Spindle Whorls, Gender, and Ethnicity at Late Chalcolithic Hacinebi Tepe

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Hacinebi Tepe, a small site along the Euphrates River in southern Turkey, has two major phases of occupation during the Late Chalcolithic period (4th millennium B.C.). The earlier phase is a local Late Chalcolithic occupation, and the second phase shows evidence of contact with Uruk Mesopotamia. The spindle whorls from both phases were analyzed and compared. The results indicate that fine- and medium-weight threads of wool and possibly goat hair were being spun in both phases. A comparison of Hacinebi's spindle whorls with three southern samples suggests that Mesopotamian women, and therefore entire Mesopotamian households, were not present at Hacinebi during the contact phase. The process of spinning is discussed with emphasis on its archaeological implications. Included are a discussion of the critical attributes of spindle whorls (what they can tell us and why), some criteria to distinguish spindle whorls from other pierced objects, and an accurate method (confirmed by experiment) for estimating the complete weights of partial spindle whorls.

Introduction

Recent excavations at Hacinebi Tepe, Turkey, have provided archaeologists with the opportunity to investigate the local impact of the Uruk expansion out of southern Mesopotamia in the late 4th millennium B.C. An Uruk Mesopotamian presence has been identified at many Late Chalcolithic Anatolian sites on the basis of various features characteristic of southern Mesopotamian material culture (e.g., Algaze 1993; Sürenhagen 1986), including pottery (e.g., beveled rim bowls, conical cups), cylinder seals and other administrative objects (tablets, tokens, bullae), small objects (eye-idols, wall cones), and tripartite houses.

Excavation and surface examination of sites in Anatolia have revealed varying amounts of southern material culture (Schwartz 1988). Both Schwartz (1988) and Algaze (1993) have developed typologies of Late Chalcolithic sites based on the amount of southern material, and therefore presumably the degree or kind of southern contact, they had. The nature of that contact and its effects have been much debated (e.g., Algaze 1993; Johnson 1988–1989; Schwartz 1988; Stein 1990; Weiss and Young 1975; Wright 1989; Zagarell 1986). The various explanations include political and economic expansion, long-distance exchange (involving state control and/or private merchants), escape from political oppression, or the need for agricultural land in the face of southern overpopulation. The relationship between indigenous inhabitants and southern immigrants has also been seen in various ways, ranging from political and/or economic domination to a relatively equal relationship in which neither group dictated the terms of trade.

Hacinebi Tepe is a small local settlement with evidence for contact with southern Mesopotamia during the Late Chalcolithic Period (4th millennium B.C.). It is located near several Uruk colonies and enclaves (FIG. 1) at a traditional crossing place on the Euphrates river (Stein, Bernbeck, et al. 1996: 2). Several classes of possibly Uruk-related materials have been found at Hacinebi, including several ceramic forms (Pollock and Coursey 1995; Stein, Bernbeck, et al. 1996), ceramic wall cones, a cylinder-sealed clay ball (or bulla) containing tokens (found in disturbed deposits), and limestone eye-idols (although one found in a precontact phase context suggests these may be a northern phenomenon unrelated to Uruk culture). A preliminary study of meat consumption patterns and domestic containers in the NE area of the site has tentatively identified northern and southern food preferences in contexts with primarily local or Uruk-related materials (Stein, Bernbeck, et al. 1996). The presence of these Uruk-related features suggests that a small group of southern Mesopotamians were living at Hacinebi during the contact phase. Studies of various aspects of Hacinebi's economy, including analyses of the faunal materials, ceramics, lithics, and plant remains, are still in progress. This paper is intended as a further contribution to the understanding of Mesopotamian-Anatolian interactions at Hacinebi through a study of its Late Chalcolithic spindle whorls.

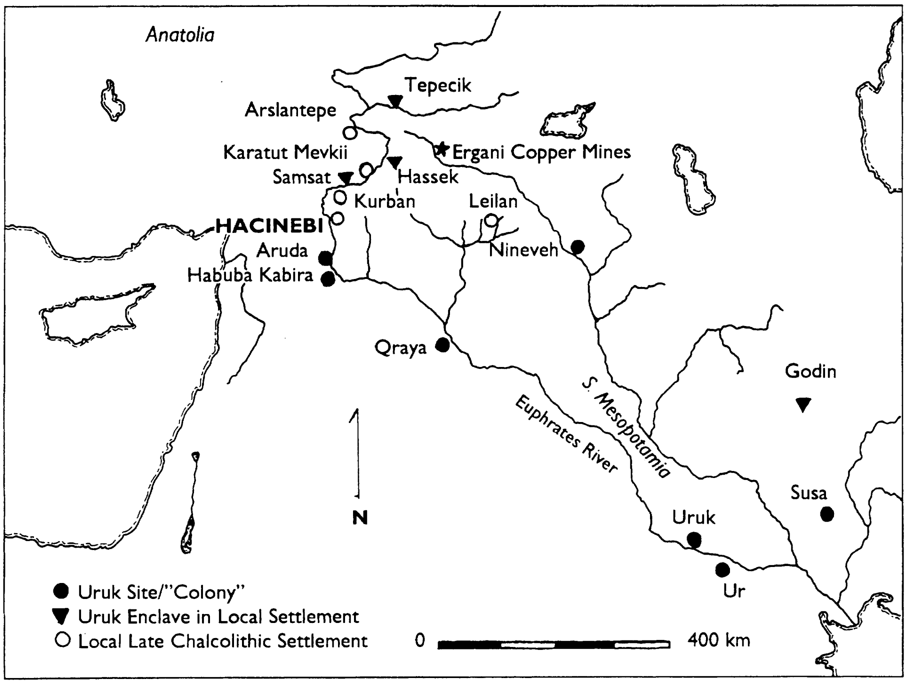


Figure 1. Map showing location of Hacinebi Tepe. After Stein 1994: 177, fig. 1.

This study addresses three main questions. First, what was being spun at Hacinebi during each phase (in terms of fibers and weights of thread), and what place did these spinning products have in Hacinebi's economy? Second, do the spindle whorls support other archaeological evidence that suggests that Mesopotamian people were living at Hacinebi during the contact phase? And finally, what can the spindle whorl evidence tell us about the presence of entire Mesopotamian households, as opposed to individuals, at the site?

In order to answer the first question, a detailed study of the critical functional attributes of spindle whorls is necessary. Since a second major purpose of this paper is to demonstrate both the potential of spindle whorl data for addressing social and economic issues, and the need for the systematic recording of these functional attributes, I first discuss how spindle whorls work and what different attributes can tell us. This section is followed by an analysis of Hacinebi's spindle whorls.

The making of cloth, thread, and netting, all of which required the spinning of fibers, were common activities throughout the Late Chalcolithic period. The resulting products may have been intended for private household use or may have been made for consumption elsewhere. Production of these items may have ranged from a small-scale, household level to a relatively large-scale, centrally organized level employing full-time cloth making specialists, such as was found in 2nd and 3rd millennia B.C. Mesopotamia (Green 1980; Maekawa 1980). Titles of officials in archaic Uruk tablets have been seen as indicating some degree of centralized control of textile distribution in Late Uruk period Mesopotamia (Szarzynska 1988: 225).

Finished textiles were a major export from southern Mesopotamia in the 2nd and 3rd millennia B.C., and may also have been important in the 4th millennium (Algaze 1993: 74). If so, the desire for raw wool or thread may have been a factor in the Uruk expansion into areas well-suited for goat and sheep herding (Wright 1989). If the production of raw wool were of major economic significance at Hacinebi, the faunal materials might provide supporting evidence (see, for example, Payne 1973). If Hacinebi were producing a large amount of thread for exchange, we might find evidence in the types, overall numbers, and distribution of spindle whorls at the site. Finally, if the impetus for exchange were attributable to the Uruk expansion, there should be significant differences in the whorl samples from the precontact and contact phases.

The second question is addressed by comparing Hacinebi's spindle whorls with spindle whorls from three southern sites. Differences in the fibers or the weights of thread being spun in these regions might be seen in differences in the functional attributes (weight, diameter, and thickness) of the corresponding whorl samples. Even if similar fibers and threads were being spun, as seems to be the case, each group may have its own stylistic traditions of spindle whorl manufacture. These may be seen in non-functional (in the technological sense) attributes such as form, material, or decoration. If a group of southern Mesopotamians were living at Hacinebi, we might expect to find different types of whorls appearing in "Mesopotamian" contexts in the contact phase.

We know, on the basis of several categories of evidence from Mesopotamia and Anatolia, that the spinning and weaving of cloth in the Near East, particularly in domestic contexts, was primarily the responsibility of women. Ethnographic evidence from the region shows that women do most of the household spinning and weaving (e.g., Crowfoot 1931; also the observations of the author in Ugurcuk and Birecik near Hacinebi Tepe). Spindle whorls and spindles are typically found in women's graves (Barber 1991: 288–289), including 3rd millennium B.C. sites in Turkey (Košay 1951: pl. 197, fig. 1, at Alaca Höyük) and northern Iran (Schmidt 1937: pl. 29, at Hissar IIB). Spinners and weavers shown in early art appear, by the hair styles and clothing, to be women. Women are shown weaving in two 4th millennium B.C. cylinder seals (Amiet 1961: pl. 16.273, pl. 19.319), and spinning in a 4th and a 3rd millennium B.C. cylinder seal (Amiet 1961: pl. 19.319; Delougaz and Kantor 1972: 32, pl. X). Female spinners are shown in a 2nd millennium B.C. mosaic from Mari (Parrot 1962: pl. 11) and in reliefs from later Susa (Porada 1965: 68, fig. 43) and Maraš (Bossert 1942: pl. 814).

Finally, numerous texts from the ancient Near East associate women with spinning and weaving. Women received or wrote letters requesting raw wool for textile manufacture (Veenhof 1972: 116); they mentioned making or were asked to make particular textiles, for their own profit or for private use (Renger 1984: 107; Veenhof 1972: 104, 110, 115); and they sometimes received wool, wool combs, spindles, looms, and weaving tools as part of their dowries (Dalley 1980: 55, 63–64, 66–74). In institutional settings, weaving is commonly associated with women (e.g., Batto 1974; Dalley 1984; Jacobsen 1970; Lambert 1961; Maekawa 1980), although male weavers are also mentioned (Harris 1975). Even in domestic settings, a man may have spun an occasional length of yarn, but it seems clear that the major responsibility for spinning and textile production in household contexts lay with women. This suggests that "when we see non-prestigious textile equipment suddenly invading an area, not only men but also women have moved" (Barber 1991: 299).

If Mesopotamians were living at Hacinebi, they may have been individual residents, such as commercial agents or merchants, or entire families (as might be expected in a situation of escape from an oppressive political or economic situation). The presence of distinctively Mesopotamian whorls in contact phase contexts at Hacinebi would provide supporting evidence for the movement of entire families.

Hacinebi Tepe

Hacinebi Tepe is a small (3.3 ha) site near the modern town of Birecik, Sanliurfa province, in SE Turkey (FIG. 1). It is located on one of a series of limestone bluffs along the eastern bank of the Euphrates river. The earliest occupation of the site (Phase A, ca. 4000–3800 B.C.) was a local Anatolian settlement in the Late Chalcolithic period before Uruk contact. The following Phase B has been recently divided into two subphases (Stein, Edens, et al. 1996: 11). Phase B1 (ca. 3800–3700 B.C.) is characterized by local Late Chalcolithic ceramics, while phase B2, the contact phase, has both Uruk Mesopotamian and local Anatolian components. Calibrated radiocarbon dates place the B2 phase at ca. 3700–3400 B.C. (Stein, Edens, et al. 1996: 11), and ceramic studies strongly indicate that the Uruk-related ceramics were introduced during the Middle Uruk period (Pollock and Coursey 1995: 113). The cylinder sealed clay ball has affinities with those from Susa and Choga Mish (Stein, Bernbeck, et al. 1996: 14), which have been dated to the early part of the Late Uruk period. In the following Early Bronze I period (ca. 3100–2700[?] B.C.), parts of the site were used as a cemetery. It was not reoccupied, however, until the Achaemenid/ Hellenistic period (ca. 500–100 B.C.). Finally, an isolated Roman farmstead was located on the western spur.

To date, excavations had been conducted at Hacinebi for five seasons (1992–1996). Figure 2 shows the locations of 15 of the excavated Operations (Op.). At least seven of these (Ops. 1, 2, 4, 5, 11, 16, 17) yielded Late Chalcolithic Phase A (LCA) occupation levels, while Late Chalcolithic Phase B (LCB) occupation levels were excavated in at least eleven (Ops. 1, 2, 4, 5, 6, 7, 10, 11, 14, 16, 17). Not all Operations had the same relative amount of excavated LCA and LCB levels.

Excavations were conducted in three major areas of the site: a northern area (with evidence for the presence of both Anatolian and Mesopotamian occupation in LCB2), a southern area (with both Local Late Chalcolithic and Uruk-related ceramics in LCB, in one case found on the floor of the same room), and the western spur (with predominantly local Anatolian ceramics in LCB2). Spindle whorls have been found in each of these areas during both the LCA and LCB phases. Refinement of the phase B subphases is still in progress; it is as yet unclear which spindle whorls derive from the B2 subphase and which from phase B1. In this paper, then, no distinction by subphases will be made. More detailed information on the volumes of excavated

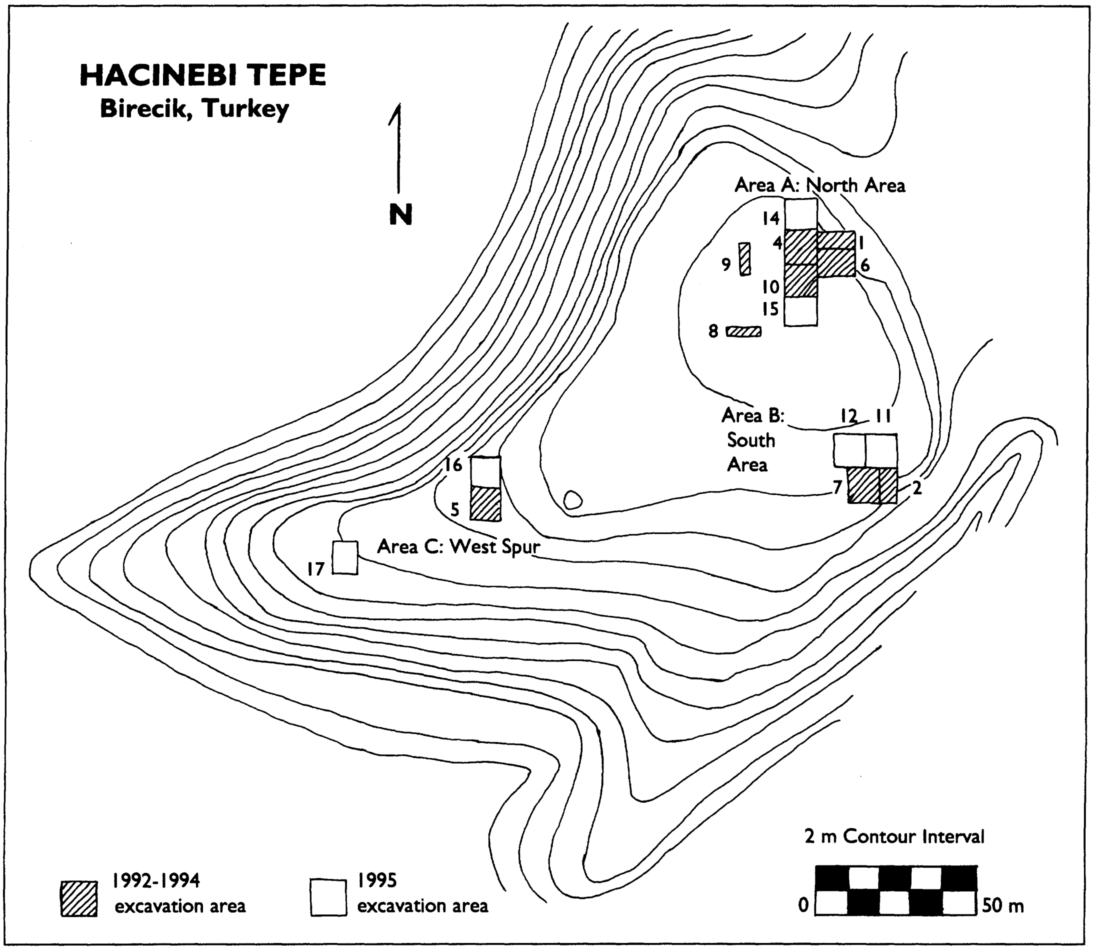


Figure 2. Map of Hacinebi. After Stein, Edens, et al. 1996: 120, fig. 1.

levels is needed for the relative numbers of spindle whorls obtained from each Operation and from each phase (TABLE 1) to be meaningfully compared. A detailed study of the economic role of spinning products at Hacinebi in either phase must await the availability of more contextual data.

Spinning is only one step in the process of cloth-making and, as mentioned above, the products of spinning are not confined to cloth. Thread, string, twine, and rope for a variety of purposes were undoubtedly made at Hacinebi. Netting was probably also an important spinning product, given the site's location along the Euphrates. Unfortunately, not only the spinning products themselves, but the tools used to make them, consisted mostly of perishable materials. Spindle whorls and loom weights are the primary evidence for the making of cloth, thread, rope, or net. Before considering the spindle whorl data, therefore, it is necessary to have a basic understanding of spinning technology and the effects that measurable differences in spindle whorls may have on the material being spun.

Spinning Technology

The spinning process involves drawing fibers out from a mass of prepared fiber and twisting them into yarn. The twisted yarn is then wound (into a ball or around a stick) so it will not untwist while the next length of yarn is being spun.

For many fibers, a method is used whereby fibers are drawn out, or "drafted," continuously from the main mass. Short-staple wool, for example, requires a continuous draft method due to its short fibers, while the long fibers of flax can only be continuously drafted with the use of a distaff rod to hold the fiber mass while drafting from it (Barber 1991: 50). The earliest artistic representations of possible distaffs are from mid-3rd millennium Mesopotamia (Barber 1991: 69); a forked stick makes a perfectly functional distaff, however, and a preserved specimen may not be recognized as such by an archaeologist. Even so, continuous draft is not the only possible method. Archaeological

Table 1. Spindle whorl distribution at Hacinebi Tepe. A dash means no LCA deposits were excavated.

	Phase LCA			*Phase LCB*		
Area, OP No.	*Sherd*	*Stone*	*Hemisphere*	*Sherd*	*Stone*	*Hemisphere*
A, 1	0	0	0	3	1	0
4	1	0	0	12	4	1
6	–	–	–	5	1	1
10	–	–	–	1	2	0
14	–	–	–	8	2	1
B, 2	0	0	0	0	0	0
7	–	–	–	1	2	0
11	1	0	0	4	0	0
C, 5	1	0	0	1	1	1
16	2	0	1	6	2	1
17	8	2	5	1	4	1
Totals	13	2	6	42	19	6

and artistic evidence indicates that flax in pre-Roman Egypt was spun without a distaff (Crowfoot 1931), and was spliced together rather than continuously drafted.

The thickness of the thread being spun is determined by the number of fibers allowed to slip through from the fiber mass to the drafting triangle (FIG. 3), a "transition area where the drafted fibers meet the twist" (Raven 1987: 14). The amount of twist is controlled by the speed and duration of spin in relation to the rate at which fibers are drafted (Hochberg 1977: 49). Drafting and twisting may be carried out simultaneously or in sequence, depending on the skill of the spinner and the particular spinning tradition of the area. Crowfoot (1931) has identified six basic types of spinning:

1. Hand Spinning: The hands alone may be used, or fibers may be drafted by one hand while the other twists them by rolling them down the thigh.
2. Hooked Stick: Manipulated in the hand or rolled down the thigh.
3. Rotation of Spindle in the Hand: This may be done with or without a spindle whorl. The spindle is drawn up and out as it is turned in one hand, while the other hand holds the fiber mass.
4. Grasped Spindle: The spindle is grasped in both hands. Known from illustrations in ancient Egypt (Crowfoot 1931: 15), this method has not been observed in modern times.
5. Supported Spindle: The spindle may be supported on the leg, in a cup or bowl, or on another convenient surface.
6. Suspended Hand Spindle: The spindle is set in motion by a flick of the fingers or a roll along the thigh, then suspended in the air to spin. This may be done from a sitting position, though standing allows a longer length of yarn to be twisted before it must be wound on. The spindle whorl may be located at the top or the bottom of the spindle. Simple implements, such as a stone or crossed sticks, have also been used instead of a spindle and whorl for suspended spinning (Liu 1978: 87). Such implements may not be preserved in archaeological sites, or may not be recognized as spinning implements if they are found.

One or more different types of spinning may be used within the same community, depending on individual preference, the fiber being spun, local tradition, or practical needs of the moment. For the archaeologist, the presence of spindle whorls does not eliminate the possibility that some spinning was done by hand or with a hooked stick. Moreover, spindle whorls can be made out of a variety of materials, many of them perishable: wood, gourds, nuts, fruit, wax, and potatoes are among materials known to have been used as spindle whorls in various parts of the world (Liu 1978: 87); bone whorls are known from several places, and were found in Late Chalcolithic contexts at Mersin (Yümük Tepe) (Garstang 1953: 156). The number of preserved whorls may only represent a fraction of the actual industry. In other words, there may have been much more spinning actually taking place than might be indicated by the number of whorls found.

When all the fiber has been twisted into yarn, the next step is to set the twist so the yarn won't untwist on itself as it is used. The method used depends on the fiber; for wool, the simplest method is wetting or washing (Raven 1987: 32). The newly spun yarn is unwound into a skein (a ring-shaped bundle), which is tied in several places to prevent tangling and carefully washed. It is then dried, either flat for more loft (fluffiness) or under tension (hanging with a small weight attached) to eliminate kinks and tangles.

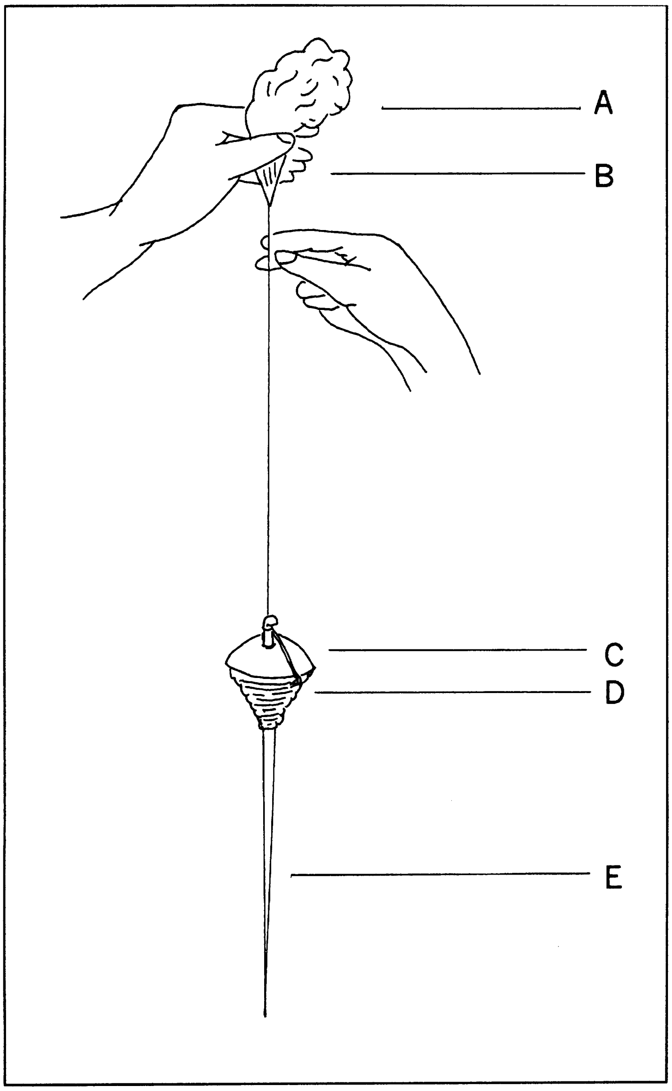


Figure 3. Drop-spinning with a high whorl spindle. A) The fiber mass. B) The drafting triangle. C) A hemispherical spindle whorl. D) Newly spun yarn. E) The spindle.

Modern spinners prefer to dry yarn under tension if it is intended for use in weaving (Raven 1987: 33).

The yarn may be used as it is at this point, or the spinner may choose to ply (twist together) two or more yarns. Besides the aesthetic effects that can be achieved through plying yarns of different colors, textures, or fibers together, plying also makes the yarn softer, stronger, and better balanced (Raven 1987: 80). Plying, or doubling, a yarn is also a way to set the twist (Barber 1991: 42).

Spindle whorls are important at the drafting/twisting and plying stages of yarn-making. Barber (1991: 303) summarizes their function:

> Spindle whorls . . . act as little flywheels on the spindle, stabilizing and prolonging the turning of the spindle as the work of twisting the thread is done. There are few practical requirements for their shape: they need to be broad enough to help maintain the momentum; they may be heavy enough to help with drafting, but must not be so heavy that they break the thread; and it helps if they are symmetrical about a central axis so as not to introduce an inefficient and irritating wobble into the rotation.

An important consideration in spinning is the amount of twist a given yarn requires. Different fibers have different twist requirements; goat hair, for example, requires more twist than wool (Hochberg 1977: 67). The strength of a tighter twist may be more important than softness or loft in yarns used as cords, fishing net, or warp threads (e.g., Ryder 1983: 747). Yarns of different thicknesses also require different amounts of twist, with fine yarns needing more twist than thicker yarns to bind the fibers together (Raven 1987: 19).

Either undertwisting or overtwisting a yarn will have undesirable consequences. Too little twist results in a weak yarn that is prone to break, while too much twist causes kinks and tangles. Hochberg (1977) recommends slowing the spindle rotation if a yarn is overtwisting, and speeding up the rotation if more twist is required. One way to influence the speed of rotation is through the diameter of the spindle whorl. In general, a large diameter whorl will spin more slowly for a longer time, while a small diameter whorl of the same weight will have a faster rotation for a shorter time.

The weight of the whorl is important in the degree of tension it places on the twisting fiber. The yarn must be kept taut as it is spun so that the twist will travel evenly along its length (Raven 1987: 16). Otherwise, the twist will tend to accumulate unevenly, with some undertwisted and some overtwisted areas. Tension is particularly critical when spinning short fibers. If a whorl places too much tension on the yarn, the short fibers are pulled out to their ends before they can be twisted, and the yarn breaks (Barber 1991: 52). With longer fibers, however, differences of 5–10 grams can be tolerated with little problem (Barber 1991: 393). Thread thickness is also an important consideration. Fine threads have fewer fibers twisted together per unit length than do thicker threads, and may be more easily overpowered in the process of spinning. Again, this is particularly true if the fibers are also short. Thus, for long-staple fibers (like flax) and thicker threads (with more fibers per unit length), there is a broader range of spindle whorl weights that give the acceptable degree of tension without overpowering the thread, while for short-staple fibers (like cotton or wool) and fine threads, the functional range of whorl weights is narrower. The preferred range is narrower still, as Parsons found in her experiments with Mexican spinners using archaeological whorls (Parsons and Parsons 1990: 317).

Whorl thickness comes into play as a way to manipulate the weight-diameter relationship; that is, given two whorls of the same weight, the faster spinning (smaller diameter) whorl will be thicker. Thus, at a given weight, whorls for finer yarns have rounder or longer shapes, while whorls for coarser yarns tend to be flatter and more disk-like.

Given the above relationships, it is clear that spinning fine yarn requires the use of a small diameter whorl (if one is used at all) for faster rotation to give the yarn enough twist for adequate strength. Conversely, whorls with larger diameters are better for spinning coarser yarns. For the archaeologist, then, the presence of small, round, lightweight whorls would indicate that fine threads or short-staple fibers were being spun, whereas the spinning of heavier threads, long-staple fibers, or plying could be inferred from the presence of larger or heavier whorls.

One complicating factor for the archaeologist is that weight can be added to a spindle through the addition of a second, or even third, whorl (Barber 1991: 62). Individually, these whorls may or may not differ from each other in their dimensions. Since spindles with whorls attached are rare finds in archaeological sites, multiple-whorl spindles for certain tasks are a possibility the archaeologist should keep in mind when interpreting spindle whorl data.

Diameter, weight, and thickness, the critical functional attributes of spindle whorls, can also be considered in combination as the rotational moment of inertia (an application to spindle whorls, particularly with supported spindles, was presented by Ruth Fauman-Fichman in a paper presented at the 61st annual meeting of the Society for American Archaeology in 1996). In suspended (or drop) spinning, however, weight is the more critical factor, especially with short fibers like wool. If the spindle is tossed in the hand, the whorl helps maintain tension on the thread and allows continual tossing of the spindle with less effort. If the whorl is too heavy or too broad, however, then more effort is required as the spindle is drawn up and out.

Considerations of fiber length, thread thickness, adequate tension, and amount of twist may all play into a spinner's decision to use a particular spindle whorl. A spinner can also control for some of these factors by changing the spinning method. Supported and suspended spindles were preferred by Crowfoot's Jordanian informants for spinning long-staple sheep wool, while rotating the spindle in the hand was considered best for goat hair and short-staple wool (Crowfoot 1931: 13–14). The weight of a suspended spindle can help with drafting, but it might put too much strain on a fine thread of short-staple fiber. With a supported spindle, a small diameter whorl can be used for faster spin, while the support would mitigate the effects of the added weight. When rotating the spindle in the hand (see Crowfoot 1931: pl. 4, 5, 8, and 9), the spindle is drawn up and out while turned, preventing the weight of the spindle from bearing on the yarn even momentarily.

Relief carvings (e.g., Bossert 1942: pl. 814; Parrot 1962: pl. 11; Porada 1965: 68, fig. 43) and cylinder seals (Amiet 1961: pl. 19.319; Delougaz and Kantor 1972: 32, pl. X) from Mesopotamia and Anatolia, dating from the 4th to 2nd millennia B.C., show women using high-whorl spindles. Most early portrayals from this region show drop-spindles, but in one case the spindle appears to be turned in the hand (Barber 1991: 59). A calculation of the rotational inertia for Hacinebi's spindle whorls patterned out, almost whorl for whorl, the same as the weight alone, suggesting that weight was a major factor in whorl selection. This evidence, along with the ethnographic information on spinning methods discussed above, suggests that Hacinebi's Late Chalcolithic inhabitants used spindles that were suspended and possibly turned in the hand.

While weight appears to be the critical attribute among Hacinebi's whorls, weight alone does not provide sufficient information for every spinning method. For functional analyses of archaeological whorl samples, all three attributes (weight, diameter, and thickness, as well as the percentage of the whorl present for partial specimens), should be considered, alone and in combination as rotational inertia, while descriptions (or even illustrations) of material, form, and decoration are needed for stylistic studies.

Fibers

Flax and wool were the main fibers utilized in 3rd millennium Anatolia (Barber 1991: 34). Wool was used in both southern Mesopotamia and Anatolia by the Late Chalcolithic period, while flax textiles have been found in even earlier Anatolian contexts (Ryder 1965). Goat hair was probably also spun (see, for example, Green 1980: 14).

Wool and Hair

According to a proposed general evolution of fleece types (Ryder 1983: 493), the main change in fleeces from the so-called "turbary" sheep of the Neolithic to sheep of the Bronze Age involved a narrowing of the kemp fibers, the bristly hairs that make up the outer coat of wild sheep. In the Bronze Age, a hairy medium fleece, similar to the modern Soay sheep, evolved as a result of this process. Soay sheep fleeces have fibers up to ca. 5 cm long (Ryder 1983:

47), with the wool fibers presumably somewhat shorter. Like wild sheep, Neolithic sheep probably had an outer coat of kemp and a shorter woolly undercoat. The kemp fibers of wild sheep measure ca. 6 cm in length (Ryder 1983: 45), while the wool fibers tend to be very short—a centimeter or less in one sample (Barber 1991: 24).

Kemp fibers do not dye well and tend to be stiff and brittle, making them less than ideal for textiles. Like goats, however, sheep of this period moulted seasonally and were plucked rather than shorn (Ryder 1983: 95). The Soay sheep, the only domestic sheep that still moults, sheds only some of the hair fibers in the spring along with the wool; fewer of the brittle kemp fibers would be included if the wool were plucked as it was shed rather than shorn (Ryder 1969: 500). This implies that the staple of Late Chalcolithic wool was relatively short and would require light to medium-light whorls to spin. Ryder (1983: 748) suggested that a spindle whorl weighing about 8 gm would be suitable for (presumably drop-) spinning Soay wool. Goat hair, which also tends to be short, would need a light whorl to be spun, if one were used at all.

At Hacinebi, in both the LCA and LCB phases, sheep and goats were the most common animals, with about four times as many sheep as goats in the earlier LCA phase (Stein, Bernbeck, et al. 1996: 49). Wool and goat hair were readily available fibers at Hacinebi in both phases.

Information on herd composition and age at death would be useful as indications of the place of animal fibers in Hacinebi's economy. In simple terms, if a herd were maintained primarily for its wool, then it would consist mostly of ewes and castrated males, with a few breeding rams. In contrast to herds maintained primarily for meat, where most males are slaughtered as yearlings, each category of animal in a wool industry would be expected to live a relatively long time. If animal fibers played a major role in Hacinebi's economy, in one or both phases, this could be detected in the faunal materials, given an adequate sample (see Payne 1973 for a more detailed discussion of these issues). Such a study has not, however, been completed.

Flax

While a few flax (Linum) seed fragments were found at Hacinebi, it is not clear if they were naturally occurring, or if the plant was being cultivated for fiber or oil (Stein, Bernbeck, et al. 1996: 31). The lack of seeds would not be surprising, however, if the plants were being raised primarily for their fiber, since the best fiber can be obtained before the seeds develop (Barber 1991: 12). Given the lack of strong direct evidence for or against the use of flax fiber at Hacinebi, the possibility will be evaluated below on the basis of the spindle whorl weights.

Analysis of Spindle Whorls at Hacinebi

The Sample and Methods of Recording

There were 102 possible Late Chalcolithic spindle whorls found at Hacinebi Tepe in the 1992–1995 seasons. Of these, 21 were from LCA phase contexts, while possible LCB whorls numbered 81. Approximately 42% of the overall whorl sample consisted of partial whorls (TABLES 2, 3). A diameter chart graduated in millimeters was used to estimate the percentage of the whorl present. The partial whorl was then weighed, and its complete weight was estimated. In a later experiment, this was shown to be an accurate method for estimating the weights of partial whorls.[1]

Table 2. Phase A spindle whorls at Hacinebi Tepe.

Type	*OP*	*HN #*	*Diam. (cm)*	*Thick. (cm)*	*Perf. (cm)*	*Weight (g)*
Hemispheres	16	10171.00	2.85	1.42	0.71	10.8*
	17	8369.00	3.40	2.10		20.0*
	17	9501.02	3.46	2.04	0.85	22.9
	17	9524.01	3.19	2.04	0.77	25.0*
	17	9524.02	4.20	2.00	0.80	42.8*
	17	9550.02	3.25	2.25	0.67	19.6*
Stone disks	17	8311.00	4.30	1.20	1.03	
	17	9501.01	3.55	0.56	0.67	11.2
Sherd disks	4	6644.00	3.44	0.96	1.00	11.4*
	5	1539.00	3.15	0.80	0.77	8.7
	11	8729.00	4.16	0.80	1.10	13.2
	16	9845.00	3.04	0.96	1.00	9.6
	16	9873.00	3.94	0.90	1.00	14.8*
	17	8335.00	4.32	0.85	0.99	20.8*
	17	8387.00	3.60	1.60	1.00	33.2*
	17	9506.01	4.40	1.15	0.80	21.8
	17	9506.02	5.00	0.98	1.00	24.0
	17	9506.03	3.99	0.80	0.83	12.5
	17	9539.00	2.93	1.46	0.63	12.0
	17	9550.01	4.50	1.22	1.00	26.7
	17	9550.03	4.06	1.50	1.04	18.2

* Partial whorl; weight of complete specimen is estimated.

1. The accuracy of the method was tested using a sample of 35 handmade perforated ceramic disks. The sample consisted of seven groups which differed in one of three dimensions: thickness, diameter, or perforation size. Each disk was weighed whole, then broken into large (36–56% of the disk) and small (13–35% of the disk) fragments. These were used to estimate the total disk weight, and the estimated and actual total weights were then compared. As expected, small fragments were subject to slightly greater error than large fragments. The amount in both cases, however, was not significant. All but 5 of the 37 weighed partial pierced objects from Hacinebi fall into the "large fragment" category.

Table 3. Phase B spindle whorls at Hacinebi Tepe.

Type	*OP*	*HN #*	*Diam. (cm)*	*Thick. (cm)*	*Perf. (cm)*	*Weight (g)*
Hemispheres	4	5643.00	2.60	1.40	0.80	9.6*
	5	4893.00	3.13	1.82	0.83	16.2
	6	2394.00	3.83	1.57	0.86	20.8
	14	8581.00	3.90	2.20	1.05	32.0*
	16	9216.00	4.05	1.66	1.00	
	17	7489.00	3.35	2.40	0.80	
Stone disks	1	399.00	2.77	0.70	0.80	7.6*
	4	4905.00	4.24	0.80	0.95	18.6
	4	4919.00	4.20	0.80	1.02	21.4
	4	5689.00	4.10	0.58	0.97	24.2
	4	6612.00	3.02	0.47	0.63	8.4*
	5	5194.00	3.10	0.84	0.56	11.5
	6	3350.00	3.86	0.70	0.72	15.8
	7	2237.00	–	–	–	–
	7	3505.00	–	–	Incomplete	–
	10	5858.00	2.60	0.80	0.77	10.4
	10	5840.00	4.61	0.44	1.05	19.5
	14	8587.00	7.45	1.60	1.30	–
	14	8980.00	4.06	1.20	0.83	18.7
	16	9201.00	6.38	1.30	1.35	57.6
	16	9852.00	3.24	0.90	0.80	13.7
	17	7435.00	2.83	0.97	0.55	–
	17	7489.01	4.00	1.00	0.74	26.0
	17	7491.01	3.30	0.60	0.87	11.4
	17	7491.02	4.22	0.95	0.84	–
Sherd disks	1	664.00	4.42	0.96	1.14	19.8
	1	561.00	4.23	1.36	1.12	29.1*
	1	828.00	4.50	0.65	0.96	15.3*
	4	2188.00	3.47	1.10	Incomplete	10.0
	4	3608.00	4.48	0.60	1.03	11.5
	4	4739.00	7.08	1.97	Incomplete	110.2*
	4	5632.00	5.88	0.85	1.00	31.7*
	4	4973.00	7.20	0.90	0.87	65.7*
	4	5631.00	4.00	0.66	0.70	14.4*
	4	5650.00	3.35	0.96	0.80	10.4

Table 3. (cont.)

Type	*OP*	*HN #*	*Diam. (cm)*	*Thick. (cm)*	*Perf. (cm)*	*Weight (g)*
(Sherd disks)	4	5679.00	3.90	1.00	1.10	18.8*
	4	5699.00	3.55	1.05	1.00	13.0*
	4	6380.00	3.62	0.80	1.00	11.3*
	4	6381.00	3.45	0.80	1.07	10.5*
	4	6613.00	4.05	0.76	1.00	14.1*
	5	5479.00	4.15	0.94	0.84	16.7
	6	2356.00	3.94	0.55	0.94	10.9
	6	3301.00	3.86	0.87	0.97	14.6
	6	4631.00	3.55	0.80	1.14	12.4*
	6	4056.00	3.77	0.90	1.00	–
	6	6619.00	3.60	0.90	Incomplete	14.2
	7	2251.00	3.60	1.20	0.94	–
	10	6243.00	4.72	0.73	0.97	23.0*
	11	6433.00	3.82	–	1.06	17.7
	11	6448.01	4.20	1.00	1.00	20.0*
	11	6448.02	4.04	0.50	0.76	10.9*
	11	7060.00	7.35	1.70	0.82	84.0
	14	7819.00	3.22	0.81	0.86	9.1
	14	7829.00	4.20	0.90	1.27	18.1
	14	7837.00	3.80	0.80	1.20	12.4
	14	8972.00	3.50	0.71	0.94	10.9
	14	8582.00	5.40	0.90	0.78	25.2*
	14	8585.00	3.80	0.75	Incomplete	13.0
	14	9413.00	5.93	1.16	1.01	54.4
	14	9142.00	7.20	1.00	0.76	44.3*
	16	8660.00	4.20	1.05	0.95	23.8
	16	8043.00	4.77	0.70	0.90	23.2
	16	8828.00	3.92	0.74	1.08	13.6
	16	8888.00	4.16	0.80	1.14	18.0*
	16	9266.00	8.00	0.80	1.15	83.6*
	16	9638.00	3.94	1.46	0.83	22.3
	17	7493.00	4.25	0.85	0.93	16.1

* Partial whorl; weight of complete specimen is estimated.

Overall and perforation diameters were measured with calipers. The weights and perforation diameters of whorls with incomplete perforations are noted in Tables 2 and 3, but were not included in the statistical sample. Where whorls had irregular diameter or thickness, the maximum measure was recorded.

Possible spindle whorls at Hacinebi included several types of pierced objects, which I grouped into five categories based on material and form:

1) Sherd disks: These are slightly curved, more or less circular disks ground from potsherds. Most of them are chaff-tempered sherds with orangish exteriors, many with darker interiors. A few are mineral-tempered. Sherd disks were the most common category, followed by flat circular stone disks.

2) Stone disks: These were made of relatively fine-grained stone. Some appear to be small, flat river cobbles that were not substantially modified beyond being perforated. The two largest stone disks (HN8587, HN9201) and one smaller disk (HN8980) were made of limestone.

3) Hemispheres: Most of the hemispheres are ceramic; two are limestone. The surfaces are smoothed and without decoration.

4) Ceramic rings: These are made of roughly formed, indifferently smoothed baked clay.

5) Lenticular limestone disks: Both surfaces were smoothed and most had some grayish staining. The edges of the two smallest disks had been chipped away. Since the staining was present on the surfaces, but not the chipped areas, it would not appear to be post-depositional.

Spindle Whorls vs. Other Pierced Objects

Are any of the pierced objects actually spindle whorls? Beads, pendants, and weights have at times been confused for whorls, and vice versa. I used four criteria to evaluate the pierced objects from Hacinebi: form, weight, overall diameter, and perforation diameter.

FORM

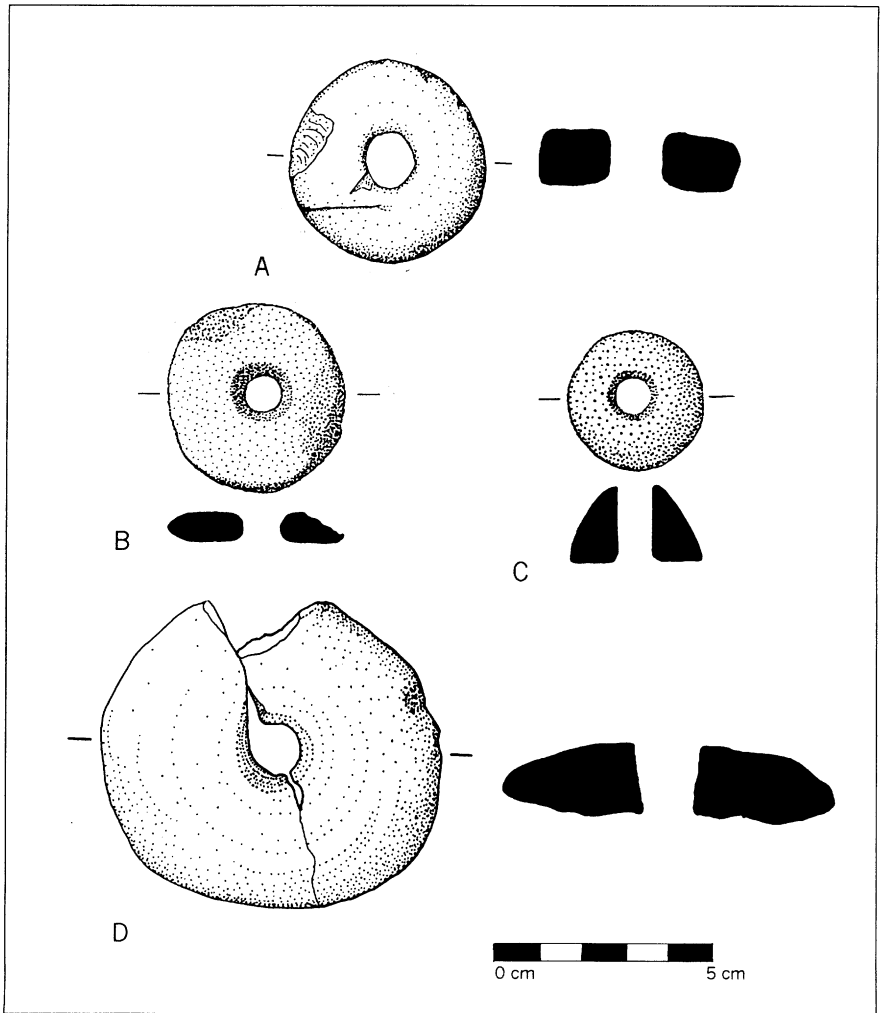
Spindle whorls occur worldwide in a variety of shapes (see Hochberg 1977; Liu 1978), with disks and hemispheres among the most common forms. Pierced objects at Hacinebi include disks (the most common form found there), hemispheres, rings, and lenticular disks (FIG. 4), all of which have parallels among known spindle whorl shapes.

A radially symmetrical shape with a well-centered perforation is important for spin stability. Although no exact measurements of perforation position were taken on Hacinebi's whorls, the perforations of all whole whorls appeared visually to be centered. While some of Hacinebi's whorls were slightly irregular in shape or thickness, few appeared to be outside functional bounds, at least when compared to illustrations of whorls from other sites.

WEIGHT

Barber (1991: 52) noted that a whorl of 150 gm or more might be needed for spinning a coarse thread of long flax fibers or for plying wool yarns, while whorls of 8 gm or less are used to spin fine thread from short-staple wool. The whorls from two Swiss sites weighed 12–57 gm, with a scattering up to 90 gm; flax or wool could have been spun

Figure 4. Typical pierced objects from Hacinebi. A) HN 664-Pierced sherd. B) HN 4905-Stone disk. C) HN 4893-Hemisphere. D) HN 2337-Lenticular limestone disk. Illustrations by Margaret Reid and Barbara Foster.



with these whorls, though draft-spinning long flax fibers would have been difficult with the lighter ones (Barber 1991: 393). The possible whorls from Hacinebi weighed 7.6–158.2 gm, all within the known range of spindle whorl weights. The lightest of Hacinebi's whorls would be acceptable for spinning fine, short-fiber thread, while the heaviest is within the range for spinning flax line fibers or for plying wool.

DIAMETER

Overall size can be used to distinguish whorls from beads. Beads less than 8 mm in diameter are quite common, and unless made of a very light material, they rarely measure more than 15–20 mm (Liu 1978: 90). Hacinebi's whorl sample ranges from 26–80 mm in diameter; composed of stone and baked clay, they are unlikely to have been beads.

PERFORATION DIAMETER

Spindle whorl perforations in one study ranged from 3 or 4 mm to 10 mm, with most measuring 7–8 mm, and were not necessarily proportional to the overall size of the whorls (Liu 1978: 97). In Parsons' (1972: 59) whorl sample, perforation diameters ranged from 2 mm (for the smallest cotton whorls) to slightly over 13 mm (for one of the largest maguey whorls). The complete perforations of Hacinebi's possible whorls ranged from 5.5 to 19 mm in diameter. Those measuring over the 13 mm maximum found in the samples above include a stone disk (13.5 mm), a ceramic ring (19 mm), and two lenticular limestone disks (14.8 and 16 mm).

Hacinebi's sherd disks, hemispheres, and all but one stone disk match the criteria of form, weight, diameter, and perforation size, and are therefore considered spindle whorls. The one stone disk has a perforation only 0.5 mm over the maximum, and appears to be at the large end of the range of diameters for spindle whorls. The ceramic ring and lenticular limestone disk categories are more problematic. In all, three ceramic rings and eleven lenticular limestone disks were found, all in LCB phase contexts, and all but two (lenticular limestone disks) from the north area of the site.

The perforation of ceramic ring HN8586, at 19 mm, is substantially above the 13.5 mm maximum found among the stone disk whorls. With a sample of only three ceramic rings, it is difficult to know if they actually constitute a separate artifact category, or if the two smaller rings could have been whorls, while HN8586 was used for some other purpose. Objects of similar shape and size from other sites have been classified as weights (e.g., Delougaz 1940: 54–56; Wright 1969: 61). Ceramic rings at Khafajah still had bits of net attached to them, indicating that they functioned as fishnet sinkers (Delougaz 1940: 56). Hacinebi's ceramic rings may have been weights as well, and for the purposes of this study they will not be classified as spindle whorls.

The lenticular limestone disks seem to be a relatively cohesive form category. The nine measured perforations are scattered from 7.4 to 16.0 mm. While the heavier lenticular limestone disks would have been an appropriate weight for spinning long flax fibers or plying wool, the perforation diameters of the largest disks (at 14.8 and 16 mm) are well above the sherd, stone, or hemisphere perforation diameters. The lighter limestone disks, with smaller perforations, would have been too light to spin long flax. It seems unlikely that such a distinctive material/form category would have served two different purposes (based on weight).

One possibility is that they were used for making cord or rope, which may not have involved the typical spinning methods discussed here. For example, one method of cord-making uses a perforated disk set on a stand. Strings go up through the center of the perforation and hang over the outside edge of the disk, the ends wound around spool- or dumbbell-shaped weights. The spools are moved from one side to the other in a set pattern to produce a braided cord. Several dumbbell- and spool-shaped objects have been found in Late Chalcolithic contexts at Hacinebi, though there is nothing to tie them specifically to cord-making.

Pierced lenticular disks have been classified as loom weights at other sites. With a central perforation, these would be suspended weights, whether or not they were associated with weaving. Finally, the gray staining on the exteriors of Hacinebi's lenticular limestone disks may have resulted from their use; a closer examination of that staining could provide a clue to their function. In any case, it is likely they were made for some purpose other than spinning thread.

To summarize, the ceramic rings and lenticular limestone disks will not be considered spindle whorls for the purposes of this study. The discussion below relates to the sherd disks, stone disks, and hemispheres.

LCA Spindle Whorls

The spindle whorl evidence for the LCA phase indicates that wool and goat hair were probably being spun, but that flax was not. The whorls range from 8.7 to 42.8 gm (FIG. 5) with diameters from 2.85 to 5.00 cm. The whorl weights are distributed bimodally (FIG. 6), with a heavier outlier, and would be suitable for spinning fine and medium threads of wool and goat hair. The heavier whorl could have been added (for a multiple whorl spindle) or even used alone to ply medium threads. None of the whorls, however, seems heavy enough to draft-spin line fibers of flax; even with multiple whorls, it would have taken several to provide the needed weight.

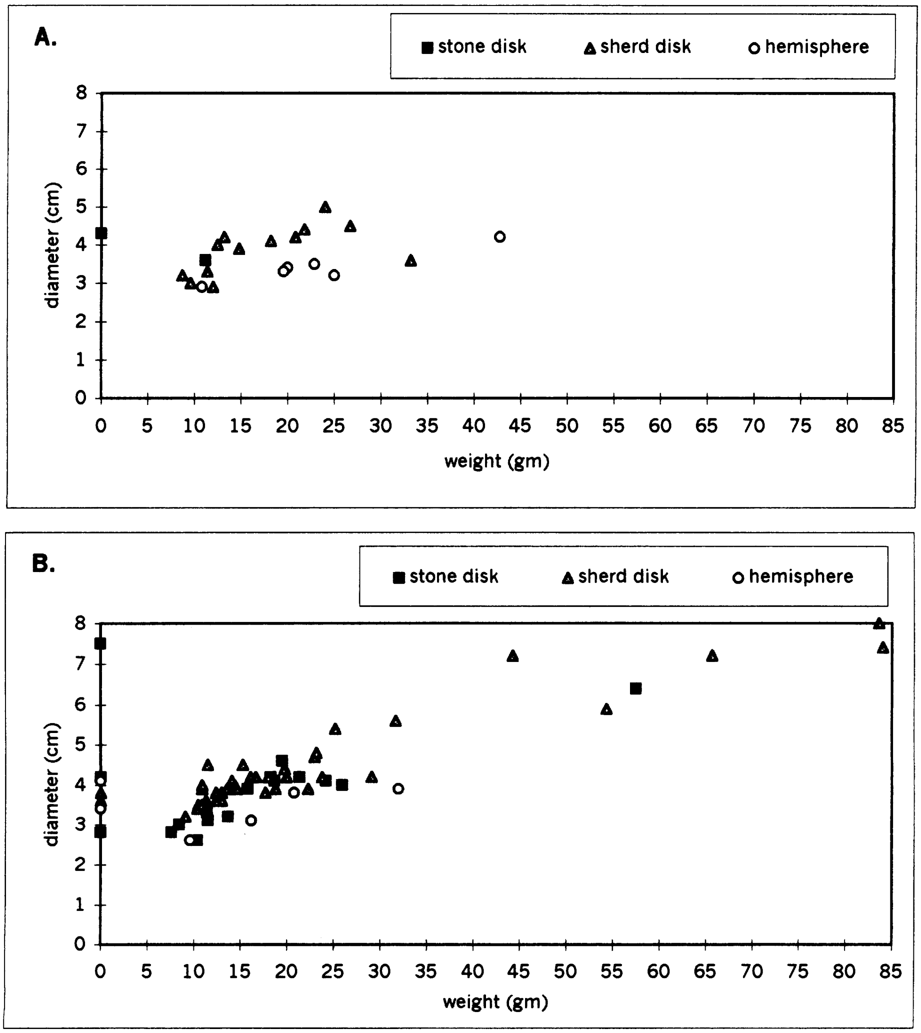
While the vast majority of the LCA whorls (90%) were found in the western area of the site, and most of those in Op. 17, comparatively little excavation of LCA levels has been conducted in the other areas. Little significance can be attached to the distribution of LCA whorls at this stage of research.

LCB Spindle Whorls

There appears to be much continuity in spinning practices from Phase A to Phase B in the Late Chalcolithic period at Hacinebi Tepe. While the Phase B whorl sample is larger, the distribution of whorl weights is very similar to that in Phase A (FIG. 5). The LCB phase whorls range in weight from 7.6 to 84 gm. As with the LCA whorls, there appears to be a bimodal distribution of whorl weights, with a scatter of heavier outliers (FIG. 6).

The bimodal distribution is fairly clear in Phase A, while there is a less distinct separation between light and medium whorls in Phase B. Given the relationship between whorl weight and thread thickness, we know that all of the whorls in the light–medium range could not have been used to spin the same kind of thread. That relationship is not a one-to-one correspondence, however, so we would not necessarily expect to see a distinct separation between light and medium weight whorls. Even with the same fiber, a range of whorl weights can be used to spin thread of a particular thickness. Moreover, there is no reason to think that only two specific thread weights were spun; the category of fine thread would be expected to show some variation. The most reasonable interpretation of the whorl weight distri-

Figure 5. Weights and diameters of whorls. A) Phase LCA. B) Phase LCB.



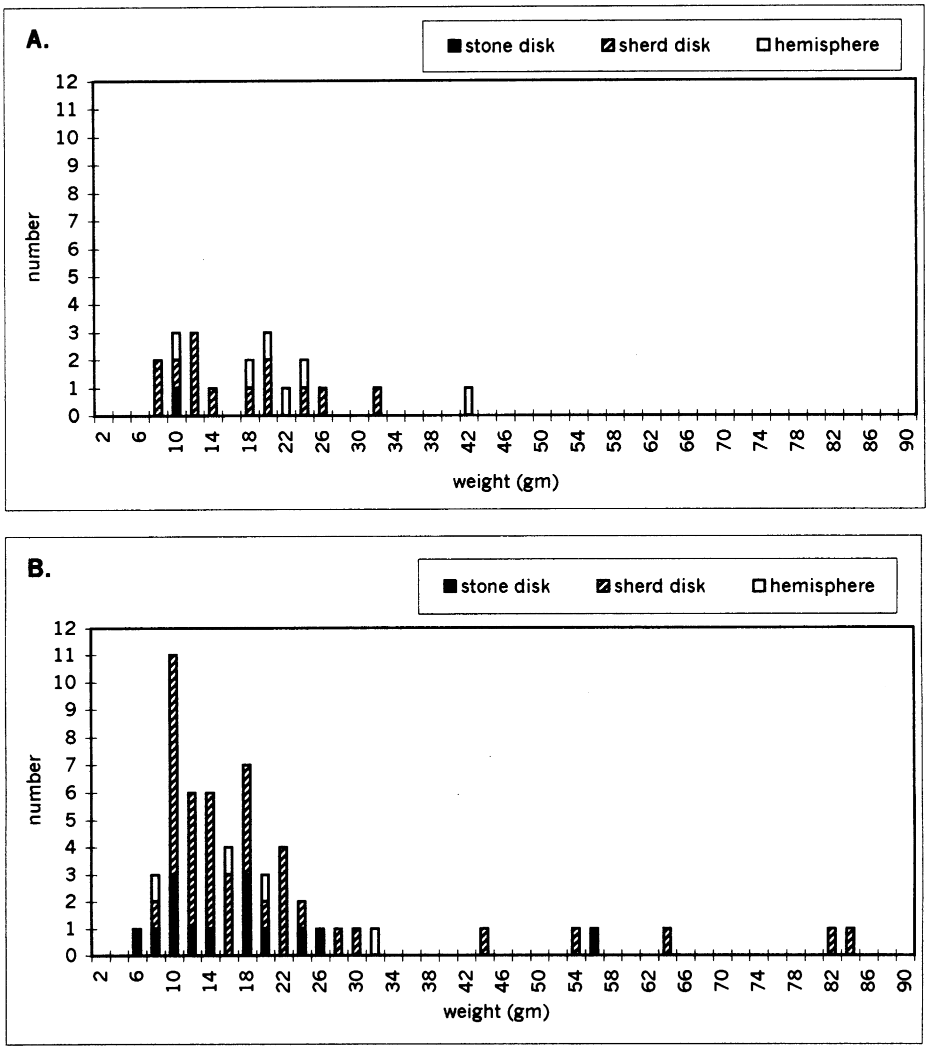


Figure 6. Weights of complete and partial whorls. A) Phase LCA. B) Phase LCB.

bution, therefore, is that we have a range of thread weights being spun, using a range of whorl weights, but that there is a tendency toward two general types of thread, a medium and a fine.

Since the acceptable range of appropriate whorl weights is smaller for short fibers and fine threads, we would expect the lighter group in the distribution to encompass a smaller range of weights than the medium group. That is in fact the case: the lighter group has a range of about 9 gm (ca. 8–16 gm), while the medium group has a range of about 17 gm (ca. 17–33 gm).

In Phase B, stone disks and sherd disks occur in all three weight groups (light, medium and heavy outliers) in similar proportions; hemispheres occur in both light and medium weights. The smallest diameter whorls within the light and medium categories tend to be stone disks and hemispheres rather than sherd disks; in general, however, material/form categories do not correspond to functional categories (based on weight).

Smaller diameter whorls would give a faster rotation, and therefore more twist, than larger whorls of the same weight. As discussed above, the smaller diameters may be associated with the use for which the yarn was intended or with the spinning of goat hair. On the other hand, it is not clear if the differences in diameter seen here (from a few millimeters to ca. 1.5 cm) were functionally significant. Since a river cobble is generally heavier than a potsherd of similar size, and hemispheres are thicker than disks, stone disks and hemispheres would naturally have smaller diameters than sherd disks of the same weight. The question is whether stone disks and hemispheres were used because of their smaller diameters (and the faster rotation they would provide) or if they were selected for other reasons (such as personal preference, durability, or access).

The scatter of heavier whorls at Hacinebi is probably associated with plying coarse wool yarns rather than spinning flax. Only the six heavy whorls would seem to be of adequate weight for spinning flax line fibers. While the preparation of wool and goat hair is fairly simple, the preparation of flax fibers for spinning involves a complicated process requiring both expertise and the use of specialized tools (Forbes 1956: 150). Flax is unlikely to have been a minor or occasional spinning product.

The possible use of multiple whorls would not substantially increase the number of appropriately heavy spindles. In most cases it would have taken at least three of Hacinebi's medium whorls to spin flax line fibers. It seems less likely that people would, as a rule, pile three or four whorls on a spindle rather than have one heavier whorl in their "kits" if spinning flax line were a regular activity. It is also unlikely that heavy flax-spinning whorls were made of a perishable material such as wood. Stone or ceramic would be the expected materials for heavy whorls, particularly given the local availability of limestone. If perishable materials were used for spindle whorls, they would probably have fallen within the existing range of weights. If so, interpretations based on relative abundance would be affected, but not those regarding the types of threads and fibers being spun.

There are significantly more LCB whorls from the north area of the site than from the operations in the south or west. This may be due, however, to differences in amounts of excavation as well as kinds of contexts (e.g., houses, large enclosure wall, terrace, trash pits, wash layers). There are also some differences in whorl frequencies among the different operations. Ops. 4 and 6 in the NE area, for example, have relatively more light whorls (65%) and fewer heavy whorls (5%) than do the other Operations. Elsewhere across the site, the majority are medium whorls (53%), followed by light (32%) and then heavy whorls (15%). As noted above, however, continued research is needed before the possible significance of whorl distribution across the site can be evaluated, particularly given the small sample sizes.

Comparison of Whorl Sizes

In phase A, there were 9 light whorls (45%), 10 medium (50%), and 1 heavy (5%), compared to 26 light (48%), 22 medium (41%), and 6 heavy whorls (11%) in phase B. While there appears to be a higher proportion of heavy whorls in phase B than in phase A, this difference could be explained by the small LCA sample size. The significance of this difference can be better evaluated as more phase A excavation is conducted. There are few heavy whorls in either phase compared to the other weight categories, not enough for the production of cord or heavy yarn to have been of major economic importance (e.g., in the making of a product for exchange). In Phase B, the heavy whorls are distributed fairly evenly across the site (given differences in amounts of excavation), and the one heavy phase A whorl was found in Op. 17, the Operation with the largest phase A whorl sample. Any cord made was probably used for common tasks in local households.

Light, medium, and heavy whorls were found in roughly similar proportions in all three areas of the site in both phases. In general, medium whorls are slightly more prevalent than light whorls, with heavy whorls as a minor category. It appears that households across the site and throughout the Late Chalcolithic period were doing a similar range of spinning tasks. These included spinning wool and possibly goat hair into fine and medium weight thread, and making some cord or heavier string by plying, and perhaps braiding, lighter weight threads together. The possible exceptions are Ops. 4 and 6 in phase B, which have a relatively higher proportion of light whorls. Women from these areas may have been making more light thread than other households, possibly for exchange, but these conclusions are extremely tentative given the sample sizes.

Mesopotamians at Hacinebi

Does the analysis of the spindle whorls at Hacinebi support the hypothesis that a group of Mesopotamians was living at the site in the LCB phase? Recent anthropological work on ethnicity (see Emberling in press for a useful survey) suggests that almost any cultural feature can be used to mark ethnic identity. Not all group differences, however, are a reflection specifically of ethnicity. Emberling (1995) points out the importance of redundancy and relative social visibility in evaluating a given archaeological case.

A lack of southern style spindle whorls (see below) or spinning products would not necessarily mean that people with a Mesopotamian ethnic identity were not living at Hacinebi. It would, however, imply that entire households of Mesopotamian people were not there. Spinning was a general domestic task in the Chalcolithic period. If women had moved along with their families, they would be expected to continue their traditional ways of spinning thread and making textiles (see, for example, Sackett 1990 on isochrestic behavior). This includes the manufacture and use of spindle whorls with the shapes, sizes and materials that Mesopotamian women, through long experience, had become skilled in manipulating.

The relative support offered by spindle whorls for the presence of a small Mesopotamian ethnic group living at

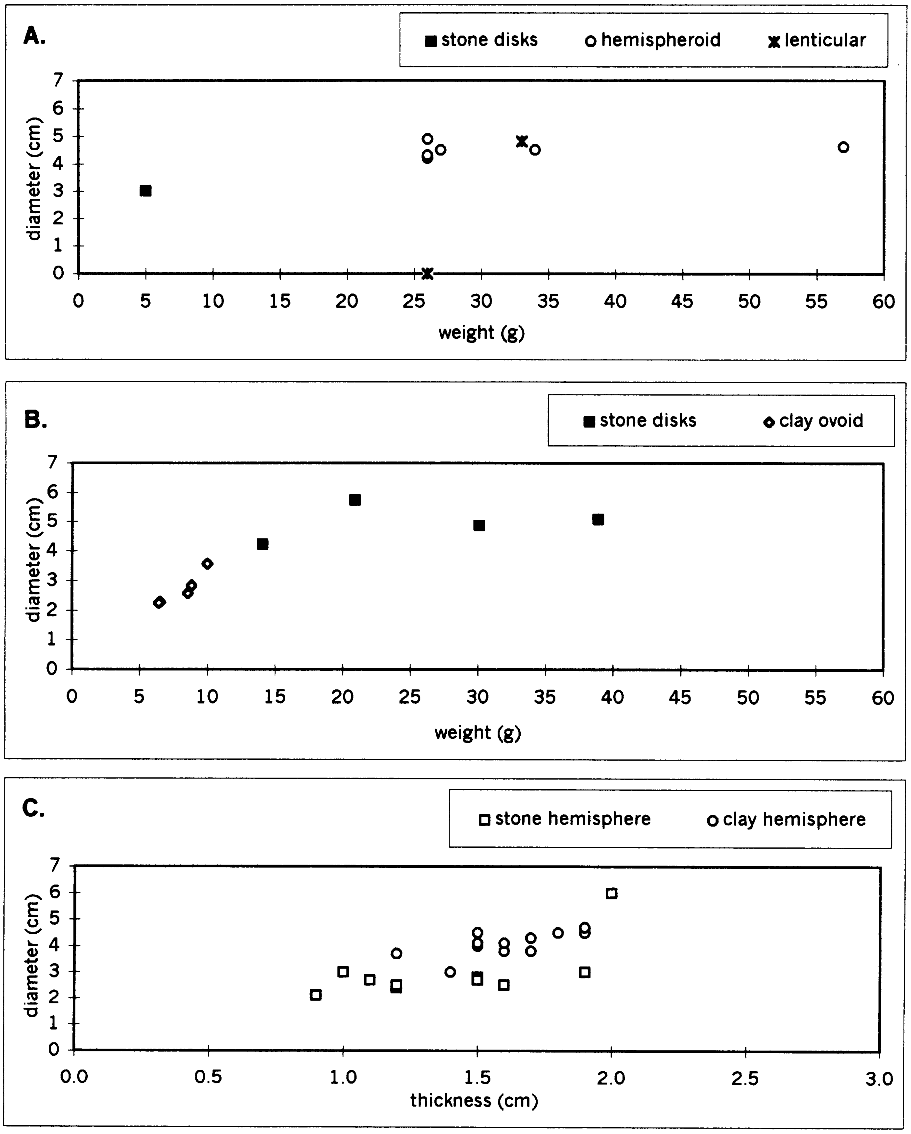
LCB Hacinebi will be evaluated on the basis of four criteria: functional types; material/form types; distribution across the site; and associations with other aspects of Uruk-related material culture.

In a brief survey of published Anatolian and Mesopotamian sites, I found a frustrating lack of detail regarding the spindle whorls from Late Chalcolithic levels. Reports for some sites simply noted that spindle whorls were present without describing them, others described forms or material, but did not give numbers or dimensions, and many differed as to the objects classified as whorls and those classified as other types of artifacts. The comparisons below therefore involve relatively few sites, and the results should be seen as suggestive rather than definitive.

Functional Types

The extremely small samples make comparisons difficult. There is, however, a suggestion of light- and medium-weight categories at all three southern sites, with a small heavy category at Abu Salabikh (FIG. 7a). Of the weighed complete whorls from Abu Salabikh, six were of medium weight, one was light, and one heavy. This small sample is distributed similarly to the Hacinebi whorls; the one light whorl is a stone disk. At Tepe Farukhabad (FIG. 7b), ovoid clay whorls were preferred for the light category and stone disks were used for medium whorls. As noted, pierced sherd disks are the dominant form in all weight categories and in both phases at Hacinebi Tepe.

Figure 7. Whorls from southern sites. A) Abu Salabikh: Uruk mound whorls. B) Tepe Farukhabad: Whorls from Uruk levels. C) Susa Acropolis: Late Uruk whorls.



I did not have access to information on the weights of Late Uruk whorls from the Susa Acropolis. Figure 7c shows their diameter and thickness, based on my measurements of published drawings (Le Brun 1978). The small-diameter whorls also tend to be thinner; they are probably lighter as well. Stone is preferred for the smaller whorls at Susa, but they are hemispheroid in form rather than disks.

Unlike the Hacinebi whorls, material/form categories of whorls at Susa, Farukhabad, and Abu Salabikh appear to correspond to functional (weight) categories. The samples in some cases, however, are relatively small. The similarity in whorl weight distributions indicates that similar weights of thread were being made in southern sites in the Early and Middle Uruk periods (e.g., at Tepe Farukhabad) and at LCA and LCB Hacinebi Tepe. The fact that somewhat different whorl styles and materials are used from site to site to spin those fibers suggests that similarities in whorl weight distributions were not the result of direct contact, but reflect the use of common fibers to fill similar needs.

Material and Form Types

Based just on material/form categories, there is no evidence for the presence of people using specifically southern-style whorls in the LCB phase at Hacinebi. Sherd disks, stone disks, and hemispheres were present in both LCA and LCB phases. Sherd disks make up a similar proportion of the whorls found in each phase, and are the dominant type in each weight group.

Not only is there continuity in all whorl forms from the LCA to the LCB phase, but some of these forms differ from typical whorls in southern sites. The whorls from Susa (Le Brun 1978) are made of stone or clay and have convex tops and flat or concave bottoms. Tepe Farukhabad has stone disks and ovoid baked clay whorls (Wright 1981). Unlike Hacinebi's whorls, many of the clay whorls from both of these sites were decorated. No perforated sherds were found in Uruk levels at Farukhabad, and none were identified as whorls at Susa (it is uncertain if any were found). A small measured sample from mostly surface and scrape contexts of the Uruk mound at Abu Salabikh in southern Mesopotamia (unpublished data provided by Susan Pollock) included disks, lenticular forms, and hemispheroid or conoid forms with convex tops and concave or flat bottoms. Most were undecorated.

The three southern samples discussed exhibit some differences in whorl forms compared to those from Hacinebi. In general, stone or clay ovoid or hemispheroid whorls were most prevalent at the southern sites, while at Hacinebi there were no ovoids, and hemispheres were a minor category that occurred in the precontact as well as the contact phase. At Hacinebi, undecorated sherd disks were the dominant form, while none of the three sites examined here used pierced sherd whorls. Three sites is a small sample on which to base a comparison. Unfortunately, a detailed chronological and typological study of Mesopotamian whorls has yet to be undertaken. On the basis of this limited comparison, however, the whorl material/form categories at Hacinebi appear to reflect local continuity rather than an influx of Mesopotamian women.

Distribution and Associations

Both local Late Chalcolithic and Uruk-related materials have been found in the NE area of Hacinebi. Part of a house containing Uruk-related ceramics and artifacts was found in Op. 14 (Stein, Edens, et al. 1996: 2). Wall 10/45 in Ops. 1 and 6 had almost exclusively Uruk-related ceramics on the east side and local ceramics on the west. Only four spindle whorls came from Op. 1, seven from Op. 6, and eleven from Op. 14. I was unable to ascertain how many of these whorls were found in "Mesopotamian" contexts. Sherd disks, however, predominated in these areas, as they did elsewhere at the site. The proportions of sherd disks, stone disks, and hemispheres were similar to proportions in the other Operations.

Five of six weighed whorls from Op. 6 were light whorls, while Ops. 1 and 14 had nearly equal numbers of light and medium whorls. If the tentatively identified differences in the proportions of light and medium whorls from Ops. 4 and 6 (as compared to the rest of the phase B Operations) should prove significant, they would more likely be due to economic rather than ethnic differences. This is in part because other Operations with "Mesopotamian" contexts do not show such patterning, and in part because the whorls used conform to local styles.

Conclusion

I suggested above three issues that might be addressed with spindle whorl data: the place of spinning products in Hacinebi's economy, the possible presence of a group of Mesopotamian people in the LCB2 phase, and the possible identification of Mesopotamian households.

Was cloth or thread produced at Hacinebi for exchange? There is nothing remarkable in the gross number of whorls found. The distribution of whorls across the site appears consistent with household production for local use. Some surplus thread may have been made by local households (e.g., in Ops. 4 and 6). Even then, based on current evidence, there is no reason to think that thread-making was a major economic focus in either phase. Nor is there any evidence for centralized control of spinning products. A more detailed study of economic aspects of spinning at Hacinebi will be conducted in the future as more information on specific contexts, subphases, and volumes of excavated material from each phase becomes available.

Is there evidence for the presence of a Mesopotamian ethnic group at Hacinebi? Tentatively, yes, based on the presence of Uruk-related materials at the site. The Uruk-related ceramics could, however, have been brought in from nearby Uruk enclaves (there is no evidence that they were manufactured locally), the bulla and cylinder sealings could have come from trade goods, the wall cones and eye idols may be based on Anatolian traditions, and the evidence for food preferences is based on a very small faunal sample. Continued study is needed (and in progress). Do the spindle whorls support the hypothesis? They do not. Distinctively southern material/form types are not present at the site, while there is evidence for continuity in spinning practices from the pre-contact Phase A to contact Phase B at Hacinebi, in terms of both spindle whorl forms and materials and the types of thread produced with them.

Could there have been Mesopotamian households at Hacinebi in which the women followed non-southern spinning traditions? In such a case, it would be likely that the ethnically Mesopotamian inhabitants at Hacinebi came from a nearby Uruk enclave rather than directly from the south, and that they moved to Hacinebi during the later part of the Uruk expansion. As already noted, however, the ceramics and radiocarbon dates at Hacinebi suggest an earlier date. Moreover, the high degree of continuity in spindle whorl forms and weights (including their relative proportions) at Hacinebi indicates that local women were doing the spinning in both phases. This, in turn, implies that entire Mesopotamian households did not move to Hacinebi. If Mesopotamian men lived at Hacinebi in Phase B, the spindle whorl evidence suggests that they married local women. Since women were also responsible for most food preparation, a study of household ceramics—particularly everyday cooking and serving vessels—and continued study of the faunal materials would provide useful additional evidence with which to address this issue.

This finding raises some interesting questions. The different relative amounts of Uruk material culture found at various northern sites indicates that different kinds of interactions between the indigenous inhabitants and southern immigrants were taking place. At sites with exclusively Uruk material culture, for example, it is clear that entire households must have moved north. Yet at Hacinebi Tepe there is no evidence for the presence of Mesopotamian women. Were there Mesopotamian men at Hacinebi, perhaps from nearby Uruk enclaves, who married local women? Or did the Uruk materials come to Hacinebi through interaction with those enclaves, with no actual movement of Mesopotamian people into the site? If Mesopotamian men did move to Hacinebi, were they sent by their families as local representatives for trade (similar to the later Old Assyrian trade), or were they simply individuals with a Mesopotamian ethnic identity, serving their own interests when settling there?

Spindle whorls alone cannot, obviously, answer all of these questions. Although this study is a preliminary one, it has, I hope, pointed out some of the potential issues that can be addressed with spindle whorl data, and the corresponding need for systematic recording and publication of spindle whorls as an artifact class. Meanwhile, the ongoing research at Hacinebi Tepe should allow us to address some of the interesting questions raised by the spindle whorl evidence regarding the nature of Mesopotamian-Anatolian interactions in the Late Chalcolithic period.

Acknowledgments

I would like to express my appreciation to Gil Stein, not only for allowing me to analyze the spindle whorls, but for all of his help as I worked on this project. My thanks also to Susan Pollock for providing data on the spindle whorls from Abu Salabikh, and to the Rackham Graduate School at the University of Michigan for the two travel grants they provided. I am also grateful to the following individuals for their comments and suggestions on the various drafts of this paper: Geoff Emberling, Ruth Fauman-Fichman, Carla Sinopoli, Gil Stein, Henry Wright and Norman Yoffee. Any errors remain, of course, my own.

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