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SOLAR DISKS AND SOLAR CYCLES: SPINDLE WHORLS AND THE DAWN OF SOLAR ART IN POSTCLASSIC MEXICO

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Abstract: Sun disks are a common motif in spindle whorl decorations at Xaltocan, Mexico. These and other forms of symbolism on domestic artifacts suggest that women participated in the solar cosmologies of Postclassic Central Mexico. These symbols and their cosmologies precede and anticipate the principles of Aztec state religion. Thus, the spindle whorls with solar symbolism suggest that rulers appropriated the symbolism of household units in their efforts to establish the legitimacy of their states. The "Little Tradition" in Mesoamerica was the source of the "Great Tradition", and not the other way around.

Resumen: Los discos solares son un motivo habitual en las decoraciones de fusayolas en Xaltocan, México. Estas y otras formas de simbolismo de artefactos domésticos sugieren que las mujeres participaban en las cosmologías solares del México central postclásico. Estos símbolos y sus cosmologías preceden y anticipan los principios de la religión del estado azteca. En consecuencia, estas fusayolas sugieren que los gobernantes se apropiaron del simbolismo de las unidades domésticas en su intento de establecer la legitimidad de sus estados. Esta "pequeña tradición" de Mesoamérica fue la fuente originaria de la "gran tradición" y no al contrario.

Resum: Els discs solars són habituals com a decoració de les fusaïoles a Xaltocan, Mèxic. Aquestes i d'altres formes de simbolisme d'artefactes domèstics suggereixen que les dones participaven en les cosmologies solars de Mèxic central postclàssic. Aquests símbols i les seves cosmologies precedeixen i anticipen els principis de la religió de l'estat asteca. Per tant, aquestes fusaïoles suggereixen que els governs s'apropriaren del simbolisme de les unitats domèstiques en un intent d'establir la legitimitat dels seus estats. Aquesta "petita tradició" mesoamericana fou la font originària de la "gran tradició" i no al contrari.

The Aztecs were the last of the great prehispanic civilizations. They were an urbanized society with a complex market economy and a heterogeneous population. With our Western bias, we might imagine a strong separation of spheres: public vs. private and state vs. domestic households. And we might imagine that the private, domestic sphere was a narrow world of family concerns. But the designs on spindle whorls suggest that women entertained thoughts on the broadest cosmological scale as they carried out their domestic routines and that the communication of state ideology was rooted in household aesthetics. Therefore, in this case, and I suppose in many others, the private and the public were not separate spheres; instead, they interpenetrated in interesting ways.

Aztec ideology and art

During its ninety year history, the Aztec empire's wealth and power depended upon nearly constant warfare and conquest. To justify this warfare, Aztec rulers promoted a religious ideology that linked warfare and sacrifice to human survival, and rulers commissioned

striking works of monumental sculpture to communicate this world view. But the origin of Aztec artistic conventions is something of a mystery. In this paper, I suggest that many of the compositional rules and symbolic meanings of Aztec art were developed not in state institutions, but in household contexts, probably by women as they pursued their craft of cloth production.

Aztec rulers supported a state religion that linked warfare to human survival. The Aztecs recognized that human life depended on the orderly alternation of natural cycles: day and night, summer and winter, rainy season and dry season, growth, death, decay, and regeneration. But while we see these cycles as natural and inevitable, the Aztec state asserted that they were the uncertain outcome of cosmic struggle. For example, the sun rose victorious each morning, driving off the moon and stars to capture the daytime sky. But the sun's victory was only provisional, for each afternoon and evening, the sun sank in weary defeat and the moon and stars took back the heavens. The sun's success in this daily struggle depended

upon its being nourished with the hearts and blood of sacrificial victims, preferably vigorous young men taken captive in battle.¹

To communicate this world view, the Aztec ruler commissioned works of monumental sculpture. For example, the Aztec calendar stone is filled with symbols that

refer to cosmic cycles (Fig. 1): To underscore the uncertainty of human survival, near the center of the stone are four symbols commemorating the four earlier creations that had been overwhelmed by destructive chaos. They are named for the forces that destroyed them: jaguars, hurricane-force winds, a rain of fire and floods. We



Fig. 1. The Aztec Calendar Stone, sacrificial stone of Montezuma II, c. 1512 (drawing after Umberger 1996).

are now in the fifth creation, 4-motion, which is destined to be destroyed by earthquakes.

these images are surrounded by a ring containing the 20 signs of the Aztec 260-day ritual almanac, related to the life cycle and personal destiny; outside of this ring is another, the solar disk, referring to the cycles of day and night and the 365-day solar calendar—these solar rays are a motif that we will see repeatedly on pre-Aztec spindle whorls; and another ring of fire serpents, the weapon that the Aztec patron deity, Huitzilopochtli, used to defeat the forces of darkness.

At the center, as if to underscore the need for human sacrifice is a central deity, with a sacrificial knife protruding from his mouth and talons on either side of his face grasping human hearts.

This magnificent sculpture belongs to what George Kubler (1943) termed the Metropolitan School of Aztec art. These monuments are distinguished by their large size, complex iconography, fine design and craftsmanship (Kubler 1943; Nicholson 1971; Pasztory 1983;

Umberger 1996). The style coalesced during the mid-fifteenth century, shortly after the Aztecs established their regional dominance, and it ended less than a century later with the Spanish conquest in 1521. Despite its short duration, the number of pieces belonging to this style is “prodigious” (Nicholson & Keber 1983:26), and stylistic development within the tradition was rapid (Pasztory 1983:143).

However, the origin of Aztec imagery is something of a mystery. While Aztec sculptors duplicated certain forms from the ancient city of Tula (where the Aztecs carried out excavations to recover Toltec remains), Tula’s sculpture is little concerned with solar imagery, which is so important in Aztec art. However, archaeological research at Xaltocan, a pre-Aztec city-state capital 35 kilometers north of Mexico City/Tenochtitlan, has yielded many images that express solar and cyclical themes with forms and symbols that closely resemble Aztec art.

Xaltocan has been occupied from 900 CE to the present (Fig. 2). During the first five centuries of its existence, Xaltocan was the capital

of a small autonomous kingdom; after 1430, it fell under Aztec rule (Alva Ixtlilxóchitl 1975-77 I:423, II:299; *Anales de Cuauhtitlan* 1945:14, 50; see Carrasco 1950). Our archaeological research has focused on the changes in daily life in Xaltocan which accompanied transformations of in regional politics (Brumfiel 2005). The deep stratig-

raphy in Xaltocan, very rare in other parts of the Valley of Mexico, has helped us define those changes. At Xaltocan, solar and cyclical motifs appear on small decorated spindle whorls recovered from the early, *pre-Aztec*, domestic contexts. This suggests that Aztec imagery did not originate in the state-sponsored art of large urban centers in

Fig. 2. The Valley of Mexico during the Aztec period, showing the locations of Xaltocan, Tenochtitlan and other important towns.



central Mexico; rather, its composition and symbolic language were developed in everyday household contexts, as women engaged in cloth production.

Cloth production and spindle whorls at Xaltocan

Cloth was woven from two fibers in Aztec Mexico. One was fiber extracted from the leaves of the maguey, a plant that was extensively cultivated in the cool highlands surrounding Tenochtitlan, the Aztec capital. The other was cotton, which did not grow locally but was obtained from warmer regions of Morelos and Puebla. The maguey or cotton fibers had to be spun into thread before they were woven. The spinner worked by hand, drawing the fibers out and twisting them into thread using a wooden spindle. The spindles were weighted with perforated ceramic disks, called spindle whorls, which prolonged the spindle's rotation. Spinning thread by hand was very time-consuming; spinning required two or three hours of effort for each hour devoted to weaving (Berlo 1991:451). Large, heavy spindle whorls speeded the production of maguey fiber thread, but smaller,

lighter spindle whorls were used for shorter cotton fibers (Parsons 1972; McCafferty & McCafferty 2000). In Xaltocan, both large and small spindle whorls are present, suggesting that both fibers were spun.²

The spinners were probably women. Cloth production in Aztec Mexico was strongly gendered female. New born baby girls were presented with the symbols of womanhood: "the spinning whorl, the batten, the reed basket [for unspun cotton], the spinning bowls, the skeins, the shuttle, her little skirt, her little blouse" (Sahagún 1950-82:201, bk. 6, ch.37). And a woman's weaving equipment was placed with her when she died (Sahagún 1950-82:138, bk. 2, ch.33). Spinning and weaving provided metaphors for women's experiences with pregnancy and childbirth, and female deities were depicted with spinning and weaving tools (Klein 1982; Sullivan 1982; McCafferty & McCafferty 1991). We have very little information about who produced cloth in the pre-Aztec era at Xaltocan, but spindle whorls and needles appear in some infant burials and women's graves, suggesting that cloth pro-

duction was a female activity (De Lucia 2004).

A careful consideration of spindle whorl decoration at Xaltocan suggests that in many ways pre-Aztec spindle whorls anticipate Aztec Metropolitan art. On this basis, I suggest that the Aztec state drew heavily upon these domestic conventions to develop its own striking artistic style.

Spindle whorl designs and solar cycles

I examined 96 decorated spindle whorls from Xaltocan. Most of these spindle whorls were recovered from the lower, pre-Aztec strata at Xaltocan, with dates of A.D. 900-1430. In higher strata representing the Aztec empire (A.D. 1430-1521), more than three-quarters of the spindle whorls were undecorated, a point to which I will return. Decorated spindle whorls were found in houses on living floors, in domestic refuse, and in five cases, in burials. The decorations were mold-made impressions, and they sometimes bear traces of the paint that must have covered their molded designs. To define the possible meaning of

these designs, I considered two aspects of spindle whorl decoration: design composition and design motifs. Texts and pictorial documents from early colonial Mexico provide guidance for understanding the meaning of these symbols.

With regard to composition, two-thirds of spindle whorls have a design divided in four parts, with motifs distributed symmetrically in the four quarters of the disk (Fig. 3). Working with pottery designs, archaeologist Constanza Vega Sosa (1984) has suggested that quadripartite divisions in Aztec art represent the four quarters of the universe, the conventional way of imagining space in Mesoamerica (see Gossen 1974; Tedlock & Tedlock 1985). Vega Sosa argues that the four quarters were defined by lines emanating from the intercardinal directions, defined by the points on the horizon where the sun rises and sets at the summer and winter solstices. Vega Sosa concluded that these quadripartite compositions demonstrated an interest in and a concern for the daily and annual cycles of the sun.

Probably, the quadripartite compo-

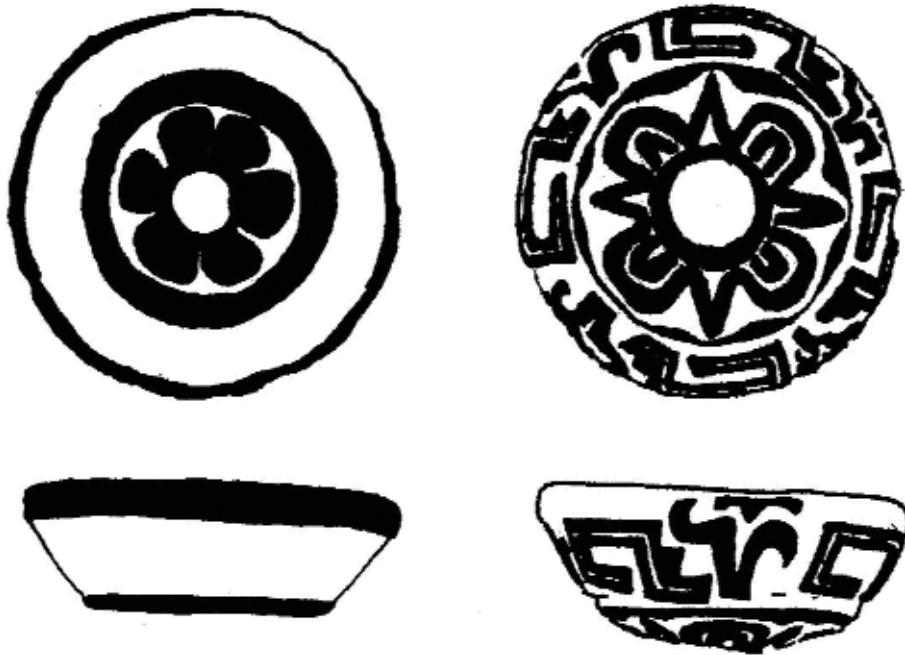
Fig. 3. Spindle whorls with quadripartite designs (drawings by Laura Jordan).



sition of spindle whorls also indicates an interest in the sun and its movements. Two-thirds (71 cases) of the spindle whorls in the Xaltocan sample are divided into four or eight parts which might refer to the cardinal and inter-cardinal directions with their solar associations. The other spindle whorls either have undivided

design motifs (5 cases), or a dual division (4 cases), or a division in three or six parts (8 cases), or in five parts (2 cases), or in seven parts (1 case), or in ten or more parts (9 cases). The spindle whorls with undivided designs bear animal motifs (vultures, frogs, the mythical *cipactli*, and a plumed serpent). The spindle whorls with five parts are

Fig. 4. Spindle whorls with flowers, above a simple flower, below a flower adorned with sun rays (drawings by Laura Jordan).



decorated with pentagrams (what we would call stars, but in ancient Mesoamerica, a circular symbol was used to represent stars). The spindle whorls with seven or ten or more parts bore designs that consisted of a series of dots or swirls or flower petals. Spindle whorls with three or six parts had the same motifs as spindle whorls with four or eight parts. It is to these motifs that we now turn.

The design motifs seem to cluster according to four themes: (1) solar

energy, (2) the spatial and temporal order of the universe, (3) the creation of this order, and (4) cyclical or rotary movement.

Flowers constitute one common motif, present on 16 of the decorated spindle whorls (Fig. 4a). Flowers have been associated with the Aztec goddess Xochiquetzal (whose name means flowery quetzal feather). Xochiquetzal was the goddess of spring, flowers, love, feminine sexuality and the patron of weavers and embroiderers (Díaz

Cíntora 1990; McCafferty & McCafferty 1999; Lopéz 2005). Thus, we might conclude that the spindle whorl designs were focused on women's sexual and reproductive powers.

This interpretation is correct, but probably too narrow. Flowers had very broad symbolic meanings in prehispanic thought. Specifically, flowers referred to the sun, heat, light, fire, and life (Velasco and Nagao 2006). Flowers had the many associations because they symbolized *tonalli*, the divine energy that sparked life in all living things: plants, animals, and humans (Hill 1992). In defense of an interpretation of flowers as symbols of *tonalli*, we might cite the many other spindle whorl designs that refer to the sun. For example, six spindle whorls are decorated with flowers and sun rays (Fig. 4b), making a design that resembles the glyph *ollin*, which refers both to the movement of the sun and to the era of the fifth sun, the present creation (Vega Sosa 1984:153). Another spindle whorl is decorated with only sun rays, another with the symbol *ihuitl*, a symbol of the day, and a third spindle whorl is decorated with a four-

petal flower, the Maya glyph *k'in*, also a symbol of the sun (Fig. 5). Two spindle whorls are decorated with a complicated sun disk motif, surrounded by a ring of what might be the petals of flowers or feathers of the solar eagle. Two other spindle whorls lack the sun disk but have a ring of petals or feathers (Fig. 6).

A second grouping of motifs is related to the spatial and temporal order of the universe. For example, six spindle whorls are decorated with a quincunx motif (Fig. 7a), crossed diagonal lines that connected the four inter-cardinal points of the universe, the points defined by the rising and setting of the sun during the summer and winter solstices. In eight other cases, two lines cross the central perforation of the spindle whorl, dividing it into four parts that represent the four quarters of the universe (Fig. 7b).

A third grouping of spindle whorls refers to the creation of the universe, of time, and of the sun. For example, one spindle whorl presents the opposition of Quetzalcoatl, associated in Aztec mythology with the movement of the sun,

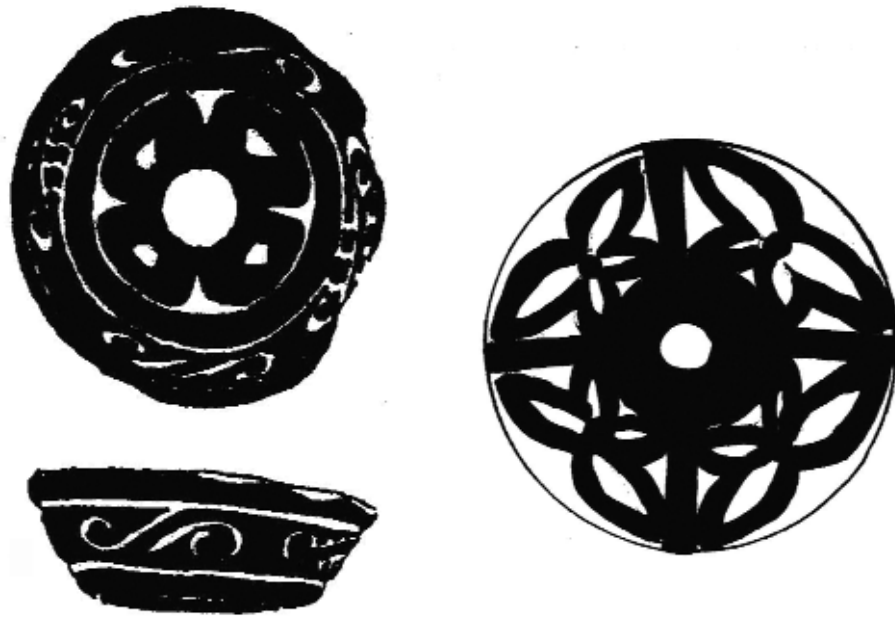


Fig. 5. Spindle whorls with sun symbols, above an *ihuitl*, a day symbol (drawn by Laura Jordan), below a spindle whorl with a *k'in*, the Maya sun glyph (drawn by Elisabeth Brumfiel).



Fig. 6. Spindle whorl decorated with possible flower petals or plumes of the solar eagle (drawn by Laura Jordan).

and Tezcatlipoca, associated with the night and the forces of darkness. Two spindle whorls are decorated with the *cipactli* symbol, the first day of the *tonalpohualli*, the

260-day ritual almanac (Fig. 8). On the day *cipactli*, the sun began to move, initiating the sequence of days and years (Sahagún 1950-82 bk.7, ch.2). Seven other spindle

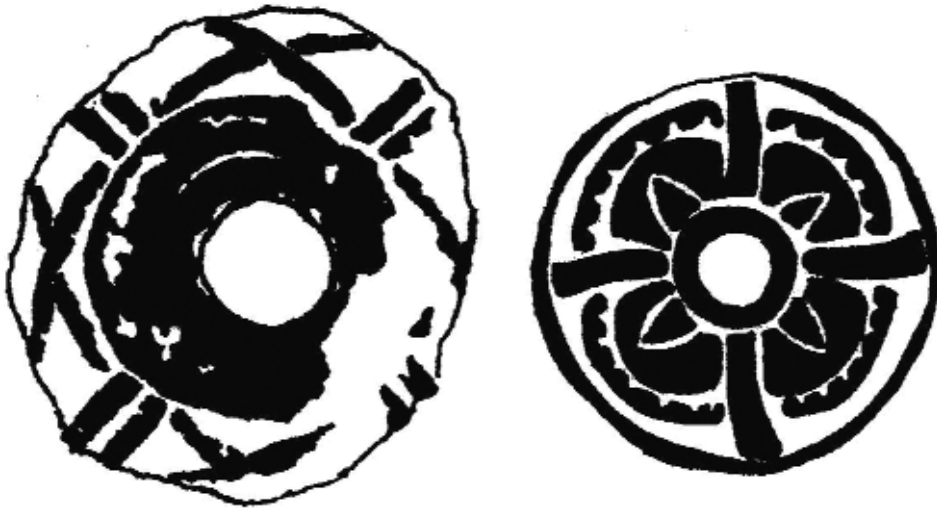


Fig. 7. Spindle whorls with four-part divisions, above the quincunx, below the four quarters of the universe (drawings by Laura Jordan).

whorls are decorated with dots or concentric circles which might represent the succession of days, that is, daily suns. The number of dots or circles varies between four and twelve.

Finally, the most common motif in the spindle whorls from Xaltocan is the *xicalcolihqui*, the step-fret spiral (Fig. 9). The *xicalcolihqui* occurs on 27 decorated spindle whorls (31% of the decorated whorls).³ In almost all cases, they occur in groups of four. Both Zelia Nuttall (1901) and Constanza Vega Sosa (1984) suggest that the *xicalcolihqui* refers to movement, and the groupings of four suggest that they might have referred to annual

cycle of the sun and its solstices. Perhaps we should accept a very generalized interpretation for the *xicalcolihqui* as representing movements and cycles of all types, including the rotation of the spindle whorl, itself, as it produced its thread. Both the spiral motif and the rotating spindle whorl might have represented all the cycles of the current universe, all the patterns of movement and change that sustained life in all its varied forms.

Discussion

Spindle whorl designs can be interpreted in a series of ways, some narrow and concrete, others broad and abstract. For example, there



Fig. 8. Spindle whorl with a cipactli, the first day of the ritual almanac (after Enciso 1971:19).

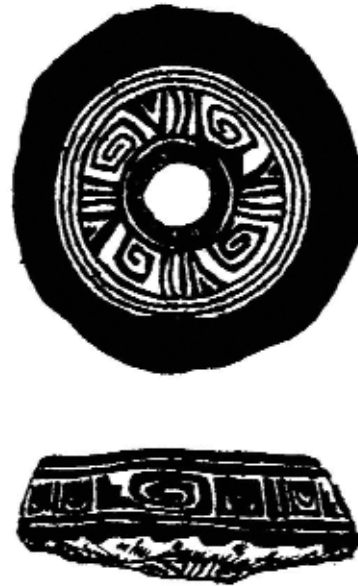


Fig. 9. Spindle whorl with the xicalcolihui, step-fret spiral with rectangular sides, a symbol of cyclical movement (drawn by Laura Jordan).

are important associations between flowers, sexuality, and the acts of spinning and weaving (McCafferty & McCafferty 1991; Sullivan 1982). Very likely, the women of Xaltocan were aware of these associations and the act of spinning with spindle whorls decorated with flowers did evoke reflections on their sexuality. Flowers were also connected with an array of symbols representing *tonalli*, divine energy (Hill 1992; Taube 2006). Currently, some residents of traditional Mesoamerican communities believe that *tonalli* is an essential ingredient of successful craft production. They believe

that this energy is the active agent in completing several products transformed by heat, including fired ceramics, slaked lime, and the proper maturation of an *in utero* fetus (Monaghan 2001). In addition, *tonalli* inspires and energizes craft producers to attain high levels of artistic achievement. For example, contemporary Huichol weavers, who are linguistically related to the Aztecs, offer sacrifices to the sun in order to acquire the force that allows them to produce high-quality textiles (Schaefer 2002).

At the most abstract level, spindle whorls referred to the energy that drove the regular cycles of the universe, particularly the sun's cycles which showered the earth with *tonalli* and defined the segments of time and space (Gossen 1974:22). We have seen that many designs on spindle whorls were related to aspects of the sun and its energy; the popularity of these themes suggests that the women of Xaltocan were interested not only in domestic activities but also in abstract and large scale cosmological concepts. In addition, the conventional motifs which appear on spindle whorls (for example the *xicalcolihque*, the *ihuitl*, the *k'in*, the *quincunx*) duplicate many that are found in other parts of Mesoamerica. This indicates that the women of Xaltocan possessed substantial knowledge of Mesoamerica's symbolic vocabulary.

It is unlikely that the women who used the spindle whorls that we find in Xaltocan were actually the ones who produced them because we have recovered very few molds for spindle whorls at the site.⁴ Nevertheless, the women of Xaltocan may have determined spindle whorl design in an indirect

way through their purchases of spindle whorls with one design or another, based on their knowledge of the meaning of the various symbols.

We don't expect prehispanic women to have such cosmological interests. Western tradition assumes that women's thought and action is focused on issues of home and reproduction, that is, the domestic sphere. Evidently, our Western expectations are mistaken with respect to the pre-Aztec women of Xaltocan. These cosmological interests were probably nourished by their reliance upon the 260-day ritual almanac for many aspects of daily life: to discern the fate of newborn infants, to diagnose the causes and prognoses of disease, and to fix the date of weddings, trade expeditions, and other household ventures. Efforts to cope with uncertainty prompted consultations with ritual almanacs, which linked household members with cosmic processes (Brumfiel 2004, 2007). Since these same forces determined the outcomes of both the household and state affairs, it is unlikely that the Aztecs regarded the domestic and public spheres as fundamentally distinct.

From the Home to the State

Many artistic conventions that appear on the spindle whorls of pre-Aztec Xaltocan are duplicated on sculptures later produced under the patronage of the Aztec state. This suggests that women were an important source of the symbols and ideology used by the Aztec state to construct its legitimacy.

The Aztec state sponsored two types of circular sculptures. The simpler of the two was the ring of the ball court, the *tlachtemalácatl* (Matos 2002). Its circular form duplicates the circular form of spindle whorls. Like the central perforation in a spindle whorl, the ball court ring had a central perforation through which the rubber ball passed to score a goal. A tenon on the edge of the ring permitted its suspension from the wall of the ball court. Among the surviving ball court rings, one is carved with the motif of an eight-petal flower which more or less duplicates on a grand scale the spindle whorls with flowers that we see in Xaltocan. Another bears a series of 16 dots surrounding its central hole. Others are engraved with sun rays. Since the Mesoamerican ball-

game had sacred meanings linked to life and death, the sky and the underworld, the presence of celestial and solar motifs on these rings is not surprising. What is surprising are the similar motifs and composition shared by the ballgame rings and the spindle whorls.

Another form of sculpture produced under the patronage of the Aztec state was the *temalacatl*, a monumental sculpture that supported an enemy warrior during the gladiatorial sacrifice (Matos & Solís 2004). In some cases, the center of the sacrificial stone was perforated to permit the passage of a cord used to tie the captive to the stone during his ritual battle. In other cases, the sacrificial stone had a central hollow to collect the blood of the sacrificial victim after his battle. The central perforation or hollow of the sacrificial stone was analogous to the central perforation of a spindle whorl. The upper face of the sacrificial stone was engraved with the sun disk, a multi-part composition (Fig. 10). Around the central hole, the sacrificial stone bore several concentric circles, with rows of dots that symbolized the succession of days. Outside the concentric circles,

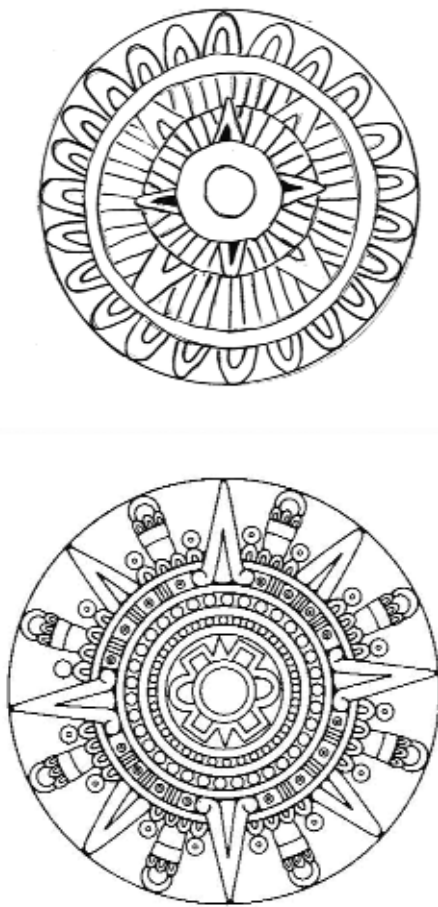


Fig. 10. Sun disks, above a spindle whorl from Early Postclassic Xaltocan (drawn by Elizabeth Brumfiel), below the Sun Disk of Yale University (after Alcina, León-Portilla & Matos 1992:311).

eight solar rays marked the cardinal and inter-cardinal directions. Outside of this, engraved eagle plumes adorned the border.

The central perforations, rows of dots, sun rays, and eagle plumes are all found on spindle whorls. The only motif that is present on these sculptures and ball court rings that

does not appear on spindle whorls is the handles of blood-letters used in self-sacrifice (Matos & Solís 2004). The handles of blood-letters are positioned between the solar rays of the cardinal directions.

The solar disk was also present on the *cuauhxicalli*, stone bowls that were receptacles for the hearts of sacrificed captives. The solar disk also appeared ceremonial seats and sculptures of the *xiuhmolpilli*, the bundle of 52 sticks that commemorated the completion of a 52 year calendrical cycle (Matos & Solís 2004). All these objects played important roles in ritual activities that communicated the themes of state ideology, that is, cosmic struggle, war, sacrifice, and imperial expansion.

Thus, the official art of the Aztec state shared several motifs and rules of composition with the spindle whorls of Xaltocan, but the spindle whorls are older than all the Aztec sculptures. Some of the spindle whorls in our sample antedate the Aztec monuments by four centuries. Therefore, we have to consider the possibility that sun symbolism and some related concepts were developed by

Postclassic women and later appropriated by the Aztec rulers. This is not supposed to happen.

Since the time of Robert Redfield, anthropologists have argued that ideas and ideology filter down from the upper to the lower classes. Redfield (1940) believed that a Great Tradition and a Little Tradition existed in agrarian class societies, and he envisioned ideas flowing from the Great Tradition of the urban elite toward the Little Tradition of the rural peasants. But, with regard to another agrarian state on the island of Madagascar, Susan Kus and Victor Raharijaona (2000) argue that the state sometimes finds it useful to appropriate ideas from the family and the home. By appropriating household symbols, state rulers can hope to transfer to themselves the deep sentiments and familiar ideas of domestic life. In this way, Kus and Raharijaona suggest, rulers strengthen their legitimacy.

Kus and Raharijaona do not consider the difficulties of appropriating the already familiar symbols of everyday life, but such difficulties might be anticipated. The process might be especially difficult when

the symbols have to be regendered, say from female-associated spindle whorls to male-associated warfare. How was this accomplished? Marie Louise Stig Sørensen (2000) observes that performances are the key to endowing material objects with cultural meaning. The repetitive association of objects with females or males, acting out narratives of female or male action, supplies the context for engendering objects.

The two sculptural forms we have just examined, ball-court rings and sacrificial stones, were the center of attention in just such performances. The ball game featured two opposing teams of male warriors (the forces of light and darkness) battling for control over the ball (a symbolic sun), a metaphoric reprise of the battle for a life-sustaining cosmos. The game attracted crowds, betting, and intense public interest. The gladiatorial sacrifice was a contest between an enemy captive and an Aztec warrior, the latter fighting with a sword edged with obsidian blades and the former fighting with a sword edged with feathers. Again, this was a metaphoric battle between male warriors, but in this case the out-

come was predestined, as was the destiny of the Aztec people, to triumph as imperial rulers and protectors of cosmic order. So through extravaganzas featuring men in metaphoric battles, male warriors became associated with the sun, replacing the solar associations of women, ritual almanacs and household well-being.

As if to confirm the successful regendering of solar symbolism as male, the spindle whorls from Aztec deposits at Xaltocan are undecorated. But far from being a passive concession to the power of state ideology, this might have constituted an act of resistance, an effort to withhold divine energy from tribute cloth intended for imperial coffers.

Conclusion

The case of Aztec Mexico seems to conform to the model provided by Kus and Raharijaona. Solar symbolism, originating in household contexts in the familiar act of spinning, was transformed into state art. The small scale of the spindle whorl with its intimate symbolic idiom was magnified on monumental sculpture in order to proclaim

the necessity of war and sacrifice, which resulted in conquest, tribute, and the perpetuation of class divisions. We see in the case of Postclassic Mexico that activities dominated by state elites were justified with symbols and ideas rooted in the daily routines of women. There was a contradiction in this process: to represent state ideology, the symbols had to change their meaning, but at the same time, their strength was augmented by the lingering associations and sentiments of their household roots.

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Notes

¹ In accord with Western science, the Aztecs perceived that entropy is that natural state of things, and order requires energy.

² Seventy-one of these decorated spindle whorls (74%) are large, that is, they weigh 20 g or more and have diameters of at least 38 mm. They would have been used for maguey fibers. Twenty-five of the decorated spindle whorls (26%) are small, that is, they weigh 16 g or less, with diameters of 34 mm or less. They would have been used for cotton.

³ Zelia Nuttall (1901) noted the presence of two types of step-fret spirals in ancient Mexico, spirals with round sides and spirals with straight sides. She believed that the spirals with round sides were associated with the above, with moving air and water, while spirals with straight sides were associated with the earth, night, and darkness. Vega Sosa (1984) accepts this interpretation but suggests that both types of spirals were related to the movement of the sun: the daytime sun in the case of spirals with round sides and the night-time sun (passing through the bowels of the

earth) in the case of spirals with straight sides. But this interpretation is not entirely consistent with the characteristics of the motif as it occurs on the Xaltocan spindle whorls. On these spindle whorls, all the spirals have straight sides, that is, there is no alteration of day and night signaled by spirals with round sides and spirals with straight sides.

⁴ In contrast, Nichols *et al.* (2000) report a concentration of almost 100 molds for large spindle whorls in a limited area of Otumba, a Late Postclassic site in the northeast corner of the Valley of Mexico. In Otumba, the molds were associated with basalt scrapers used to extract maguey fibers from fleshy leaves, which implies that those who produced the spindle whorls also participated in the preparation of the maguey fibers, including spinning the fibers. In addition a complete assemblage of domestic ceramics was found in this area, suggesting that the production of spindle whorls and spinning maguey fibers occurred in a household setting. Thus, it is probable that the women who lived in these domestic units participated in the design of the spindle whorls.