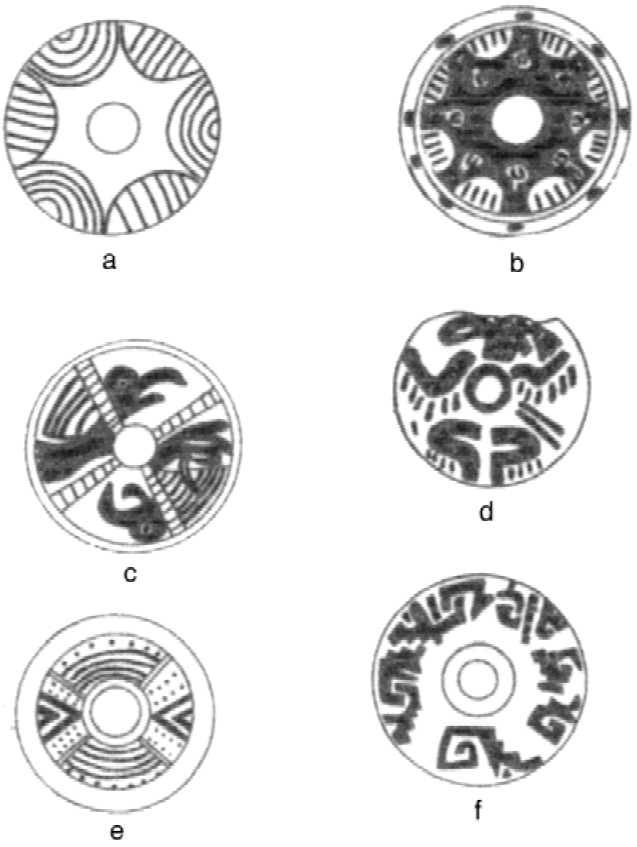


Figure 6. UA-l spindle whorls with hatched-crescent motif (a–b). Zoomorphic and geometric motifs on UA-l spindle whorls (c–f). Drawing by Sharisse McCafferty.

A second stylistic distinction was in the frequency of whorls with bitumen paint. At UA-1, 11% of the whorls possessed remnants of bitumen. These were exclusively small whorls (Types B, D, and E) and generally had mold-impressed decoration, often with the bitumen partially obscuring the pattern. Stratigraphically, bitumen-covered whorls were more common in the lower levels (14%) as opposed to only 8% in levels I and II (0–50 cm). The possibility that the popularity of bitumen-covered whorls decreased in the Late Chololan period (A.D. 1400–1520) is supported by the relative scarcity of bitumen from UA-79 (2%) and the San Andrés burial (6%). This may indicate a decrease in Gulf Coast interaction corresponding to shifting ethnic patterns relating to the arrival of the Tolteca-Chichimeca in the Early Chololan period.

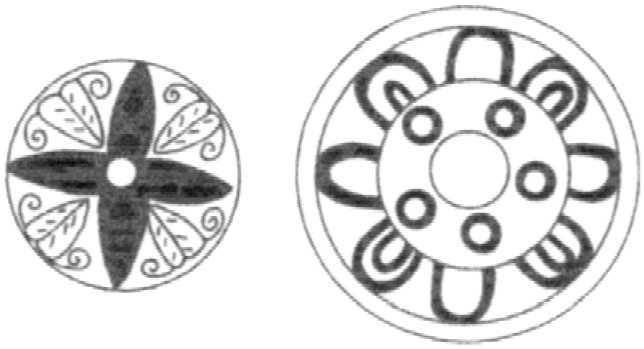


Figure 7. Floral motifs on UA-79 spindle whorls. Drawing by Sharisse McCafferty.

A qualitative difference also existed between the UA-1 and UA-79 whorls. The UA-1 whorls were generally mold-made, with care given to detail and design motifs. In contrast, the UA-79 whorls were often poorly formed with uneven impressions. Many examples were hand-sculpted and decorated with irregular patterns. The quality of spindle whorls would not necessarily affect their functional utility. The apparent decline in whorl quality from the Early to Late Postclassic periods may indicate a weakening in the symbolic significance of whorls.

Wear patterns on whorls can be used to infer spinning techniques. For example, six whorls from UA-1 and four from UA-79 feature a wear-pattern inside the center hole and on the exterior edge and across the radius of the whorl. This probably indicates whorls used for drop spinning, with the whorl in a low position. In this method the starter thread is pulled through the center hole and tied with a half-hitch. Whorls with this wear pattern were of Type J, probably used for drop-spinning maguey to produce a thick thread for cordage.

Whorls used in supported spinning often show wear patterns around the edge where the rotating whorl came into contact with the vessel wall of the spinning bowl. Some bowls from UA-1 display wear patterns on interior walls that may relate to their use as spinning bowls, and they have distinctive pitting on the interior base that may be the result of the spindle's "drilling" motion.

The spatial distribution of whorls from UA-1 provides insight into use and discard areas (Figure 8). Because large whorls were more likely used for drop-spinning and small whorls were best suited for supported-spinning, the UA-1 whorls were differentiated on the basis of diameter, with whorls having a diameter of less than 4 cm considered as "small" (s) and those with a diameter greater than 4 cm considered as "large" (S). A further distinction was made between the upper two levels (0–50 cm) that were interpreted as post-abandonment plow zone, and Levels 3 and below which were considered primary depositional contexts relating to the occupation of Structure 1 (McCafferty 1992a). The relative frequencies of small and large whorls varied between the two contexts, with large whorls occurring more frequently in the upper levels. Whorls in the upper levels were distributed fairly evenly across the site, with only weak clustering apparent. In contrast, whorl distribution in the primary contexts shows strong clustering in the Trash Midden and in Well 1, with almost all other whorls found in contact with the structure floor. In the upper levels large whorls were randomly distributed, whereas in the occupational context large whorls were primarily found in the midden and well, while small whorls were also found on the floor.

These patterns indicate that whorl distribution varied based on context, with larger whorls used in drop-spinning more likely to enter the archaeological record in mixed contexts, as they were more often used in open areas outside of the household compound. Small whorls, used in supported spinning, were most often used within the household compound. The whorls recovered from the floor contact level may relate to areas where spinning took place at the time that Structure 1 was abandoned.

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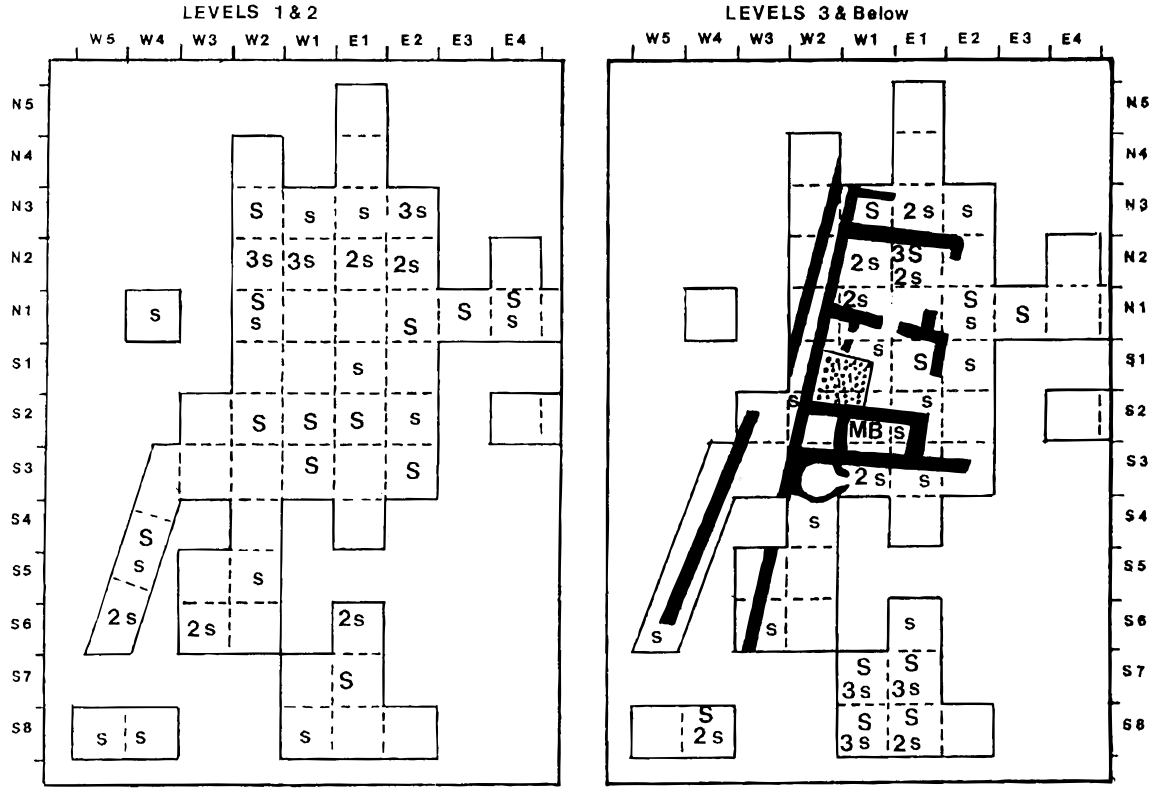


Figure 8. Spatial distribution of UA-I Structure 1 spindle whorls. s = small whorls (<4 cm in diameter), S = large whorls (>4 cm in diameter), M = spindle whorl mold, B = bone weaving tool. Drawing by Sharisse McCafferty.

CULTURAL CONTEXT OF SPINNING AND WEAVING

In addition to functional aspects of spinning and weaving, spindle whorls provide other information on the cultural context of textile production, including issues of gender-based division of labor and the organization of textile production. Ethnohistorical sources establish a strong correlation between spinning and weaving activities and female gender identity (Brumfiel 1991; McCafferty and McCafferty 1991). Spinning and weaving tools are often depicted in Mesoamerican pictorial manuscripts as accoutrements of the earth/fertility goddess complex (e.g., Cihuacoatl, Tlazolteotl, Xochiquetzal, among others). They are depicted carrying spindles and weaving battens, or with spindles as part of their headdresses (Figure 9). The goddess complex was closely associated with spinning and weaving as stereotypical female activities relating to domestic production and, metaphorically, sexual reproduction (Sullivan 1982). Spindles, whorls, and weaving battens were among the implements given to a baby girl at her bathing ceremony as symbols of female gender identity (Sahagún 1950–1982:6:201). Sahagún (1950–1982:6:96, cited in Sullivan 1982:13) recorded the admonition given to girls to "pay heed to, apply yourself to, the work of women, to the spindle, the batten."

The gender stereotype of spinning and weaving as female tasks is explicit for Aztec society, but evidence from other parts of Postclassic Mesoamerica is less compelling and the extension of this cultural standard to other ethnic groups is more tenuous. Spinning and weaving equipment has been found in mortuary contexts from Postclassic Oaxaca, where spindle whorls, battens, picks, and spinning bowls are associated with women affiliated with the earth/fertility complex (Hamann 1997; McCafferty and McCafferty 1994). Spinning implements are clearly gender specific in the Mixtec- and *Borgia*-group codices (McCafferty and McCafferty 1991), some of which may have been painted in or around Cholula



Figure 9. Aztec goddess Tlazolteotl with spindle whorls in headdress (after *Codex Borgia* 1993).

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(Nicholson 1966, 1994; Nowotny 1961). Landa (1978:55) mentioned spinning as a female task among the Maya, and spindle whorls are depicted in the hair of goddesses in the Postclassic *Codex Dresden* (1988:9; also Hendon 1997; Joyce 1993).

Torquemada (1975–1983:1:387) noted that the women of Cholula were involved in the "female task of spinning and weaving" (authors' translation; but see Bonfil Batalla 1973:75). Spindle whorl data from Cholula, however, is ambiguous for interpreting a relationship between female gender identity and textile production. An elite burial found within the Altar of the Carved Skulls (Noguera 1937), on the northeast platform of the Great Pyramid, included a woman buried with a bitumen-covered spindle whorl, two needles, a flat incised bone (possibly a batten), a copper filigree pin, and several vessels. Of the more than 500 other burials from the ceremonial center surrounding the Great Pyramid (López Alonso et al. 1976), however, only 9 included spindle whorls. Whorls were buried with both females and males (4 females, 3 males, and 2 unidentified). The most complete "sewing kit" included a whorl, two needles, and a bone punch, associated with an adult female (Individual 428). Whorls were also associated with both males and females at the mass burial found in San Andrés Cholula (McCafferty 1992b; Suárez Cruz 1989). Because the majority of these individuals seem to have been buried to accompany the principal male into the afterlife, however, their status as slaves or retainers may have excluded them from stereotypical gender roles. Nevertheless, the inclusion of whorls with both males and females suggests that the division of labor may not have been as strictly observed in practice as it was in the documentary accounts.

The UA-1 excavations provide a rich sample of spindle whorl data that can be used to infer the role of spinning and weaving activities in the domestic compound. The high number of whorls indicates that spinning may have been an important activity in the compound, either for meeting tribute demands, ritual gift-giving, or for market exchange. Many of the whorls found at UA-1 were unbroken, yet were recovered from the large trash midden south of Structure 1. Complete whorls were also common in the UA-79 f-10 midden. One possible explanation for why whole whorls were discarded is that they may have been swept up with other domestic trash, but these contexts exhibit suspiciously high numbers of "accidental discards." A second possibility relates to the practice, implied in the Florentine Codex (Sahagún 1950–1982:2:138), of burning a woman's spinning and weaving tools at the time of her death so that they would be available to her in the afterlife. Alternatively, these whorls may not represent a spinning industry at all, but rather areas where weavers consumed surplus thread. Thus spindles full of prepared thread, including whorls, may have been brought into the compound for direct use as bobbins in textile production, with the exhausted spindles and whorls discarded at the end of the process (for spindles used as bobbins in contemporary Guatemala, see Sperlich and Sperlich 1980:33).

Does the UA-1 household compound indicate a level of production greater than that needed for domestic consumption? Until more household assemblages have been excavated for comparison, the answer remains speculative, but UA-1 appears to have an unusually high number of whorls—25 from the floor contact of Structure 1 and an additional 17 from the associated trash midden. For comparison, Parsons and Parsons (1990:314–315) reported that their informants had 2 to 5 whorls each, with some handed down from mother to daughter. If this ratio can be extended into the pre-Columbian past, then it suggests that multiple spinners worked in the Structure 1 compound.

Polygyny was a common form of household organization in Postclassic Mexico, particularly among the nobility (Carrasco 1971b). Ethnohistorical sources (Herrera 1945:167; Motolinía 1951:202, 246) indicate that one of the incentives for maintaining polygynous households was the need for multiple textile producers to supply cloth for tribute and gifts. UA-1 Structure 1 is relatively small when compared to other Postclassic houses of central Mexico (Evans 1988; Norr 1987; Sisson 1973, 1974; Smith et al. 1989), so it is unlikely that it was a polygynous household despite the possibility of intensive spinning activity.

The San Andrés mass burial (Suárez Cruz 1989), featuring numerous individuals identified with spinning, may reflect a textile industry beyond the scale of domestic production, and it is possible that Structure 1 could have been a production locale for such an organization. Until more houses suitable for comparison have been excavated and analyzed, we can only infer that the UA-1 house contained a relatively high number of whorls, and was therefore intensively involved with at least some stage of textile production.

CONCLUSIONS

Pre-Columbian textile production as observed at Postclassic Cholula was a complex process that was intricately tied to economics, status, gender, religion, and social organization. Detailed analysis of spindle whorls from archaeological contexts in conjunction with ethnohistorical accounts of textile production and use present added dimensions and depth to the study of Mesoamerican cloth and clothing. Because of the abundant information from Cholula, it provides a model that will be useful for a wide range of comparisons.

The combination of ethnohistorical and archaeological data generates hypotheses and indicates ambiguities between the data sets (cf. Leone and Crosby 1987). In response to the questions raised by the ethnohistorical accounts of Cholula's textile production, for example, the large quantity of spindle whorls from Postclassic contexts suggests that Cholula was a center for fiber processing and/or consumption. Based on models derived from Colonial Aztec accounts (e.g., *Codex Mendoza*, 1992:3:Folios 58r–60r) and contemporary ethnographic practice, spinning and weaving generally occurred together within the household context. The presence of spindle whorls, therefore, indirectly implies the full range of textile production activities.

A second question raised by the ethnohistorical accounts related to the kinds of materials used in Cholula, with the specific comment that cotton garments were *not* produced (Rojas 1581:30, cited in Carrasco 1971:64). Size differences of the whorls from archaeological contexts at Cholula fall into three general modes: Types B and E that correspond to the small "cotton" whorls from the Valley of Mexico and Morelos; Type J that resembles the large "maguey" whorls from the Valley of Mexico and Tlaxcala; and a third mode (Type D) of very light, shallow whorls with a large center hole. It is suggested that these correspond to ethnohistorical descriptions of whorls used for spinning feathers (Sahagún 1950–1982:8:49). Type D whorls make up the largest group in the Cholula totals and are particularly abundant in the UA-1 Structure 1 assemblage, which may relate to a specialized production area due to the high number of whorls recovered and its proximity to the ancient lake where migratory birds could be hunted. The high frequency of ceramic "fowl balls" provides further evidence of such hunting activities.

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The Cholula spindle whorls provide information on diachronic change both in whorl morphology and in the design elements encoded onto the whorls. These data are indicated through stratigraphic variation within the UA-1 site, supported by comparisons with Late Postclassic whorls from UA-79 and also the mass burial found in San Andrés Cholula (Suárez Cruz 1989). Whereas medium-size Type D whorls were the most common in Early Postclassic contexts at UA-1, larger whorls increased in frequency in later contexts. This may indicate a greater reliance on drop-spinning and use of maguey during later periods, perhaps as a result of Aztec market strategies.

A third question raised by the ethnohistorical sources relates to the stereotypical association of textile production as a female activity. Documentary sources from central Mexico, Oaxaca, and the Maya area represent women as textile producers. Burial contexts from Cholula, however, only partly support this association because some male skeletons were accompanied with spinning equipment. Because many of these males may have been sacrificed servants or slaves, there may be a status factor involved in the representation of gender identity whereby norms were less rigid for individuals from lower social classes. The one high status couple found in the Altar of the Carved Skulls did conform to gender norms as reconstructed from ethnohistorical sources. More contextual information linking sexed individuals with burial offerings will be useful in further evaluating the relationship of gender identity to textile production at Cholula.

In conclusion, the detailed study of archaeological spindle whorls provides a wide range of information on the functional and social practices of textile production at Postclassic Cholula. As one of the stereotypical activities of women in pre-Columbian society, spinning and weaving provide important clues into gender relations in the past. Critical analysis of the presence of textile-related artifacts in burial contexts, for example, can offer insights into how these diagnostic activities may have functioned on a symbolic level within the society.

Archaeological evidence is necessarily grounded in permanent materials such as stone and ceramic. Textiles are rarely recovered from pre-Columbian contexts in Mesoamerica, and a wealth of information is consequently irretrievable (but see Anawalt 1981a). Analysis of spindle-whorl data and the integration of archaeological and ethnohistorical data can lead to a greater understanding of pre-Hispanic textile production, thus opening avenues to a more complete understanding of the past.

RESUMEN

Fuentes etnohistóricas describen los trajes pre-hispánicos de Cholula, tanto en las crónicas de los españoles como en los códices indígenas. Desafortunadamente, los textiles no conservan bien como evidencia arqueológica, hasta que casi no existen ejemplares verdaderos de estos vestimentos. En actualidad los arqueólogos dependen en la cultura material, especialmente los malacates, para interpretar la producción textil precolombino. En este artículo hablamos de la producción textil en Cholula basada en fuentes etnohistóricas y materiales arqueológicos, e incluimos las relaciones sociales de la producción.

En años recientes varios investigadores han estudiado los malacates de Mesoamérica para inferir materias de producción (Parsons 1972; Smith y Hirth 1988), cambios diacrónicos (García Cook y Merino Carrión 1974), y cambios sociales con énfasis en el papel femenil (Brumfiel 1991; McCafferty y McCafferty 1988, 1991). Utilizando malacates de la Cuenca de México, Parsons (1972) sugiere una división entre los de tamaño chico (para hilar algodón) y los grandes (para hilar *ixtle*, la fibra del maguey). En nuestra discusión sugerimos que los malacates de Cholula necesiten un modelo más diverso para incluir un rango más extensivo de materias, como plumas, pelo de conejo, *chichicaztli* (mala mujer), y palma, entre otras.

Investigamos tres problemas en el estudio: (1) la intensidad de producción en Cholula del postclásico; (2) la utilización de materias, incluyendo algodón, ixtle, y otras (especialmente plumas); (3) el desarrollo social de producción, especialmente con respecto a género.

Los malacates de Cholula son discos perforados de barro. Pueden ser medidos por varias maneras: diámetro, altura, peso, y diámetro de perforación (Cuadras 1–5). Muchas veces tienen decoración de molde o incisión, y varios tienen pintura negra de *chapopote*. Todos que hemos encontrado provienen del postclásico, indicando que antes la gente usaba malacates impermanentes, posiblemente de madera o barro secado por el sol.

Los malacates usados en nuestro estudio provienen de excavaciones domésticas, como UA-1 y UA-79 de los terrenos de la Universidad de las Américas, y un entierro múltiple en San Andrés Cholula. El corpus consiste en 237 malacates de contextos excavados, entre las concentraciones más abundantes de Mesoamérica. Así podemos apoyar las fuentes etnohistóricas que Cholula sí era centro de producción textil.

Para inferir la utilización de materias, dividimos los malacates en 10 tipos, más subtipos, definidos en Cuadra 6. Cuatro de los tipos ocurren como más de 10% del total (Cuadra 7): Tipos B, D, E, y J. Tipos B y E corresponden a tamaños asociados con malacates para algodón en el Valle de México, y Tipo J corresponde a los malacates grandes para hilar maguey. El tipo más abundante, Tipo D (31%) es ligero como los para algodón, pero más ancho de diámetro y con una perforación más grande que Tipos B y E. El Tipo D producirá un hilo grueso, y sin mucha torción. Según Sahagún (1950–1982:8:49), éste correspondería a los malacates "llanos" que se usaban para hilar plumas. Con base en los datos de malacates, entonces los Cholultecas del postclásico hilaban algodón, *ixtle* y plumas, y posiblemente otras materias todavía no identificadas.

Para interpretar dimensiones sociales de la producción textil de Cholula, consideramos restos incluidos con entierros de Cholula. Las fuentes etnohistóricas claramente relatan los procesos de hilar y tejer como obras de mujeres (McCafferty y McCafferty 1991); en contraste, entierros de mujeres y hombres incluyen malacates como ofrendas. Por seguro es más común con mujeres, y los hombres enterrados en San Andrés Cholula pueden haber sido esclavos o sirvientes, y entonces no están tan desarrollados por modelos de género. Pero la evidencia que tenemos de los entierros implica que las representaciones de género que hacemos de las fuentes no corresponden completamente a la "práctica" que podemos ver en la arqueología.

Otros rasgos de la producción textil incluyen técnicas de hilar, especialmente la diferenciación entre el hilado por tirar ("drop-spinning") y el hilado de soporte, que interpretamos basada en los restos de uso (como marcas abrasivas en el acabado) y la distribución de los malacates en sus contextos de deposición.

Por fin, consideramos evidencias decorativas en los malacates, con cambios diacrónicos en patrones entre el postclásico temprano y el postclásico tardío. Otro cambio se relaciona con el uso de *chapopote* para pintar los malacates–este rasgo es más común en el postclásico temprano, y puede indicar interacciones culturales con la Costa del Golfo.

En conclusión, los malacates de Cholula indican un rango de información acerca de la producción textil y su desarrollo social. Aunque casi no existen textiles pre-hispánicos de Mesoamérica, el análisis de los malacates, especialmente cuando se relaciona con datos etnohistóricos, produce interpretaciones importantes sobre la cultura material de México antiguo.

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