

Cotton Spinning Technology - Mexico

Introduction

Archaeologists and ethnohistorians studying Prehispanic cultures in Central Mexico (FIG. 1) have long recognized the importance of cotton as a major resource and tribute item among contact period groups (e.g., Anawalt 1981; Berdan 1987). Although archaeologists have described ceramic spindle whorls used in the production of cotton cloth (e.g., Parsons 1972, n.d.; Wiltfang 1975; Meighan 1976: 77-81), they have been slow to identify additional artifactual evidence of textile manufacture or to examine technological or quantitative changes within specific Prehispanic textile industries. This report discusses material evidence for Prehispanic cotton spinning in western Morelos, an important cotton-producing area of the central Mexican highlands. Diachronic changes in spinning technology and intensity are documented and interpreted, leading to suggestions concerning the changing role of cotton textiles in the Postclassic cultures of Central Mexico.

Mesoamerican Textile Technology

Cotton thread was spun by hand in Prehispanic Mesoamerica. Women worked either alone or in groups producing thread that was woven into cloth on the traditional backstrap loom (Anawalt 1981). Three simple tools were required to produce cotton thread: 1) a thin wooden spindle fitted with, 2) a ceramic disk or whorl, and 3) a small ceramic bowl used to support the spindle as it twirled. These three items are mentioned and illustrated (FIG. 2A) in two lists of textile equipment by Sahagin (1950-1969, Book 6: 201, fig. 30, and Book 8: 49, fig. 75). In Sahagin's terminology, the spindle and whorl are referred to together as *malacatl*, while the bowl is called *tzavalcaxitl*.¹ Other conquest period illustrations of these items are found in Duran (1967, I: fig. 28) and the Codex Mendoza (1980: Folios 58r, 59r, 68r); the latter example is reproduced here in Figure 2b. Ethnographic descriptions and illustrations of spindles, whorls, and bowls used for spinning are abundant in the literature on modern Mesoamerican textiles (e.g., Cordry and Cordry 1968; O'Neale 1945: 8-10). Whorls used in

1. The Nahuatl term *malacatl* derives from *malina*, to twist, and *acatl*, cane or reed. Separate terms for spindle and whorl are not found in conquest-period sources. Among contemporary Nahuatl-speaking weavers in the Sierra Norte de Puebla, Mexico, *malacatl* refers to both the spindle and whorl, although separate terms do exist: *malacatitl* for the whorl and *malacapuitl* for the shaft (Frances Berdan, personal communication). The 16th-century term *tzemalcaxitl* derives from *tzahua*, meaning to spin, and *caxitl*, a pottery bowl. This term has not been reported among modern weavers, probably because there is no special vessel used specifically for spinning. Related terms for specialized spinning tools mentioned in Sahagin are *teucuitlazoalcaxitl*, meaning golden spinning bowl (Sahagin 1950-1969, Book 9: 18) and *xaxalmalacatl ic iujtanatl*, which is a shallow spindle used to spin with feathers (Sahagin 1950-1969, Book 8: 49).

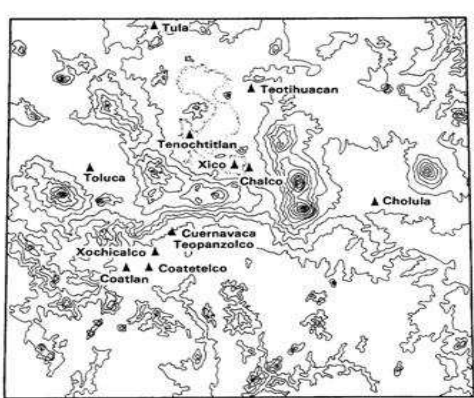


Figure 1. Major archaeological sites in Central Mexico mentioned in text.

spinning cotton are usually ceramic, although wood, stone, and gourd examples are also reported. Whereas Aztec spinning bowls were a functionally-specialized vessel type, modern cotton spinners tend to use broken ceramic or gourd bowls to hold the twirling

spindle. These bowls are needed during the thread making process to support the spindle when spinning short-staple fibers like cotton. Medium and long-staple fibers like wool or maguey are best spun with a drop-spinning technique, where the spindle is dropped by hand and allowed to spin freely, suspended only by the twisting thread. While it is possible to spin cotton in this manner, a far higher degree of control is obtained when the spindle is supported (Hochberg 1980: 19-44). The use of a small bowl for support of the spindle makes the process easier and more efficient (Cordry and Cordry 1968: 27; O'Neale 1945: 10). It is interesting to note that while spinning bowls are found in nearly all Prehispanic illustrations of spinning in Central Mexico, examples in the Mixtec codices from highland Oaxaca show women spinning without the use of a support bowl (e.g., Codex Nuttall 1975: 11).

The Morelos Data

Archaeological Evidence for Spinning

Spindle whorls and spinning bowls were made of materials that can be recovered through archaeological investigation. Spindle whorls occur as formed ceramic disks whose function can be inferred by direct analogy from ethnohistoric and ethnographic usage. In a study of Aztec-period whorls from the Teotihuacan Valley, Mary Parsons (1972) notes a bimodal distribution of whorl size and weight. She interprets the smaller whorls (her type III) as having been used for spinning cotton, and the larger whorls (types I and II) as having been employed in spinning maguey fiber. Parsons' functional interpretation of whorl size is based on ethnographic analogy (O'Neale 1945; Kent 1957) and is technologically reasonable. Whorl weight is a major determinant of the angular momentum (the speed and force of spin) of the twirling spindle, and short fiber materials such as cotton require less angular momentum than does the longer fiber maguey. This bimodal distribution of whorl sizes is also found among archaeological spindle whorls from the state of Morelos. Weights of 85 unbroken whorls from the site of Teopanzolco in Cuernavaca dating to the period A.C. 1150-1400 are plotted in Figure 3. These whorls range from 2 g to 74 g in weight, with most examples clustering between 2 g and 18 g. Following Parsons (1972: fig. 13), we interpret whorls under 18 g to have been employed in spinning cotton and whorls over 34 g to have been used in processing maguey; whorls with intermediate weights (18-34 g) may also have been used in spinning maguey although this assessment remains tentative for the time being. It is important to note that there are significant stylistic differences in whorl decoration that correlate with their separation into functional groups of cotton- and maguey-spinning whorls. Within the Teopanzolco collection nearly all of the whorls under 18 g in weight exhibit plain smooth surfaces while all but one of those over 18 g in size are decorated with incised or mold-impressed designs. The Teopanzolco collections are representative in terms of the forms and sizes of Postclassic whorls found throughout Morelos.

Nearly all of the small cotton-spinning whorls known from Morelos conform to Parsons' type Ma plain variety (1972: 52-53). Several examples from Teopanzolco are illustrated in Figure 2c. Maguey whorls are less common in Morelos than in the Basin of Mexico, probably because the species of maguey employed for fiber in the Basin (the so-called pulque magueys, *Agave mapisaga* and *A. salmiana* [Gentry 1982: 594-608]) do not grow in most of the state because of its lower elevation and warmer climate (there are relatively more large whorls at Teopanzolco than in areas of lower elevation to the south of Cuernavaca). Similarly, the majority of the large whorls recovered in the state have mold-impressed geometric designs, resem-

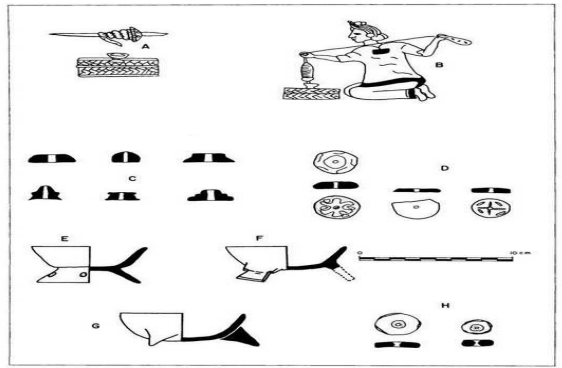


Figure 2. A) Aztec spinning equipment (Sahagún 1950-1969, Book 8, fig. 72). B) Woman spinning (Codex Mendoza 1980: Folios 68r). C) Small spindle whorls for cotton, surface collections at Teopanzolco. D) Excavated Epistatic whorls (left: origin, Tlaxcoalinga, 1320-1600; center: candidate, Tlaxcoalinga, 1320-1600; right: candidate, Aztec, 1492). E and F: Aztec III Black-on-Orange spinning bowls, Coatepec (CNV-137 and CNV-148). G: Local spinning bowl, Coatepec (CNV-167). H: Epistatic perforated sherd (left: Sochicatlan, 250-1000; right: Tlaxcoalinga, 1320-1600). C, E, F, and G are from unpublished drawings by Smith; D and H are from unpublished drawings by Hirth and Smith.

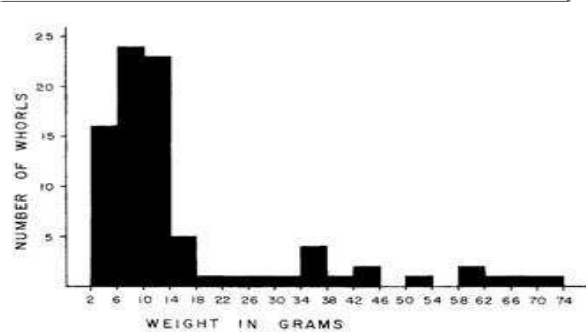


Figure 3. Weights of ceramic spindle whorls from surface collections at Teopanzolco, Morelos (Teopanzolco phase).

bling examples from the Toluca Valley illustrated by Parsons (1972: plates 15-16).

Prehispanic spinning bowls correspond to a group of small, orange ceramic bowls with supports, which have been recovered in Late Postclassic contexts in the Basin of Mexico and surrounding areas of Central Mexico (FIG. 2E, F). Typological studies based on paste and surface decoration (Parsons 1966; Smith 1983) place these bowls within the well-documented ceramic category known as Aztec III Black-on-Orange which dates to the Late Aztec phase of A.C. 1350-1521+ (TABLE 1; Parsons 1966). The first published reference to Aztec spinning bowls appears to be Bernal's mention of "Unas copitas de las llamadas `bases de malacate'" (1948-1949: 36), although Bernal questions this interpretation and calls the vessels toys. Medellín Zenil (1952: 56, 1960: 200), in his discussions of Aztec pottery recovered in Veracruz, accepts without comment the textile-related function of these bowls, but subsequent discussions of Aztec pottery and textile production have not followed up this important lead. Medellín Zenil's functional interpretation is apparently based on his association of Aztec III miniature bowls with those portrayed in conquest period pictorial codices (FIG. 2A, B).

Confirmation for the use of these miniature bowls as spinning vessels comes from three properties of the bowls themselves. 1) Aztec III miniature bowls have a relatively narrow range of orifice diameters, suggesting their manufacture for a specific use with technological constraints² (FIG. 4). 2) They always have supports, usually annular (FIG. 2E), with some examples exhibiting slab supports (FIG. 2F), that provide stability for their use in spinning. 3) Many examples of these bowls examined by Smith exhibit patterns of abrasive wear on their interior base, which could have been produced by their prolonged use in supporting the twirling spindle. Furthermore, the Aztec III miniature vessels are orange, the color used to depict spinning bowls in the ethnohistorical sources (e.g., Codex Mendoza 1980: Folios 58r, 59r, 68r); they are sometimes referred to as "golden spinning bowls" by Sahagún (see note 1).

While Aztec spinning bowls have been recovered from Late Postclassic deposits around Mexico City (S6journ6 1983: figs. 92, 113-114; Parsons 1966: figs. 39-40), they are not very common in the Basin of Mexico. By contrast, these vessels are quite common in surface collections and **2**. Although the frequencies are low, the data in Figure 4 may suggest a bimodal size-distribution. Apart from size, the three tiny bowls are no different from the larger spinning bowls. They could indicate spinning of particularly fine thread that required greater control than the standard cotton thread, such as the Mexican brown cotton with its very short fiber length. excavated contexts in

Morelos. Nine whole vessels were recovered from Late Postclassic (Cuauhnahuac phase) burials at the site of Coatetelco (Raul Arana, personal communication), and fragments of these vessels were also represented in Hirth's surface collections from 22 of 71 Late Postclassic residential communities in the CoatlanTetecala region in western Morelos. Their occurrence in the nearby Toluca Valley is documented by 19 complete examples contained in the Frederick Starr collection of several hundred ceramic vessels from Postclassic burials in that area (the collection is housed in the Field Museum of Natural History in Chicago). Additional examples are reported from the Aztec garrison of Quauhtochco (modern Huatusco) and from Quiahuitlan in Veracruz (Med-

Figure 4. Rim diameters of local and Aztec spinning bowls. Local bowls are from excavated contexts at Xochicalco and Coatetelco (Ternazcalli and Cuauhnahuac phases); Aztec bowls are from Coatetelco and the Frederick Starr collection of vessels from the Toluca Valley at the Field Museum of Natural History.

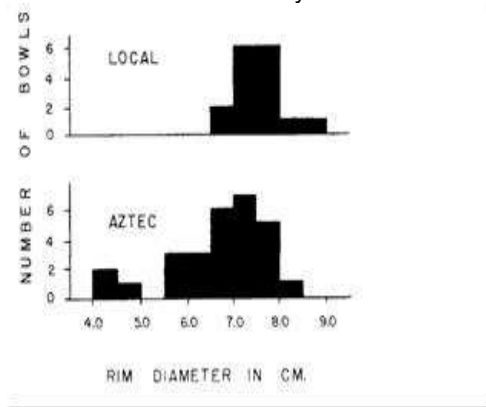


Table 1. Postclassic ceramic phases in western Morelos.

Date	Period	Western Morelos	Cuernavaca Area	Basin of Mexico
1500	Late Postclassic	Late Cuauhnahuac	Tecpan	Late Aztec
1400		Early Cuauhnahuac		
1300	Middle Postclassic	Temazcalli	Teopanzolco	Early Aztec
1200		Tilancingo		
1100	Early Postclassic	Phase H	not yet defined	Mazapan
1000				
900	Epiclassic	Phase G		Coyotlatelco
800				

ellin Zenil 1952: 56, 1960: 200) as well as from Coixtlahuaca, Oaxaca (Bernal 1948-1949: 39). Although quantitative assessment is not possible, it appears that Aztec spinning bowls are less common within the Basin of Mexico than in those areas outside the Basin that were paying heavy tribute in cotton textiles to the Triple Alliance at the time of the Spanish conquest (Codex Mendoza 1980: Folios 23r, 23v, 35r, 48r).

Other types of miniature tripod bowls recovered archaeologically in western Morelos probably also functioned as spinning vessels. Small hemispherical bowls with coarse-sand-tempered, local orange paste and a black-smudged surface finish (FIG. 2G) are the same size as the miniature Aztec III bowls (FIG. 4, top). They nearly always have solid conical supports, although slab supports (but not annular bases) also occur (see Smith 1983: 439-441). Like the Aztec III bowls,

many of these black-smudged miniatures exhibit wear on their interior bases. Although the latter have not been reported outside of Morelos, Moedano Koer (1941: 30) suggests that other miniature tripod bowls served the same function at Tzintzuntzn (Moedano Koer 1941: fig. 4). Likewise, Lister (1955: 21, 88-89) discusses the distribution of miniature tripod vessels in western Mexico and suggests that their occurrence outside Tzintzuntzn is associated with the Tarascan expansion.³

Changes Through Time

Archaeological investigations have established that cotton was grown throughout Central Mexico by 3400 B.C., if not earlier (Stephens 1967: 260). The earliest spun-cotton yarn was recovered from Purrón cave in the Tehuacan Valley and dates to between 1200 and 1500 B.C. (MacNeish, Nelken-Turner, and Johnson 1967: table 30; MacNeish and Garcia Cook 1972: fig. 41). The earliest spinning paraphernalia may have consisted of perforated ceramic disks, made from broken and reworked ceramic vessels, that could have been used as simple spindle whorls.⁴ Reworked ceramic disks dating from 825 to 1025

3. Recent excavations by Smith at Late Postclassic sites in Morelos yielded many examples of local and Aztec spinning bowls and spindle whorls that will allow more detailed descriptions and analyses of these artifacts based upon larger samples than are currently available.

4. While some archaeologists assert that perforated circular disks manufactured from potsherds could not serve as spindle whorls (Caso, Bernal, and Acosta 1967: 436), ethnographic examples of this practice are known (Weigand 1969: 24). Kent (1957: 473) examined this issue and concluded that while rough asymmetrical sherd disks will not work effectively as spindle whorls, well-made symmetrical examples can serve

B.C. have been recovered in the Tehuacan Valley (MacNeish and Peterson 1972: 187) and continued in use up until ca. A.G. 700, when specially-manufactured whorls appeared for the first time in prehistoric sites throughout Central Mexico.

Excavations of the Xochicalco Mapping Project in 1977 (Hirth 1983) recovered a number of specially-manufactured spindle whorls from Epiclassic (A.c. 700-900) contexts at Xochicalco and Tlacuacingo (FIG. 2D). These artifacts, together with contemporary examples recovered from Cerro Tenayo (Rattray 1966: 130-131) and Cholula (Muller 1978: fig. 24), represent the earliest securely-dated spindle whorls in the central Mexican highlands. Classic-period whorls are found in the Maya lowlands (Willey 1972: 84-86; Sheets 1978: 61-63) and in western Mexico (Meighan 1976: 77-81), but these are spindle whorls stylistically distinct from those of the central highlands. Formed whorls are absent from Classic deposits at Teotihuacan, although perforated sherd disks are present (George Cowgill, personal communication). Perforated ceramic disks are also present at Xochicalco and Tlacuacingo (FIG. 211). On the basis of size and weight we believe that both the Epiclassic whorls and disks recovered from western Morelos were used to spin cotton.

The Early Postclassic period in Morelos corresponds to the time period A.C. 900-1200. The early part of this period is poorly understood, and no spinning artifacts have been recovered. The later part of this period corresponds to the Tilancingo phase (A.c. 1100-1200) when there was a clear separation between small undecorated cotton whorls and large mold-impressed maguey whorls that continued through the Spanish conquest (see above). Excavated examples of these whorls come from dated deposits whose ceramics were not fully quantified, so that no judgments can be made regarding their relative frequency (TABLE 2). Examples also have been recovered from surface collections in the Coatlan-Tetecala region, where both maguey and cotton whorls have been recovered from single-component domestic sites dating to the Tilancingo phase.

Spindle whorls are numerous elsewhere during this period, including Tula (Franco 1956; Parsons n.d.) and Cholula (Muller 1978: figs. 24, 25). With regard to the whorls at Tula, there are strong stylistic similarities to contemporary whorls from the Huastec region on the Gulf coast (see Cordry and Cordry 1968: 27; Willey 1972: 80-81). Whether reworked, perforated ceramic disks were actually used as spindle whorls and/or had subsidiary functions will need to be established with future research. While we believe that some ceramic disks were used as whorls we do not believe that this was the only function these disks performed.

Both large (maguey) and small (cotton) whorls are found at Tula (Parsons n.d.) and Cholula (Muller 1978: fig. 25) during this period, whereas nearly all of the Huastec examples are of the small variety. We suspect that while a Huastec-derived whorl tradition was emerging in the area around Tula, a separate and independent highland tradition of small, plain whorls was emerging in Morelos.

Miniature, black-smudged spinning bowls make their first appearance at Xochicalco and other

sites in western Morelos during the Temazcalli phase (A.c. 1200-1350). Maguey and cotton whorls are also present, and the cotton-spinning artifacts (small whorls and bowls) comprise 0.17% of the ceramic assemblage from this phase (TABLE 2). Although there are only five single-component sites in the Coatlan-Tetecala region during the Temazcalli phase, at least one of these produced a cotton whorl from surface collections. In the Basin of Mexico, O'Neill (1962: 269, 277) reports six cotton and two maguey whorls in Early Aztec levels at Chalco; the cotton whorls comprise 0.12% of the ceramic materials for that phase. Early Aztec surface collections from Huexotla and Xico contain both cotton and maguey whorls in small quantities (Brumfiel 1986). The Chalco whorls appear to include at least one Huastec (or Toltec?) style example; other whorls correspond to various of Parsons' types, although type IIIa, which she refers to as the Morelos-type cotton whorls, is not present (O'Neill 1962: 217).

Aztec III Black-on-Orange miniature spinning bowls make their first appearance in western Morelos at the beginning of the Cuauhnahuac phase (A.c. 1350— 1521 +). Cotton-spinning artifacts increase in frequency from 0.17% to 0.59% of the ceramic assemblage recovered from Xochicalco and Coatetelco (TABLE 2). Whorls or bowls were recovered at 60% (26 of 43) of the single-component Cuauhnahuac-phase sites in the Coatlan-Tetecala survey region. A similar increase in cotton whorls is reported for Chalco, where 13 cotton whorls were recovered, comprising 0.41% of O'Neill's Late Aztec ceramic sample (1962: 269, 277). At Huexotla and Xico, however, Brumfiel (1986) reports a 50% decline in both cotton and maguey whorls between the Early and Late Aztec periods. Within the Chalco collections all the small,

5. The Chalco data are taken from O'Neill's (1962) dissertation. Levels 1-8 of his test pit have significant amounts of Aztec III Black-on-Orange ceramics with small numbers of Aztec I and Aztec II sherds; these are interpreted as a Late Aztec deposit with some mixture of Early Aztec materials. Levels 9-28, with Aztec I and Graphite Black-on-Red (but no Aztec III) are interpreted as an Early Aztec deposit. Sherd totals for the calculation of the percentages are taken from O'Neill (1962: table 2).

Table 2. Spinning artifacts from excavated Postclassic contexts at Xochicalco and Coatetelco, Morelos. Figures in this table pertain to ceramics from firmly-dated, non-mixed levels from controlled test-pit excavations in midden deposits.

Phase	Whorls		Bowls		Total cotton artifacts	Total sherds
	Maguey	Cotton	Local	Aztec		
Late Cuauhnahuac	-	5*	3	1	9 (0.57%)	1,589
Early Cuauhnahuac	2	7*	10	3	20 (0.59%)	3,417
Temazcalli	3	2*	2	-	4 (0.17%)	2,402
Tilancingo	*	*	-	-	-	495

*Additional examples are present in dated deposits whose ceramics have not been quantified in the same manner as those from the midden test pits.

undecorated cotton whorls and spinning bowls date to the Late Aztec period (O'Neill 1962: 214).

Implications

While cotton textiles were clearly manufactured and used in Central Mexico from a very early date (Smith and Kerr 1968), the appearance of specially-formed ceramic spindle whorls during the Epiclassic period may relate to an increase in the scale and intensity of cotton production. At the time of the Spanish conquest the use of cotton apparel was a privilege reserved for members of the elite, and cotton textiles had become important tribute items within expanding conquest states (Barlow 1949; Anawalt 1981; Berdan 1987). Furthermore cotton was used in the manufacture of the ichcahuipilli (defensive armor) worn by warriors (Penafiel 1985: 17).

The Epiclassic period was characterized by two important sociopolitical trends—the emergence of numerous small, independent city-states during the breakup of the Teotihuacan empire after A.C. 650, and an increase in the general level of conflict and militarism as a result of increased competition over scarce resources within Central Mexico. The demand for Morelos cotton would have increased with the fragmentation of Teotihuacan's interregional trade networks. Growth in the number of intermediate-size administrative centers during this period (Sanders, Parsons, and Santley 1979) would have raised the demand for cotton textiles proportional to the increase in the

number of rural elite. At the same time, an increase in regional conflict would have raised the demand for cotton needed to produce *ichcahuipilli*. The result would have been an increase in the aggregate demand for cotton at the same time that non-local cotton produced in areas such as the Gulf Coast may have been less readily available due to decreased interregional trade. The appearance of more specialized spinning equipment within Epiclassic sites in Morelos may reflect an increase in the demand and scale of cotton production in Central Mexico.

The data presented above suggest that the peoples of western Morelos produced a number of technological innovations in cotton-spinning technology during the subsequent Postclassic epoch. Local spinning bowls are present in Morelos around A.C. 1200, while the Aztec and Tarascan variants do not appear until after A.C. 1350. The overall similarity of Morelos and Aztec examples suggests that the latter were patterned after the former. Similarly, the small, plain cotton whorls appear to have their origin in Morelos, where they go back to the Epiclassic period. Plain cotton whorls have not been found in the Early Postclassic deposits at Tula (Parsons n.d.), and at Chalco they do not appear until the Late Aztec phase (O'Neill 1962: 213-218).

The Middle to Late Postclassic transition witnessed a dramatic increase in the intensity of cotton-thread production in Morelos, as measured by the frequency of spinning artifacts in excavated deposits (an increase of 350%) and the prevalence of such artifacts in surface collections from single-component sites. At recently-excavated Late Postclassic sites near Xochicalco, spinning artifacts are both abundant and ubiquitous. Preliminary indications suggest that cotton spinning was carried out by all households, both elite and commoner. The quantities of finished textiles would have been quite high, and in addition to their local use many textiles must have been exported from this area (see note 3). Ethnohistorical documents reveal a heavy trade in Morelos textiles (e.g., Duran 1967, II: 23), and these items are prominent in lists of tribute paid by Morelos polities to the Aztec empire (Codex Mendoza 1980: 23r, 24v).

This active trade in cotton textiles was not limited to Morelos. Berdan (1987) and Anawalt (1981) review ethnohistorical documentation of similarly high levels of textile production and exchange throughout Late Postclassic Central Mexico where cotton textiles had four primary uses. First, cotton garments were used as clothing. Although the chroniclers suggest that use of cotton clothing was restricted to the elite (see Anawalt 1981), this may have applied only to the Basin of Mexico where cotton was an import. A second utilitarian function was in the manufacture of *ichcahuipilli* or armor (Periáñez 1985: 17; Berdan 1987). A third, symbolic and sociopolitical, use of cotton is represented by the role of elaborate, decorated textiles in elite exchange, politics, and status validation (see Anawalt 1981). Fourth, cotton textiles served as a medium of exchange in both the tribute and market systems (Berdan 1987). Drennan (1984) has stressed the importance of textiles in transferring economic value over large distances in Prehispanic Mesoamerica because of their high labor investment and low weight. In sum, cotton textiles played a number of important roles in Late Postclassic society and economy, and as a result they were manufactured and exchanged at very high levels.

The Middle to Late Postclassic increase in cotton production in Morelos indicated by the above data contrasts with, but may be related to, the decline in spinning activity reported at Huexotla and Xico in the Basin of Mexico (Brumfiel 1986). Recently, scholars have argued that processes of population growth, urbanization, and political centralization led to increasing emphasis on agricultural production within the Basin, with a corresponding displacement of non-agricultural production to exterior provincial areas like Morelos (Brumfiel 1980, 1986; Blanton and Feinman 1984; Hassig 1985). This model, developed primarily from ethnohistorical documentation of conditions under the Aztec empire in the years A.C. 1430-1519, suggests that the observed changes in the regional configuration of craft production were most dramatic between the pre-imperial and imperial periods, and the authors cited above link the economic changes to the growth and expansion of the Aztec empire.

Our data suggest an alternative interpretation. If the consensus dating of the Middle to Late Postclassic transition at ca. A.C. 1350 is valid (Sanders, Parsons, and Santley 1979: 466-471; Smith 1987), then the shift in the locus of textile production at that time took place nearly a century before the formation of the Aztec empire. Our data then suggest little change in the intensity of textile production between the Early and Late Cuauhnahuac phases (TABLE 2), which correspond to the intervals before and after Morelos was incorporated into the Aztec empire (Smith 1987). Thus the Middle to Late Postclassic changes in regional patterns of textile production cannot be due to the effects of the Aztec empire; however, the three factors singled out to explain the economic changes—population growth, urbanization, and political centralization—are still likely candidates. These developments were not limited to the

ethnohistorically-documented imperial period; settlement pattern data show that they had a longer trajectory during the Postclassic epoch (Sanders, Parsons, and Santley 1979). Rather than viewing the changes in craft production as responses to the development of the Aztec empire, we see both the economic shift and the rise of the empire being generated by long-term demographic, economic, and social changes in Postclassic Central Mexico. Advances in our understanding of the techniques of textile production thus can not only further the study of Prehispanic technology, but can also help scholars track changing ecological, economic, and social patterns among the agrarian states of Postclassic Central Mexico.

Acknowledgments

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