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# The Fiber Revolution

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## Textile Extensification, Alienation, and Social Stratification in Ancient Mesopotamia<sup>1</sup>

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by Joy McCorrison

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One of the most significant transformations in the emergence of economically and socially complex societies has been the development of social groups with differential access to productive resources. Anthropologists have puzzled over the number of empirical cases suggesting that women have disproportionately lost access to productive resources. This paper follows one such case—the development of textile workshops in Mesopotamia—to offer new insights into the alienation of women producers in the ancient Near East and the development of Mesopotamia's political economies. During the transformation from a series of relatively self-sufficient communities to a highly integrated complex of rural and urban settlements, a fundamental shift took place from the use of flax to the use of wool for the majority of textile production. This shift has extremely important implications for archaeologists' reconstructions of agricultural production, labor roles, and social relationships. This paper explores the socioeconomic context of a change in the materials of textile production and its potential for explaining the development of important aspects of social complexity and political economy in ancient Mesopotamia.

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*Since all economic relationships are also social relationships, it follows that the alienation of labor has directly social ramifications.*

ANTHONY GIDDENS, *Capitalism and Modern Social Theory*

One of the most significant transformations of our social existence has been the emergence of social groups differentiated largely on the basis of access to productive resources. In highly stratified societies, social elites extract a surplus generated from the labor of primary producers and manipulate this surplus in part for the reproduction of hierarchical social relationships (Childe 1950, 1951; D'Altroy and Earle 1985; Brumfiel and Earle 1987; McGuire 1992:186). Under these circumstances, elites control productive resources from which primary producers have been largely alienated. This paper draws on the archaeological record and historical sources to examine one set of economic and social processes through which such alienation occurred. During the transformation of ancient Mesopotamia from a landscape of relatively independent and self-sufficient communities to a highly integrated complex of rural and urban settlements, flax was replaced by wool as the principal textile fiber. This shift coincided with the development of large textile-producing workshops alongside the formerly ubiquitous small-scale, household-based producers. By considering the changes in the textile fibers and in textile production in tandem, we can better understand the changes in land tenure, social relations, labor roles, and labor specialization culminating in the great Mesopotamian households, temples, palaces, and the classes of people that worked in them in the 3d millennium B.C. A change in textile fiber necessitated other major adjustments in textile production, and the consequences of these adjustments dramatically affected domestic economies and social relationships during a critical era of human history.

In ancient Mesopotamia, the appearance of workshops firmly situated within the economic, social, and ideological framework of a temple economy heralded an institutionalized alienation of encumbered labor, predominantly (but not exclusively) women's. To understand how this available labor pool of women developed one must examine the development of textile production in the context of the developing agricultural economies of earlier protourban and urban periods in the ancient Near East.

The roots of extractive relationships between elites and producers in the Near East and elsewhere are generally believed to lie in kinship relations organizing production and reproduction through access to resources—

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food, land, labor, mates—in previous less stratified or nonstratified societies (e.g., Patterson and Gailey 1987, Bender 1981, Brumfiel 1983, Halstead 1989, Bonte 1981, Terray 1972). As class relations developed, kinship and gender relations profoundly changed. Kinship organizations were subjected to manipulation, loss of autonomy, and reformulation to suit the legitimizing interests of emergent social elites (e.g., Diamond 1951, Godelier 1977, Murra 1982, Wheatly 1971, Linnekin 1992). The transformation of kin-ordered to class-ordered social relations entailed the alienation of individuals from access to resources used in production. Women appear to have been particularly affected, for the formation of class hierarchy is often accompanied by an increased subordination of women to men and the establishment of increasingly rigid gender hierarchies (Rapp 1977:310; Gailey 1985:78). Yet it is only through the analysis of historically specific circumstances that abstract relationships and influences can be examined and the validity of models tested. Internal social dynamics certainly play a role in the transformation of social relationships, but contingencies of external, techno-environmental conditions are equally significant (Brumfiel 1983). Because kinship-based organization of production can take many forms, the emergence of social elites, which is predicated upon kinship relations, may follow a variety of trajectories (Friedman and Rowlands 1977; Gledhill 1981:3–5).

## Textiles in Ancient Mesopotamia

The importance of textiles to ancient Mesopotamian economies has long been underscored by innumerable references to textile production and exchange in cuneiform texts. Wool fueled the political economy of ancient urban Mesopotamia. Four thousand years ago, scribes at the Mesopotamian city of Lagash noted in exquisite detail the compensation due each worker, who regularly received allotments of barley and wool (Waetzoldt 1987:117–26). Linens, in contrast, were luxuries fit for dressing kings and divine images (Edens 1992:122; Waetzoldt 1972:xxii; 1980–83:592; Pettinato 1972:94; Zettler 1992a:144). Linen textiles were rarer than woolen textiles, according to the economic texts from archives of the major landholding institutions in ancient Sumer. The large surplus-producing workshops attached to landholding institutions employed mostly women and produced mostly woolen textiles (Lambert 1961:431; Maekawa 1980:83–90; Waetzoldt 1972). Harriet Crawford (1983) argues that these textiles were exchanged in great quantities for timber, stone, obsidian, or metal. From Akkadian and Eblaite texts in particular it is clear that textiles played a crucial role in the exchange networks that sustained the great cities of the 3d and 2d millennia (e.g., Archi 1993:50; 1988). Textiles and agricultural products may also have figured prominently in the exchange systems important in the expansion of the earlier Uruk culture (Algaze 1993; Crawford 1983; Larsen 1987:51; Zagarell 1984), although later ar-

chives indicate that most textiles were consumed within the landholding establishments that produced them (Waetzoldt 1972:72).

It was the shift to wool, a fiber more efficient to produce than linen, that catalyzed the initial development of large textile workshops and the labor class that eventually was attached to them. Therefore it is critical that archaeologists and Assyriologists reexamine the shift to wool production and its immediate effects on textile-producing households. Even before weaving appeared, plant fibers were twined and knotted into cords, bags, nets, headgear, and baskets (Schick 1988). Early farmers domesticated the flax plant and produced linen textiles long before they made pottery (van Zeist and Bakker-Heeres 1975). At the same time, they relied upon domesticated animals for meat, not wool or hair. Only later did herdsman devote their energies to raising animals for wool, and only later did wool *displace* flax as the primary textile fiber.<sup>2</sup> Now that a combination of evidence points to the first widespread appearance of the wool-bearing sheep, anthropologists must consider how the introduction of a new textile fiber—wool—would have affected the technological aspects of textile production. Raising sheep rather than flax implies dramatically different agricultural practices and land use. Furthermore, the labor requirements of herding and raising flax strongly suggest that agricultural intensification and territorial expansion were closely linked to the emergence of specialized woolen textile production.

## The Nature of the Evidence

An obvious problem in working with textiles is that they quickly decay; therefore archaeologists can rarely study a large corpus of ancient textiles. Because actual textiles tend to be archaeologically invisible (Crawford 1983), it is only through a synthesis of all available secondary evidence—texts, tools, and agrarian and pastoral practices—that textile production and exchange can be reconstructed (see, e.g., Brumfiel 1991; Evans n.d.; Hicks 1993; Murra 1989; Schneider 1987, 1989; Weiner and Schneider 1989; Wattenmaker 1994; Weiner 1992; Wright 1996). Most of the evidence for ancient textile production comes from prehistoric tools and from historic texts (Barber 1991). A relatively rich corpus of texts on clay tablets provides significant, if temporally sporadic, glimpses of the roles of textile production and exchange in certain sectors of Mesopotamia's historical economies. It is important to emphasize here that these texts usually come from urban sites and that rural households are poorly represented. For the interpreta-

2. Basketry, hides, and skins are not considered in this paper. Wool and flax, along with skins and other plant fibers (bark, grasses, wands), may have contributed to textile production in varying amounts in different periods and communities. Emphasis on wool, for example, appears in records of public households—palaces and temples. Rather than emphasizing a linear progression from all flax to mostly wool, this paper focuses on the significance of a new technology (wool) and its attendant production requirements.

tion of texts this study relies on the conclusions of expert Assyriologists familiar with entire corpuses in an effort to avoid what Postgate (1990) has called “brief raids across the [disciplinary] frontier to plunder choice bits of information.”<sup>3</sup> Households should possess a few artifacts of spinning and weaving if a household unit had access to agricultural land suitable for flax production, but the contents of excavated domestic structures in nearly all Near Eastern sites are postabandonment middens, deposited after domestic activity ceased within the structure itself. It is therefore very difficult to reconstruct most aspects of household textile production. General trends in fiber production, however, can be determined from archaeobotanical and archaeozoological evidence.

### Evidence for Linen Production

Apart from the rare find of an actual linen textile, there are only two basic types of evidence that indicate the use of flax. One of these is linseeds, and these seem to be less common in the archaeological record of the late 4th and early 3d millennium than in preceding periods. The other is texts, and these similarly seem to suggest diminished use of flax for fiber during early historical periods—a trend that is particularly significant in the context of a relatively long prehistory of flax growing and linen production.

The domesticated flax plant (*Linum usitatissimum* L.) yields two valuable resources—linseed and fibers. Both products appear early in the Neolithic, suggesting that the plant was quickly appreciated and cultivated for both oil and linen. The earliest evidence for domesticated flax comes from charred linseeds recovered from Pre-Pottery Neolithic A sites in the Near East (van Zeist and Bakker-Heeres 1975). These seeds suggest that the plant was processed for linseed oil, but fortuitous finds of 7th-millennium-B.C. linen textiles at Nahal Hemar Cave in the Judean desert indicate that flax was also processed into textiles by the first villagers (Schick 1988:38).

Linen cloth dates back at least as early as 7000 B.C. (*New York Times*, July 13, 1993; Schick 1988) and attests to flax cultivation at some of the earliest agricultural sites, including most probably sites where only seeds have been found such as Jericho (Hopf 1983), Tell Aswad, Tell Ghoraifé, and Tell Ramad (van Zeist and Bakker-Heeres 1985). Only rarely have other Neolithic sites, all Pre-Pottery Neolithic B in date, yielded preserved linen. Both Çatal Hüyük (Ryder 1965) and Çayönü (*New York Times*, July 13, 1993) have yielded Neolithic linen textiles. Some of the earliest fabrics were made with finger-twining techniques (Schick 1988), but weaving was also known from an early date. Ceramic impressions of two styles of woven textiles from early

Neolithic Jarmo confirm that loom-woven textiles were in use in the 7th millennium B.C. (Adovasio 1983:425). Similar impressions were recently noted in other northern Mesopotamian sites, including Tell Magzaliya, Telul eth-Thalathat in northern Iraq (Fukai and Matsutani 1981:pl. 45–29, 45–30), and Kashkashok II in the Khabur drainage of northern Syria (Matsutani 1991:35). The expertise exemplified in the production of twined fabrics and simple-weave textiles, as well as the complex technology requisite for processing plant fibers and domesticated flax, suggest that the occupants of these Pre-Pottery Neolithic B sites inherited a textile craft that extended farther back in time than the archaeological record attests (Schick 1988; Barber 1991:258–59).

Linseed is most likely preserved as a by-product of linseed oil processing rather than flax fiber processing. It occurs infrequently in archaeological sites, being preserved only when exposed to fire. Unlike fiber, linseed could regularly become charred in accidental spoiling of food preparation. Before being consumed, linseed must be heated to vaporize harmful prussic acid compounds (Gill and Vear 1980:196; Renfrew 1985:64). Its occurrence among charred plant remains could be attributed to its prehistoric production as a food (Gallant 1985:156). Linseed oil is attested in many cuneiform texts recording commercial exchanges from the 3d millennium onward (Waetzoldt 1985:77; 1980–83; 583–94; Dalley 1980:53–74).

Although flax plants need not be exposed to fire during processing for fiber, it is possible that the occupants of sites with linseed remains were also growing and processing the plant for fiber. A precisely timed harvest can yield a flax crop with fiber and seed. Flax seeds have been consistently recovered from post-Neolithic village sites throughout the Near East (see Miller 1991). While flax probably spread with dry-farming from Neolithic village to village, it ultimately was irrigated in the dry alluvial plains of southern Mesopotamia. Helbaek (1972) reported 5th-millennium flax seeds of increased size from Choga Mami, Tepe Sabz, and Tell es-Sawwan and attributed this size difference to the effects of irrigation agriculture. At Tell el ‘Ouelli linseed appears in Ubaid 4 levels (4500–4000 B.C.) (Neef 1991:323). By the 3d millennium B.C., when people were living in cities, reported finds of linseed in archaeological sites have dwindled to a few isolated cases on the periphery of the civilized world (fig. 1). Sites well beyond southern Mesopotamia report charred flax seeds into the 3d millennium, among them Arad (Hopf 1978), Bab edh Dhra and Numeira (McCreery 1980:84–87), Kurban Hüyük (Miller 1986), Shahr-i-Sokhta (Costantini n.d.), and Tepe Hissar (Costantini and Dyson 1990).

It is tempting to interpret the scarcity of linseeds recovered from urban contexts in historic periods as representing a reduction in the use of linseed and flax, but for several reasons this would be unwise. Because so few sites from southern Mesopotamia have reported plant remains and so few archaeologists excavating historic deposits have examined domestic contexts, it is difficult to trace the cultivation of flax through the ma-

3. I have, for example, omitted reference to catalogues and lexical lists of archaic texts found in Green and Nissen (1987) and Englund and Nissen (1993).

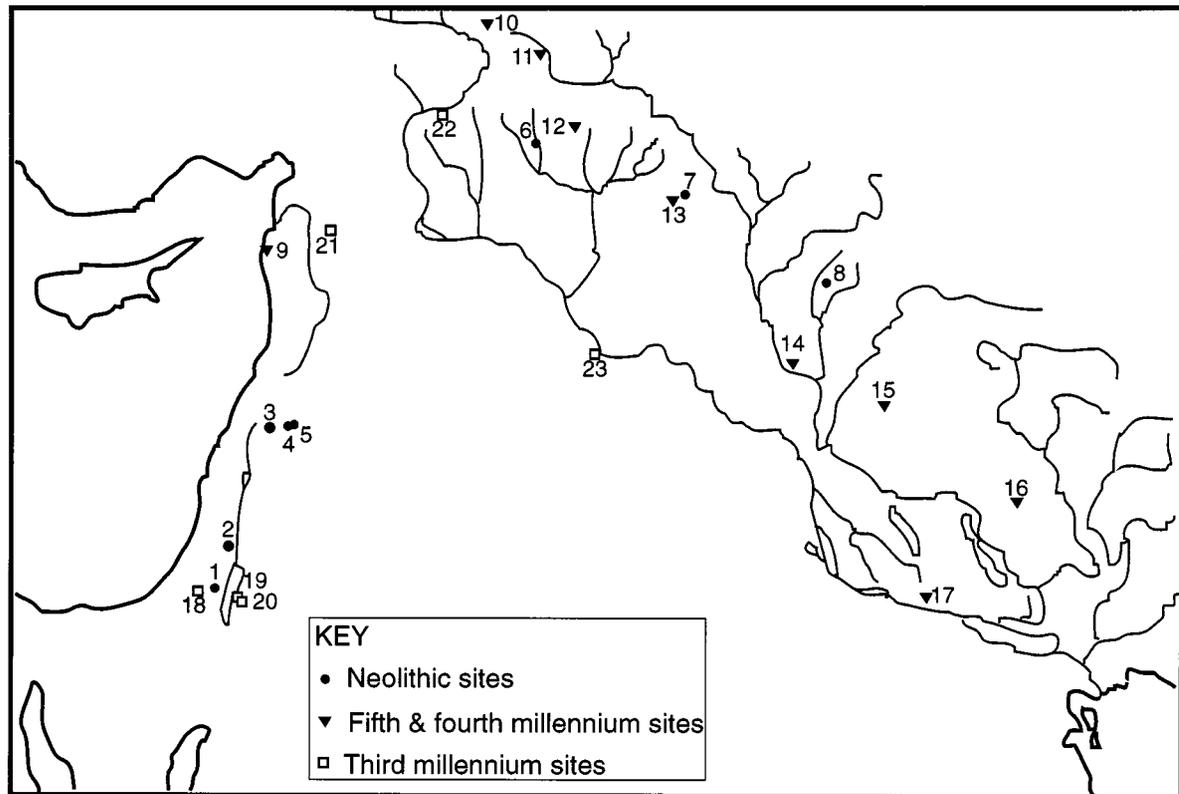


FIG. 1. Sites with evidence of flax (linseed, linen) or textile impressions. 1, Nahal Hemar; 2, Jericho; 3, Tell Ramad; 4, Tell Aswad; 5, Tell Ghoraifé; 6, Kashkashok II; 7, Telul eth-Thalathat; 8, Jarmo; 9, Ras Shamra; 10, Korucutepe; 11, Çayönü; 12, Tell Aqab; 13, Tell Magzaliya; 14, Tell es-Sawwan; 15, Choga Mami; 16, Tepe Sabz; 17, Tell el 'Ouelli; 18, Arad; 19, Bab edh Dhra; 20, Numeira; 21, Ebla; 22, Kurban Hüyük; 23, Mari (not on map: Shahr-i-Sokhta, Tepe Hissar).

terial record. Therefore, it is entirely possible that the lack of excavated domestic contexts accounts for our lack of linseed in the archaeological record. Furthermore, throughout the development of agriculture, people continued to select crop varieties for different purposes. At some undefined point in prehistory or history, separate flax varieties were developed for higher fiber or higher oil yields. Late Uruk images of flax plants bred for linen rather than for oil (Crawford 1985:74) suggest that this occurred before or during the 4th millennium.

Textual sources continue to attest to the use of linseed and linen textiles throughout the 3d and 2d millennia (Waetzoldt 1980–83:587–88), with the addition of a sesame summer crop for oil (Postgate 1985:147; Bedigian 1985). At the same time, both texts and archaeological evidence show that by the 3d millennium flax had yielded to wool as the primary textile fiber.

### Evidence for the Onset of Wool Production

Woolen textile production followed that of linen by at least several thousand years (Ryder 1984; Barber 1991:

68, 211). Sheep exploited for meat were part of village economies in the 7th millennium B.C., but it was only in the 3d millennium that woolen textiles became critical to the Mesopotamian economy (Crawford 1983, Jacobsen 1970; see also Pettinato 1972:94; 1981). Evidence for the earliest wool-bearing sheep includes iconography and figurines, animal remains, texts, and occasional finds of woolen textiles. The earliest preserved woolen textiles come from 4th-millennium Upper Egypt (Greiss 1955, cited in Barber 1991:25) and are somewhat anomalous because the Egyptian textile tradition persisted in producing predominantly linens for thousands of years thereafter. (The excavators of Neolithic Çatal Hüyük [6500 B.C.] originally claimed to have discovered woolen textiles and felt (produced by matting wet wool), but closer examination has shown that these textiles are linen [Ryder 1965].)

Mesopotamian iconographic evidence shows some variation in sheep breeds during the 3d millennium. Woolen textile production depends on the selection of wool-bearing sheep, which postdated sheep's initial domestication (Sherratt 1983). Wild sheep have a hairy coat, and the selection of a fleece with lengthened un-

derhairs (wool staples) suitable for spinning and weaving took many generations (Ryder 1987). Iconography depicting coat differences suggests that at least three breeds of sheep were known in ancient Mesopotamia. Two were wool-bearing, but one of these, the fat-tailed sheep known from texts to have been primarily bred for wool, appears fairly late in the mid-3d millennium (Hilzheimer 1941:33–35). Until recently, there has been little complementary archaeological evidence to indicate exactly when the selection for and widespread introduction of wool-bearing sheep breeds might have occurred.

The earliest archaeological evidence usually cited for wool-bearing sheep is a 5th-millennium clay figurine from Tepe Sarab in western Iran (Bökönyi 1974:159 and fig. 44). V-shaped incisions on the side of this crude representation may indicate wool staples, although it is possible that they represent no more than very simple decoration on a lumpy clay animal. No other indication of wool-bearing breeds occurs before the 4th millennium, at which point wool-bearing sheep appear widely in the archaeological record and in textual sources. The combination of archaeology and texts would seem unambiguously to support a 4th-millennium date for the widespread occurrence of wool-bearing sheep (fig. 2).<sup>4</sup>

Some of the earliest evidence for wool-bearing sheep comes from texts. Simple notation tablets—among the earliest known texts—in Uruk levels at Warka in southern Mesopotamia record the annual tallies of herds probably belonging to a religious establishment (Green 1981:8). With the aid of lexical lists preserved from later periods, the designation “wool sheep” can be clearly recognized in these archaic Sumerian documents (Green 1981:4; Szarzynska 1988:225). The herd structure described also suggests that these sheep were managed for wool (Nissen 1986:330). Herd structure varies according to the management strategy adopted to maximize yields of meat, milk, wool, and hair or a combination of such products (Cribb 1984, Redding 1981, Payne 1973). By examining herd structure archaeozoologists have recognized a shift in animal exploitation in the 4th millennium, during the same period as the Warka tablets. Information on early herd structure and herd management comes from comparison of the kill patterns of bones from archaeological sites with kill patterns from modern herds. For example, if a herd is managed for wool, one expects to see relatively high numbers of animals living to full maturity.

Archaeozoological evidence for possibly the earliest herd structure favoring wool production comes from the Kermanshah Valley of highland western Iran (the location of Tepe Sarab). Sometime between 5000 and 3600 B.C., the ratio of sheep to goats shifted to a preponderance of sheep (Davis 1984:67). Concomitantly, greater percentages of these animals were allowed to

reach maturity, reflecting a greater emphasis on milk and wool (Davis 1984:274–75). Bones from the site of Siahbid indicate a high sheep-to-goat ratio (8:1), interpreted as 5th-millennium date for the first herding emphasis on wool in the highlands (Bökönyi 1977). But in the Kermanshah Valley, this emphasis on wool production may or may not predate 3600 B.C. (depending on the actual dates of the sites within a 1,400-year range). In the lowlands fringing southern Mesopotamia, herding strategy changed in the late 4th millennium B.C. At several Late Uruk sites, archaeozoologists detect the appearance of robust sheep, perhaps suggesting the introduction of a new breed (Payne 1988:105); heavier musculature may have carried a heavier coat (wool staples). At Tell Rubeidheh in the Jebel Hamrin area of eastern Iraq, robust sheep outnumber goats and other animals, and most of the sheep represented in the faunal assemblage are mature animals (Payne 1988:108, 115). The herd structure at Tell Rubeidheh and at other Late Uruk sites also suggests that specialized wool production dominated the herding strategies during this period (Payne 1988:114). Large, presumably wool-bearing sheep also appeared at Late Uruk sites in the Kermanshah Valley (Davis 1984), at Jebel Aruda along the upper Euphrates (Buitenhuis 1988), and at Umm Qseir on the Habur River (Zeder 1994a:116). In Late Uruk sites in Khuzistan, the ratio of ovicaprids to cattle and pig remains increases (Mudar 1988:156, 161), also apparently corroborating a trend toward the herding of wool-bearing sheep.

In sum, archaeozoological, textual, and most iconographic evidence seems to indicate a major and widespread adoption of wool-bearing sheep and emphasis on wool production during the late 4th millennium.

## Flax and Wool Production Requirements

The implications of using a new textile fiber in southern Mesopotamia are stunning when one considers the different land and labor requirements for raising flax and wool. These requirements can be inferred from agronomic sources and from the ethnographic and, in some cases, the historical record. From Mesopotamia, where flax cultivation ceased some time ago, there is little documentation of the plant's requirements. I have accordingly drawn information from agronomic records of traditional flax cultivation in India (a somewhat comparable ecological context) and Britain. Tomb paintings from Pharaonic Egypt clearly show that ancient flax required the same processing as modern flax (Barber 1991).

Some of the archaeological indicators of textile production offer almost no potential for differentiating between flax and wool fiber use. For example, spindle whorls may be used to spin either fiber. Almost no archaeological reports include whorl weights (Barber 1991:52), which along with size measurements have helped archaeologists distinguish between the spinning

4. For a full review of the putative instances of Neolithic wool-bearing sheep and contrary evidence, see Ryder (1984) and Barber (1991).

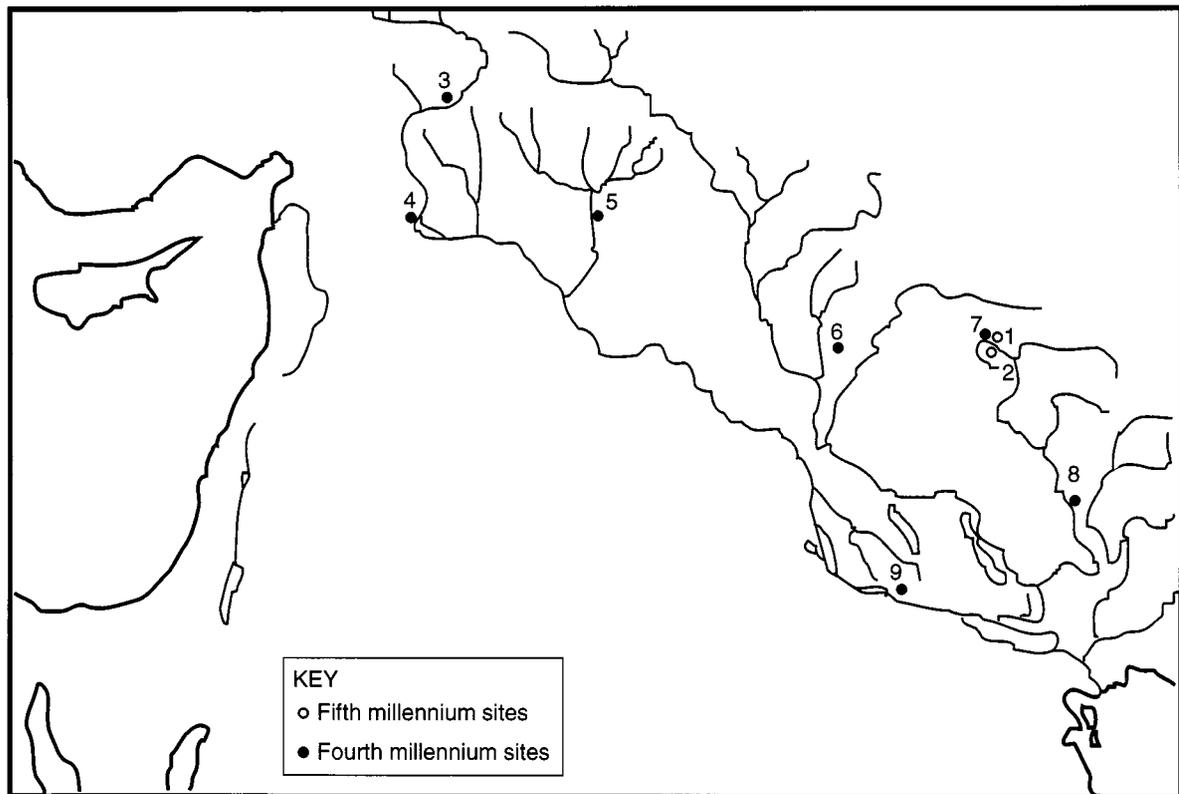


FIG. 2. Sites with evidence of wool sheep (texts, faunal remains). 1, Tepe Sarab; 2, Siahbid; 3, Hayaz Höyük; 4, Jebel Aruda; 5, Umm Qseir; 6, Tell Rubeidheh; 7, Kermanshah Valley; 8, Khuzistan; 9, Warka.

of coarse and fine fibers of maguey and cotton respectively in the New World (Parsons 1972). The quality of thread from either source can be determined by spinner's skill, which can overcome some of the differences resulting from the use of spindle whorls of different dimensions and weights (Ochsenschlager 1993a:54). In any case, processed flax and wool fibers are of comparable fineness (see Bradbury 1920, Ryder 1992) and therefore cannot be distinguished in this way.

Although Mesopotamian spindle whorls are unlikely to be informative about type of fiber, distribution studies might document a shift in the locus of textile production with the introduction of wool. Few excavations of 4th- and 3d-millennium sites in southern Mesopotamia, however, have recovered household contexts that would permit a study of the distribution of spindle whorls in different architectural contexts. (The problem of midden accumulation and systemic context in Near Eastern sites has been discussed elsewhere [also see Cameron and Tonka 1994].) Nevertheless, by comparing distributions of spindle whorls in public (palace and temple) and private (domestic) compounds during several periods and by selecting appropriate sites and contexts for such studies, archaeologists could document the loci of spinning and test whether fibers of different weights (corresponding to different qualities) were produced in different areas. Such data might help to iden-

tify the establishment of textile workshops in the archaeological record (see Wattenmaker 1994).

Differentiating flax from wool in the archaeological record of textile production poses great challenges. Spindle whorls, loom emplacements, bone and copper needles, awls, and weights provide evidence only for general textile production. They can be used to spin and weave many fibers. Ground looms of the type used in Mesopotamia unfortunately leave almost no trace (Barber 1991:83–91; Waetzoldt 1972:130–36). Flax processing could potentially be detected from scutching tools, retting basins, and stream modification for ponding (see below), none of which have left any record in southern Mesopotamia. Nevertheless, several important inherent differences in the resources and technologies required to process wool and flax fibers (table 1) suggest that the organization of production of fibers, spun thread, and textiles was dramatically altered by the introduction of wool.

#### LINEN PROCESSING

Cultivation and processing of flax for fiber require both prime agricultural land and high labor inputs. Frequent watering is important, and the plant requires damp and readily drained soils (Bradbury 1920:22–28; Richharia 1962:70). Weeding is indispensable; competing weeds

TABLE I  
*Labor Steps in Producing  
Flax and Wool*

Flax	Wool
Growing	Herding (Feeding)
Weeding	–
Pulling	–
Rippling	Plucking
Retting	Washing
Bracking	–
Scutching	–
Hackling	Combing
Spinning	Spinning

stunt development, and contaminants damage fibers during retting (Maddens 1989:71; Gill and Vear 1980: 198; Bradbury 1920:53–60; Blackman, Holly, and Cox 1951). At harvest, flax must be pulled, a back-breaking task usually accomplished communally. The stalks must next be rippled to remove seed and capsules. Preparation of fibers for spinning then entails retting—partially rotting plants in standing water or, as in biblical Palestine, spreading the stalks on the ground or a flat roof where there is heavy dew. Retting takes about 10–14 days, after which, if pond-retted, the stalks must be lifted in heavy sodden bundles and allowed to dry. As with pulling, pond retting requires heavy labor and may be accomplished communally or with the labor of the strongest community members. Once the stalks have dried, bracking breaks the pith around which the fibers cling; scutching (beating) removes the broken pith from the stalk, and hackling (combing) cleans away pith fragments. At this point, flax fibers are ready for spinning and weaving. Since linens require bleaching to break down pectic acids and do not easily accept dyes, the final stages of textile production usually include spreading the cloth in the sun (Bradbury 1920) and treating it with soap from an alkaline plant (Jacobsen 1970:223).

#### WOOL PROCESSING

Wool of course comes from sheep, and sheep may be fed in various ways. Although 3d-millennium texts do refer to stall feeding and to grazing of agricultural fields and stubble (Adams 1981:142; Jones and Snyder 1961:221; Wright 1989), one advantage of sheep herding over flax cultivation is that fiber may be raised *away from* prime agricultural land. Sheep may be herded for at least part of the year in nonagricultural steppes, a practice documented by archaic Sumerian texts (Green 1981:16–17). By introducing wool, populations in southern Mesopotamia could effectively *shift* textile production from prime agricultural land to marginal land or double-crop the same land (reaping crops and wool from stubble-fed sheep). Such a strategy is a form of agricultural intensification, or “extensification” (*sensu* Halstead 1992:

109)—“colonizing marginal land, which might involve less careful husbandry or less frequent cropping.”

Labor requirements for wool production also differ from those for flax. They roughly parallel the production of flax only from the point of wool fiber collection onward. Since Sumerian terminology for “plucking” pictures a comb, shearing was certainly not the practice (Ryder 1992:135), and plucking remained the method for obtaining wool through the 2d millennium (Ryder 1993:14–15; Waetzoldt 1972:14–38). Perhaps it was the experience of hackling flax and the ready adaptation of the hackling comb that first inspired early wool collection. Wool may have been washed on the live animal, as is the ethnographically attested practice in shearing modern sheep in Iraq (Ochsenschlager 1993b:36). Texts describe “washing the wool on the back of a sheep” and “setting the ewe and sheep in water” (Waetzoldt 1972: 109, 110). Since modern sheep breeds do not molt wool, the plucking of molting fine wool fibers is more closely analogous to the modern practice of combing cashmere fiber from goats than to the process of shearing and separating wool and hairy fibers afterwards (Ryder 1992: 136). The labor involved would have varied according to the timing of plucking; if the sheep’s hair had not yet begun to molt, little hair would have contaminated the molted, plucked wool fibers. A goat takes about 30 minutes to comb (Ryder 1990:559). Ur III textile workers plucked something on the order of 38 sheep in a day, yielding some 32 kg of raw wool (Waetzoldt 1972:14–17).

After washing and plucking, wool was ready for combing, spinning, weaving, and dyeing. The time spent cleaning plucked wool could vary widely with the quality of the wool and the requirements of the final product. Kashmiri women dehairing cashmere fibers from cashmere-and-hair caught with combs separate about 60 kg of fiber in two hours (Ryder 1992:136). Lower-quality wool may be used directly without further combing (Waetzoldt 1972:113), but for the finest-quality woolen cloth it took 94 workdays to generate enough finely combed wool (pp. 115–17). The processes of plucking and combing are analogous to scutching and hackling flax, and flax and wool could be spun with the same basic tools and labor. Wool does not require the effort of plowing, sowing, weeding, pulling, retting, and bracking. Fewer herders could tend more sheep for a greater fiber volume than could be generated by the same people growing flax. Almost all the agricultural labor (except that devoted to linseed production) could therefore be diverted to other tasks.

#### LAND AND LABOR USE

The great difference between agricultural and steppic productive capacities lies not only in the quality of land required but also in labor expenditure, labor scheduling, and specialization. A simple calculation of land and labor required to produce a woolen garment and a linen one emphasizes the critical production differences between them.

TABLE 2  
*Land Use for Flax and Wool Production*

Region	Flax			Wool		
	Land Required (ha) <sup>a</sup>	Fiber Yield (kg/ha)	Processing Techniques	Sheep Required <sup>b</sup>	Land Required (ha) <sup>b</sup>	Collection Method
Mesopotamia (Ancient)	[60 m <sup>2</sup> /0.006 ha]	[335]	[Hypothetical] Traditional	3.5	24.5 (15.75) <sup>c</sup>	Plucking
Mesopotamia (Modern)	Not available	Not available	Not available	1.14	8 (5.1)	Shearing
Britain	40 m <sup>2</sup> /0.004 ha	500	Mechanical			
India (General)	130 m <sup>2</sup> /0.013 ha	151	Traditional			
Gangetic Alluvium 1	31 m <sup>2</sup> /0.0031 ha	650	Mechanical			
Gangetic Alluvium 2	15 m <sup>2</sup> /0.0015 ha	1,268	Mechanical			

<sup>a</sup>To produce 2 kg linen/person/year.

<sup>b</sup>To produce 2 kg wool cloth/person/year.

<sup>c</sup>Figure in parentheses applies to northern Mesopotamia.

Flax required less area but better-quality land. From 3d-millennium (Ur III) accounts, the ration of 2.0 kg of cloth per year per worker gives a Mesopotamian assessment of a minimum per-person need (Waetzoldt 1987:125). Gill and Vear (1980:198) cite early-20th-century British flax yields at under 500 kg/ha. This figure may be reduced by 30% to approximate yields in the hot climate of Mesopotamia, where plants would be pulled late in the ripening phase (to recover seed as well as fiber) and processing was accomplished entirely by hand (with less even scutching resulting in higher "tow," or short, useless fibers), to produce an estimate of around 335 kg of hackled fiber/ha. Using these estimates, 167.5 persons could be supplied by 1 ha flax; only 0.006 ha (60 m<sup>2</sup>) was needed per person per year (table 2).

Indian flax in plots similar to those in ancient Mesopotamia produces similar yields. In India, flax may be sown as the first crop after rain ceases or broadcast in standing paddies (Richharia 1962:7–71). Extrapolation from the yields of an experimental crop on the Gangetic alluvium in Bihar suggests that somewhere between 15 m<sup>2</sup> and 31 m<sup>2</sup> would be required to produce 2 kg of fiber (Richharia 1962:72). The national average of fiber yield from all areas is somewhat lower and would require higher land allocations—0.013 ha (130 m<sup>2</sup>) per person for 2 kg of flax fiber. This latter figure, moreover, may be more comparable to the requirements in ancient Mesopotamia, for it reflects traditional, nonindustrialized and nonmechanized methods of flax growing and processing (Richharia 1962:134).

Wool land requirements are substantially higher. Late-3d-millennium texts reveal differences in average annual yields of different varieties of sheep. Some animals produced nearly 1 kg of wool, while finer-quality wool, about 0.71 kg per year, came from another variety of sheep (Waetzoldt 1972:5–6; cf. Hilzheimer 1941:34–35). (The average Near Eastern sheep today produces 1.75 kg of wool per year [Redding 1981:32, citing Watson 1979:107 and Hirsch 1933:18], but this is shorn, not plucked.) A 3d-millennium average of 0.85 kg per sheep

per year (Adams 1981:148; Waetzoldt 1972:17) suggests that each person required 2.35 sheep to yield 2.0 kg of fiber. Two-fifths to one-third of plucked wool was discarded and lost in processing (Waetzoldt 1972:117), thereby raising the required minimum to 3.5 sheep per person in order to supply 2.0 kg usable fiber. Sheep in turn require grazing land varying in area according to the available forage. Thalen (1979:265) suggests that 6–8 ha of lightly grazed desert pasture in southern Mesopotamia can support 1 sheep per year (or 24.5 ha per person need). In the Jezireh steppe to the north, only 4.5 ha per year is required per sheep (or 15.75 ha per person need).<sup>5</sup>

There are also labor differences. The labor required for flax far surpasses that for herding sheep, but it is concentrated in periods of growing and preliminary processing rather than continuous year-round. Russell (1988:83, 99) estimates that 457–549 labor days (the work of three herders) would have been necessary to maintain a flock of 100 sheep and goats. Archaic texts from Warka suggest that late-4th-millennium flocks (connected to temples) averaged around 68 animals (Green 1981). Although sheep herding is continuous, much of the time can be spent in simultaneous tasks, including hand spinning. Flax labor, in contrast, cannot be combined with other tasks. I have found no precise figures on the labor days spent in flax cultivation, but I estimate that each plot producing 2 kg might have required up to 58 person-days for full fiber extraction before scutching and hackling. Some of this labor might have been performed communally.

## Consequences of Agricultural Intensification

### THE COURSES OF INTENSIFICATION

With the introduction of wool fiber, flax-growing households of southern Mesopotamia were faced with 5. These estimates do not take into account the land efficiency of grazing stubble on agricultural fields.

the possibility of extensification and substantial economic restructuring. A decision to rely on sheep for fiber would effectively have freed prime agricultural land for alternative crops, including, presumably, cereal crops that could have augmented subsistence or contributed to staple surplus. Concurrently, more fiber could have been raised on vast tracts of marginal land using less labor than flax cultivation. Extensification under these circumstances might have resulted in any of a number of productive strategies (Morrison 1994: 142–44), and not all agrarian households need have adopted the same ones. One of the most obvious strategies might have resulted in agricultural intensification with shortened fallow. Households with access to agricultural land might have intensified their production of cereals and other crops that could be directly consumed, possibly including a substitution of sesame (a modern summer crop) for linseed (a winter crop). Cropping frequency might thus have been increased with year-round use of land and labor for cultivation (Boserup 1965). Winter cropping on the arid alluvium of southern Mesopotamia must rely on irrigation at the nadir of annual water supply to the rivers (Adams 1981:5–6). Increased cropping frequency and use of soils during the late spring and summer months would have increased the risk of salinization, a problem known to have diminished crop yields in late antiquity (Adams 1981:19–20; Buringh 1960:155–63; Jacobsen 1982:8–13; Gibson 1974). There is no textual evidence for summer cropping in early Mesopotamia (Jacobsen 1982:67), although summer crops of sesame are reported in 2d-millennium B.C. texts (Stol 1985:119). The only relevant archaeological evidence comes from Late Uruk deposits in Khuzistan and suggests only winter crops (Wright, Miller, and Redding 1980). Agricultural intensification could have shortened or eliminated fallow seasons between plantings or narrowed the range of crops produced and the frequency of crop rotation.

Concomitantly, households might have diversified both landholdings and production by increasing their husbandry efforts, with some household members tending wool-bearing sheep on marginal lands, either in the swampy interstices of settlement and fields or (possibly part-time) in more remote steppe lands. Seasonal grazing on cereal crops before and after they set seed might have increased as lands formerly under flax came into cereal (barley) production. Under any of these strategies, increased specialization of some household members' labor in sheep herding would necessarily have been accommodated by increased specialization of other members' labor in agriculture and perhaps also weaving. Although it is possible that such an adjustment of labor roles took place within household economies preadapted to the absence of herdsmen for long periods of time, it would ultimately have had profound effects upon household form and family structure (Rudolph 1992:122–23; Mitterauer 1992). A shift in the materials produced and labor organization would have affected social relationships among household members. It is virtually impossible to imagine a scenario in which the relationships and the status of individuals within

households would have remained static while a major change occurred in the conditions of material production.

Agricultural households in southern Mesopotamia might also have increased specialization by allocating agricultural staple surplus for exchange and relying on shepherds outside the household to produce raw wool for weaving. Developing a model to explain the development of a palatial economy in ancient Greece, Halstead (1989:76–80) suggests that agricultural extensification occurred in response to population pressure on prime agricultural land. Villagers cultivating marginal land were at greater risk for crop failure, and Halstead suggests that they produced special crafts—shell bracelets—and exchanged them with households generating an agricultural surplus. In effect, both households generating agricultural surplus and households producing shell bracelets were engaged in specialized production. This model applies only tangentially to southern Mesopotamia, and its interesting contribution lies in the development of craft specialization as a strategy by which some producers offset unequal access to resources (crop land) by producing goods for exchange. Pastoral specialists might be obvious candidates for such production (wool), but it is also possible to speculate that households without adequate access to top-quality agricultural land suitable for flax growing might have exchanged barley grown on more marginal agricultural plots with pastoralists. The right to graze sheep and goats on fields of barley stubble or grain itself during certain seasons of the year might have been traded for wool. Within households relying on marginal agricultural land, labor freed from producing fiber might have been diverted to producing surplus textiles for exchange. Such a strategy would have triggered specialization in textile craftsmanship.

The challenges of reconstructing and differentiating among alternative developments in production and specialization, agricultural intensification, and diversification remain formidable. To do so would require not only detailed knowledge of the emerging elite administrative centers documented in archaic texts but also archaeological evidence from urban and rural domestic contexts and administrative institutions, preferably augmented by the material remains of pastoral groups. The reality is that with a very few exceptions (e.g., Matthews 1989, 1990, 1992; Pollock 1987, 1990; Pollock, Steele, and Pope 1991; Wright 1969; cf. Hole 1974), archaeological excavations of prehistoric strata in southern Mesopotamia are confined to narrow trenches at a few urban sites. Some of the best rural archaeological evidence available comes from the regional surveys carried out by Adams (1965, 1981; Adams and Nissen 1972) and comparable work in neighboring Khuzistan (e.g., Johnson 1973). The patterns of rural settlement shifted appreciably during the periods when cities first appeared (Adams and Nissen 1972:18–19), but there are still debates about the relationships between settlement patterns and economic and social behavior (e.g., Algaze 1989, Johnson 1988–89, Hole 1994). Little can be inferred about changes in the organization of labor in

rural households from existing archaeological data, and promising efforts at sites such as (urban) Abu Salabikh (Pollock, Steele, and Pope 1991) have been curtailed by recent political events. Even so, among the many questions raised by the idea of extensification in southern Mesopotamia two major ones remain to be discussed. What were the consequences of the restructuring of labor and land use in flax-growing households? Why did extensification occur? Although the data do not yet point to unequivocal answers, these questions lie at the heart of our understanding of later Mesopotamia's temple and palace economies.

#### THE REORGANIZATION OF LABOR

Whatever the productive strategy pursued, changes in household production will entail restructuring of household labor. Some labor might have gone into sheep herding, but it is unlikely that all the flax-growing labor would have been diverted to pastoral activities. First of all, as we have seen, less labor and different scheduling are required to herd animals. More important, there were probably pastoralists already occupying the steppe margins of the Mesopotamian alluvium (Zarins 1990), and we have good reason to believe that they were exchanging animals and animal products with farmers. By the late 3d millennium the steppes to the north and east were apparently under direct control of military officials, and the taxes delivered in the name of military landholders were mostly livestock (Steinkeller 1991). Yet even in this later period there are glaring lacunae in our understanding of economic strategies in the Mesopotamian periphery, and the strategies of nomadic groups remain difficult to document.

The earliest archaeological evidence for animal husbandry from southern Mesopotamia, at Tell el 'Ouelli, indicates that very few sheep and goats were consumed by villagers, who relied more on cattle and pigs (Huot 1992:193). Whether these few sheep and goats were raised by members of the 5th-millennium households that consumed them would be difficult to document. It is, however, a reasonable guess, since archaeologists link the emergence of truly specialized pastoral producers—nomadic herders who could supply extra animals to settled communities—with the exchange of meat, dairy products, hair, and wool for surplus agricultural produce. Pastoralism, of course, dates to the Neolithic, but the increasing segregation of pastoral labor from settled villages to fully nomadic groups accompanies the development of an agricultural surplus and a system of exchange for animal products (Lees and Bates 1977:827; Bonte 1981; Galvin 1987:120). The question most pertinent to this discussion is whose labor went into herding as wool became increasingly important.

We may infer from archaic texts that during the Late Uruk period at Warka animals owned by a religious establishment were entrusted to the care of shepherds for an entire year. Yet the degree to which the herders were autonomous or attached to the establishment remains unclear (Nissen 1986:330; Green 1981:15). Further-

more, the records of an elite institution surely document only one segment of a varied economy that included rural populations whose economic transactions have not been preserved in texts (Hunt 1991). It is unclear to what extent agriculturally based households may have also participated in animal production in the 3d millennium B.C., when specialized animal production was widespread (Zeder 1991, 1988; Stein 1987). From texts we can document consumption of animals by elite establishments. Furthermore, archaeozoological remains from Early Dynastic III Lagash contain high proportions of sheep and goats that were apparently consumed on site, but no appropriate data have been recovered from rural sites to document animal production outside of cities (Mudar 1982). Mudar (1982:26) points out that the remains from an administrative and possibly a domestic context in one of the great Mesopotamian cities of the 3d millennium indicate consumption of animals but may not fully reflect herding activities and management. Animals raised for their wool were perhaps ultimately eaten in cities. Textual evidence from Tell Drehem (Ur III period) corroborates the evidence from Lagash. At Drehem, animals for butchery and consumption were received from herds whose management is not detailed in the available texts, suggesting the possibility that (by the late 3d millennium) herd management lay outside the control of the administrators who were collecting and butchering animals (Zeder 1994b). Were animals brought in from rural settlements? Were they acquired through exchange? Some animals were apparently acquired from fully nomadic pastoralists (Rowton 1973, Zeder 1994b, after Jones and Snyder 1961:43–44). Some shepherds, however, held land, according to land sale documents from the Fara period (Gelb, Steinkeller, and Whiting 1991:17, 20). It is therefore unclear from the evidence at urban sites exactly whose labor contributed to sheep herding for wool production, especially since the textual evidence for specialist occupations spans a thousand years of changing social and economic conditions. It is perhaps safest to suggest that by the 3d millennium some personnel attached to temple and palace households continued to serve as specialized shepherds, while nomadic pastoralists were supplying animals as well.

Archaeological patterns of rural settlement in southern Mesopotamia vary regionally, with, for example, an increase of small rural settlements around the urban center of Uruk in the south and the abandonment of rural settlements in the north (Adams and Nissen 1972: 18–19; Adams 1981:61–66). Possibly there is a dynamic between specialized herders and rural cultivators that might be invoked to explain these patterns, but I do not see enough evidence to suggest an explicit link between settlement patterns and the socioeconomic development of households. One might speculate, for example, that in some regions some household members were diverted to increasingly specialized labor in pastoral activities, while other household members' labor and indeed entire households were increasingly absorbed into large estates that provided fodder, barley grain, or graz-

ing rights in support of herders and their flocks. Nevertheless, this reorganization, even if supported by other data, can hardly by itself explain all the shifts and variation in settlement. Pastoralists remain difficult to trace in the archaeological record; their remains are all but undetectable in the once-agricultural ancient landscape.

Other remains, such as economic documents recovered from a range of sites, estates, and periods and ultimately detailing different historical relationships of peoples and resources, do offer some perspectives on changes in households with the advent of a new source of fiber. Most documents inform Assyriologists about labor and production in large estates (temples and palaces). To understand labor and production in prehistoric domestic contexts using such documents, archaeologists necessarily employ direct historical parallels, extracting some generalities about economic activities, divisions of labor, and relative status from later (usually Ur III) texts and inferring their existence in earlier periods of Mesopotamian prehistory. While this method glosses over periods of tremendous cultural, social, and economic transformation, it remains an important approach.

During the 3d millennium, temple weavers, including orphans and poor women dedicated to the temple by impoverished kin (Gelb 1972), were uniquely disenfranchised among craft specialists.<sup>6</sup> They were full-time laborers with relatively low wages or rations and had no apparent "family" in a domestic household (Gelb 1972; Maekawa 1980, 1987; Wright 1996:29–31, 38). They were overwhelmingly women (Wright 1996:33; McCormick 1993), and weaving moreover was widely identified with females in Mesopotamian ideology (Wright 1995). Archaeology's challenge is therefore to understand how weaving came to be especially identified with women and how far into Mesopotamian prehistory this situation extends. Zagarell (1986:419, 427) has argued that sealings and seals depicting so-called pigtailed women show women weaving in Late Uruk workshops. At issue in this discussion is how women weavers became attached to state workshops with little control over their own subsistence. It is most parsimonious to assume that they developed weaving skills in independent (kin-organized) households in which textile production had a long tradition and from which labor (women's and men's) was increasingly siphoned off for the use of the developing Mesopotamian state. This need not mean a gradual development; the emergence of temple economies must have entailed profound and revolutionary restructuring of social relationships.

Independent households were perpetuated through kin-based relationships among members who shared and divided tasks for subsistence and reproduction

6. Gelb (1972:12) argues that the temple households served as a "collecting center . . . for women, children, orphans and foundlings, and masses of other rejects of the society who were offered ex-voto to the temple or were forced, directly or indirectly, to work for the temple because of economic stress."

throughout prehistory. As the basis for subsistence—agriculture—changed, so would task-sharing and relationships among household members. If the advent of wool production meant that only a small portion, if any, of agrarian household labor shifted to animal husbandry, then the rest of the labor freed from fiber (flax) production would have had to be redirected. Several potential tasks for redirected labor include the production of other agricultural products (perhaps a surplus of agricultural staples) or specialized crafts. Leaving aside for the moment the purely economic consequences of newly available labor and the necessity of obtaining wool, one must consider the effect of a labor shift on the relationships among producers within agricultural households. Specifically, one must ask how the status of *some* women changed so much that they ultimately became encumbered weavers in estate workshops, alienated both from their subsistence base and from the rights and status conferred by kinship.

Family structure in some agricultural communities has been shown to be closely linked to the organization of labor. For example, among peasant farmers in Austria, the labor requirements of different economic modes (characterized by one or two dominant economic activities such as flax growing and cattle raising) determine family form. Whether and when family members split off or remain within households can be influenced by labor demands. Seasonal and cooperative needs for labor may induce marriage at an early or late age, coresidence with an older generation, remarriage of widows, and support of farm hands and day laborers attached to the household (Mitterauer 1992:143, 149). Families, of course, are not always discrete social units that by themselves constitute households (Sahlins 1972:77). Extended families, lineage members, dependent clients, and, in some cases, slaves and chattels may also belong to households (Gelb 1979, Diakonoff 1976–77 [1973]). In small-scale agricultural societies, however, kinship relations generally do govern household-based production. Where kinship relations are the primary organizing principles of labor contributions, a shift in labor requirements will predictably affect kinship relations over several generations (Smith 1987).

To understand the consequences of a shift in textile fiber production, it is worth summarizing, necessarily cursorily, some of the changes in social organization in southern Mesopotamia. Throughout the 1,500-year-long Ubaid period preceding the development of cities in southern Mesopotamia, hierarchical elites probably mobilized agricultural surplus to finance community activities and labor projects of large households (Stein 1994) or to support craft specialists producing goods for long-distance exchange (Oates 1993). Elites with an interest in manipulating resources for their own benefit presumably emerged from the inherent tensions within kin-structured communities (Gailey 1987, Diamond 1951, Diakonoff 1969). We know almost nothing of the particular, contingent social and political circumstances within which this transformation took place. It is in part by examining the fully established socioeco-

conomic institutions of later, historical periods that archaeologists may speculate on the development of Mesopotamian social and political life.

Temples and palaces were historically loci of political power and controlled large tracts of land, domestic livestock, and labor. Temples (the foci of urban life) grew as socioeconomic units as groups of people joined them. It is likely that lineage heads initiated such decisions, perceiving benefits to themselves and release from obligations of personal reciprocity in joining and “persuading” their lineages to join the temples of gods, in which they took on the functions of priests. Hints of this survive in interpretations of the texts of land acquisitions by temples (Gelb, Steinkeller, and Whiting 1991:31), but these texts are the glimmerings of a distant past, and their meanings are hard to discern.

Although most social and political relations of the Ubaid period elude clear definition from the archaeological record, the basic socioeconomic unit was surely the agrarian household, as is true for most agricultural, pre-industrial societies (Sahlins 1972:76; Smith 1987:297). Mesopotamian households, like more recent ones, were subject to change with changes in agricultural labor, crops, livestock, and land. They must also have varied from region to region and period to period. Texts offer information on specific historic households—who were members, their relationships to each other, and the resources they held, produced, and consumed—at various times in the past (e.g., Stone 1987, Yoffee 1988). Archaeologists have had to suggest models for household composition and dynamics based on material remains—house size, indicators of wealth and status, and debris left over during production of foods and crafts (e.g., Smith 1987). A recent analysis suggests that some households prior to and at the outset of the Ubaid period in the northern Mesopotamian plain may have expanded both in size and as foci of extended kinship identity (Bernbeck 1995). Perhaps this development may be attributed to factional competition between extended lineage groups headed by chiefly elites (Stein 1994) seeking to enhance their own status.

Households in the 4th millennium are harder to characterize from archaeological evidence in southern Mesopotamia itself, but archaeologists are confronted with large temples along with written documents that attest to their economic operations in a newly urban landscape that included urban and rural households. Some of our understanding of socioeconomic development with the emergence of cities in 4th-millennium Mesopotamia is still speculative (Zagarell 1986), but anthropologists can infer shifts from purely domestic to domestic and workshop-based production, from less specialized to more specialized tasks in a new network of labor and labor roles (still including unspecialized labor), from landholding producers to land-alienated producers in a society of landed and landless, and from kinship- and household-based status to increasing stratification based on class relationships and sometimes gender hierarchies (table 3).

We may be certain of one aspect of women’s labor in

prehistory. Women are both symbolically and materially reproducers as well as producers (Gailey 1987:x), and their potential contribution as reproducers is critical in all socioeconomic circumstances. In kin-based domestic units, women typically bear and rear or participate in rearing children as a fundamental productive task. Other labor is likely to be organized according to individual women’s ages and statuses. A change in agricultural labor demands in a household might mean that (reproductive) women contributed proportionately less agrarian labor (e.g., Boserup 1970, Burton and White 1987, Ember 1983) if conflicts arose with child care and domestic chores compatible with child care (Brown 1970).

In the Mesopotamian case, it is unlikely that all women would have left home (at least periodically) for perhaps an entire growing season in order to graze sheep. Labor freed from flax growing may have been reorganized so that women performed fewer agricultural tasks and more textile production within the household. When textile fiber had to be obtained from nonagricultural land, household-based weavers would have experienced diminished access to economic resources—both the fiber for weaving and the subsistence crops still raised on land they less frequently tended. If women in poorer households with access to only marginal land were especially affected in this way, some changes in their social status with the decline of their economic status would be expected.

A change in the household organization of labor affected not only the status of some women but also gender and kinship relations as extensification proceeded. Ultimately anthropologists expect that understanding such changes will help describe the rise of gender hierarchy in the initial emergence of class relationships (see Gailey 1987:xvii, 20–23). Not all women in Mesopotamian states were subordinated (Pollock 1991), but those who were had limited access to agricultural resources, and their reproductive capabilities were appropriated to the service of the estate from which they received their rations (Gelb 1972). Their situation is amply documented in Ur III cuneiform administrative documents (e.g., Lambert 1961; Maekawa 1987:52–53; Waetzoldt 1987). (For reviews of the historical status of women, their access to resources, and gender roles, see Dalley 1977, 1980; Pollock 1991; Steinkeller 1982; Winter 1987; Wright 1995, 1996; van de Mieroop 1989.) Women whose direct contribution to subsistence was diminished through fiber extensification may have experienced a decline in status, and these were the women whose labor could ultimately be devoted to larger, wealthier households better able to support them, such as temples (e.g., Gelb 1972). These were women whose lowered status in marginal households made them particularly alienated when lineage groups joined temples.

If multiple strategies were followed in the course of agricultural development in ancient Mesopotamia, it is understandable that some women may have been disproportionately impoverished in a developing class-based hierarchy while others enjoyed high status and

TABLE 3  
*Major Changes in the Development of Early Mesopotamian Civilization*

Date (B.C.)	Period	Social and Political Changes	Economic Changes
4500 3500–3100	Ubaid Uruk	Headmen (?), hierarchical elites Increasing social differentiation, class relations	Use of plow, larger households Earliest texts, first cities, attached specialists, religious administrations, wool sheep widespread
3100–2900 2900–2300 2350–2150	Jemdet Nasr Early Dynastic Akkadian	? City rulers, rival city-states Early legal codes, first regional state, Sargon of Agade, new language	? Palace and temple estates Cuneiform writing
2150–2110 2110–2005	Guttian interregnum Ur III	Local resistance? Shift of growth and power toward northern Mesopotamia	Chaos Detailed economic texts from workshops, serious agricultural salinization, land sale allegedly forbidden

access to resources and power (Pollock 1991). In later periods elite women, who could still sell land and own other resources (Gelb, Steinkeller, and Whiting 1991, Steinkeller 1982), dominated textile production in wealthy households and controlled the ultimate disposition of the textiles produced (see, e.g., on northern Mesopotamia, Dalley 1977, 1980). Conversely, women were not the only ones who may have lost access to economic resources with the development of Mesopotamian states; many people lost direct access to agricultural land.

#### LANDHOLDING ESTATES IN THE METAPHOR OF HOUSEHOLDS

To understand how the development of encumbered women's labor fed the development of the Mesopotamian state (Zagarell 1986, Gailey 1987), it is imperative that we understand the development of estate economies—the production and distribution of commodities outside kin-organized households (Fox and Zagarell 1982:8; Zagarell 1986). A vast literature discusses both the evidence for and the functioning of temples, palaces, and large private estates in different periods of Mesopotamia's history (e.g., Gelb 1971, Foster 1981, Postgate 1992, Yoffee 1995, Zettler 1992a). Textile workshops belonged to temples and palaces, which have been widely characterized as households (e.g., Gelb 1965; 1971:139; 1972; 1979; Zagarell 1986) or houses of gods (e.g., Postgate 1992:114) in which, for example, priestesses were married to gods in the familiar idiom of kinship. For much of Mesopotamia's history, so-called public households (with land and labor under control of crown, temple, or nobility and organized by class relations) coexisted with private-communal households (with landownership and labor organized by kinship relations) (Gelb 1979; Zettler 1992a: 218; Diakonoff 1976–77:55). Public households or estate economies probably emerged from community organizations initially structured along kinship lines (e.g., Diakonoff 1991:73; Foster 1982:113; Fox and Zagarell 1982; Gelb

1979:5; cf. Bernbeck 1995). Tensions between kinship groups struggling to maintain control over the resources necessary for their survival and reproduction (watered land, access to women's reproductive capabilities) and emerging elites seeking to co-opt these resources to their own exclusive benefit may be responsible for the transformation of early socioeconomic relations and the emergence of estates. The development of estate economies deserves (and has received) far more extensive treatment than can be offered here. It is nevertheless helpful to examine evidence pertaining to access to land—a fundamental resource in ancient Mesopotamia around which (with labor) temple economies formed.

As Foster (1981:299–30) points out, “criticism and reaction to the temple-state hypothesis have centered primarily on the question of land ownership.” Underlying well-known models of Oriental despotism were assertions that early Mesopotamian resources and workforces were exclusively controlled and organized by temples or palaces. Textual evidence for different forms of landownership has exploded the supposition that large estates held such exclusive dominion, and Assyriologists have shown that rural community groups, elites, and temple laborers enjoyed different access to agricultural land at different times and places. Some community groups apparently retained collective control over land throughout Mesopotamian history (Gelb 1971; Diakonoff 1991:80), although there is disagreement about the relative importance of communal landholding during different periods.

A long tradition of communal landholding in Mesopotamia perhaps provided a conceptual format for temple control and allocation of access to agricultural land. Temples assumed the role of a landholding household to which members of the temple labor force were attached. At least initially, temple elites presumably created obligations to the temple by employing a familiar rhetoric of obligations to lineage and community group. Kin-based access to communally held land lay at the heart of Mesopotamian society, but as temples acquired land the terms if not the terminology of access

to land were radically transformed (Foster 1982:113). Temple acquisitions of land may have entailed acquiring the kin to work land (Yoffee 1995:289) or incorporating landholding groups as members of the temple (Gelb, Steinkeller, and Whiting 1991:32). In any case, prebend allocations of land or land access conventions in the 3d millennium underscore that the temple operated as an institution socially knit by relations of class (rather than relations of kin) masked by a metaphor of the household of the god. Land set aside ostensibly to maintain the god effectively maintained an elite group that no longer took part in the labor of agriculture.

Understanding access to agricultural land is compounded by multiple conventions and regional and temporal variations (e.g., Zettler 1992a:113; Foster 1982). Yoffee (1995:290) has recently summarized what is known about landownership in ancient Mesopotamia, emphasizing regional differences in landholding and the juxtaposition of different systems of landownership during long periods of Mesopotamian history. Furthermore, every individual sought to negotiate his or her status in multiple contexts, and many persons were participants in multiple systems of land tenure, usually through membership in various communal organizations (Diakonoff 1975:126). These complexities and potential, indeed deliberate, ambiguities in relationships that guaranteed access to land<sup>7</sup> make it extremely difficult to describe simple trends in landholding throughout Mesopotamian history. Nevertheless, since variable access to land serves as a crude index of socioeconomic status, it would seem critical to evaluate changes in land tenure as an important insight into changing social relations in ancient Mesopotamia. Ancient records of landholding convey an impression of gradual, evolutionary change in landholding conventions, but the gradual trend so evident in hindsight was most likely experienced as a series of rapid, radical transformations and expressed in an ambiguous and obscuring language of historical continuity.

#### LANDOWNERSHIP AND TEXTILE EXTENSIFICATION

Evidence exists for the loss of access to agricultural land by both men and women. Records of land tenure suggest that consensual agreement, or at least kin witnesses, traditionally accompanied important decisions about land access and landholdings (Gelb, Steinkeller, and Whiting 1991:16; Diakonoff 1954; 1991:76). According to Gelb, this traditional framework had shifted by the middle of the 3d millennium with the appearance of individuals who could *by themselves* sell land. Various forms of land tenure coexisted thereafter for millennia. From this significant development, interpreted as the emergence of private, single ownership of land (Gelb 1971), one may also infer that the relations

of household members underwent an important transformation.

The evidence on land tenure and its implications for social relations in ancient Mesopotamia comes from a group of ancient texts known as kudurrus. The earliest of these bear no relation to the later Babylonian documents known by the same term (Brinkman 1982:273) but are stone and clay records of alienation or sales of land and in some cases, other property (Diakonoff 1954; Gelb, Steinkeller, and Whiting 1991:16). Kudurrus from the middle and late 3d millennium can be read with some confidence. The essential components of a kudurru were the size of the alienated field and the names of buyer and seller(s). They were apparently intended to document the buyer's acquisition of land rather than serve as a binding contract between buyer and seller (Gelb, Steinkeller, and Whiting 1991).

Any attempt to trace changes in land tenure must take into account the thousand-year span of extant kudurrus from southern Mesopotamia and the changes in political economy throughout this time. The earliest texts have yet to be fully deciphered, and it is possible that the Sumerian term now read as "to alienate" (DUG.SILA) may mean something different (Gelb, Steinkeller, and Whiting 1991:30). Thus the kudurrus contemporary with the introduction of wool-bearing sheep and extensification of fiber production can be interpreted only with great caution and by extrapolation from interpretations of later ones. From the Sargonic period (2350 B.C.) through the Ur III period (2150–2000 B.C.) the format of kudurrus does show interesting changes in the documentation of land tenure (Gelb, Steinkeller, and Whiting 1991; Diakonoff 1954; 1991:94). A scarcity of kudurrus dating to the Ur III period may mean that for a brief period the sale of land was forbidden (Gelb 1971:147; Diakonoff 1991:94). Diakonoff (1975:126; 1991:80, 88) has consistently argued that the ideology of community-based landholding was maintained throughout Mesopotamian history, a view shared by Yoffee (1988). One might predict that with the development of the Mesopotamian state different landholding conditions could persist side by side as temple, palace, and kinship groups sought to control agricultural land and its products.

A typical formula for a kudurru shows the sign for field, numbers (measurements), a sign for alienation, and the name of the buyer, followed by sellers listed as *bēlū eqlim*, "lords of the field," or *ahhu bēlū eqlim*, "brother-lords of the field" or "sons of the field" (including women) (Gelb 1979:82), whose family relationships appear along with commodities given to the sellers (Gelb, Steinkeller, and Whiting 1991:27). "Sons of the field" in Sargonic kudurrus receive very small compensation in the form of bread, fish, and milk (Diakonoff 1954:22; 1991:76). By the Ur III period, secondary sellers and additional payments and gifts had disappeared altogether (Gelb, Steinkeller, and Whiting 1991:17), although there are admittedly almost no texts documenting land sales at all from this period. It is extremely difficult to be certain of the significance of the

7. For example, the *naditu* women in the Old Babylonian period were priestesses who were attached to the household of a god but retained access to and could even enlarge family landholdings under the auspices of their office (Postgate 1992:132–33).

land sale conventions that have survived in ancient texts (Postgate 1992:184), but it is highly likely that they reflect transformations in land tenure, that is, that control of land suitable for agricultural production was restricted to increasingly few individuals as wealth and class distinctions widened (Diakonoff 1954:29; 1969). Gelb, Steinkeller, and Whiting (1991:17) summarize their interpretations thus:

all our evidence permits us to say is that during the Fara and Pre-Sargonic periods [2600–2350 B.C.], familial (or more broadly, communal) consent was required to permit the alienation of real property by individuals or nuclear families. The importance of such consent declined visibly in the Sargonic period, but only in southern Babylonia. In Ur III times, there is no evidence for any form of familial or communal consent in sales of orchard and houses (sales of fields apparently were prohibited<sup>8</sup>) with such transactions now possibly being supervised and authorized by the state.

The earliest kudurrus all come from nonexcavated contexts, can only with great uncertainty be linked to specific sites, and according to the paleography of archaic signs date to the Jemdet Nasr period (3000–2900 B.C.) These kudurrus are contemporary with the archaic tablets documenting wool-bearing sheep from Uruk (Nissen 1986:330; Nissen, Damerow, and Englund 1993:92) and the widespread use of wool. Assyriologists are not universally confident about the kudurrus' interpretation, and their uncertainties stemming from the antiquity of the writing may ultimately also be exacerbated by inherent ambiguities in texts that could have been written (and read) to reify both kinship and state ideology in a contested domain of land access. Some later land-sale documents do clearly show individual ownership and the exclusion of multiple sellers or kin witnesses from land alienation transactions. Yet some scholars have legitimately questioned *when* this significant shift actually occurred. By the time some "brother-lords of the field" received only nominal gifts of bread and fish for their land, they may actually have served as witnesses in name only, their assent being no longer essential for land sales.<sup>9</sup> Netting (1982:36) has

8. In an earlier consideration of the lack of documents for land sales in Ur III times, Gelb (1971:149) underscores the pitfalls of negative evidence in inferring prohibition of land sales and, by default, ownership of all land by the state. He suggests from a few scattered texts that private ownership did exist, that multiple and individual ownership coexisted, and that in the Ur III period "land owning individuals cultivated their land under some kind of control or supervision of official bodies" (p. 150). Foster's (1982) review of institutional landholding in Sargonic Sumer amply indicates both the complexity of the evidence and the coexistence of different categories of landholding throughout much of the period under discussion.

9. This may be the case for the Manishtushu Obelisk, a kudurrus which records multiple land sales during the mid-3d millennium. Diakonoff (1954:26–29) suggests that this records alienation of very large tracts of land, which probably still required the consent of multiple "elected" representatives of a clan. He also proposes that these clan members had by this time acquired greater control

suggested that the activities of the "brother-lords of the field" were a relict of corporate kin groups—groups of related individuals who hold land in common and "function as an individual with relation to their property" (Hayden and Cannon 1982:134; Goodenough 1951:30–31). If the arrangement of signs on the earliest (archaic) kudurrus does document land alienation,<sup>10</sup> then corporate land tenure was an ancient tradition in Sumer.

Corporate groups (often lineage-based) and their collective control of important resources are familiar institutions in the ethnographic literature. Numerous ethnographic examples suggest strong associations between such groups and corporate holdings of agricultural land. Hayden and Cannon (1982:149–50) discuss corporate control of wild resources and trade routes, but they correctly note that land is "the most critical resource in most agricultural societies." Not surprisingly, therefore, land availability plays a critical economic role in maintaining the social constitution of agrarian societies. A strong correlation links the emergence and strengthening of lineage-based corporate groups and moderate land shortage (Hayden and Cannon 1982:150). In the case of prehistoric Pueblo societies, corporate, lineage-based landholding, as inferred from architectural configurations, seems to have increased as a direct consequence of greater competition for agricultural land (Adler 1996). Where a few individuals can control access to important resources, they are likely to do so to their own benefit, but with increasing land scarcity it is increasingly difficult for an individual to deny access to many other competing individuals. Boundary markers become notably more pronounced as land becomes scarcer (Stone 1994): good fences make good neighbors. Where good fences fail, kin-related groups acting as a single owner may more easily fend off other individuals while also providing collective labor on relatively large landholdings. Although it remains impossible to pinpoint precise thresholds at which corporate landholding groups form and dissolve, various writers have noted that where land resources are extremely scarce, lineage strength declines and single ownership increases (Hayden and Cannon 1982:150–51; Netting 1990).

over family resources and that such representatives required little more than token assent from more dependent clan members. The Manishtushu Obelisk offers an important insight into the nature of society, particularly the hierarchical relationships of sellers (Diakonoff 1991:88; Zarins 1992:70). It stands out for the size of tracts and multiple sales recorded. It is at the same time a source of information on lineage-based communal landholding and a powerful testament to the new practice of single ownership of land with land purchases by a single buyer, in this case the *lugal* or king.

10. Gelb, Steinkeller, and Whiting (1991:31) suggest several alternative interpretations for the earliest kudurrus: (1) They record cumulative records of multiple purchases by a single buyer (see Yoffee 1988 for a much later but similar case). (2) They are land grants from an institution. This would explain the relatively large areas involved but seems unlikely in this early period. Royal land grants of this type are known from thousands of years later. (3) They (a) record the transfer of family-/corporately held land to a temple household when the corporate group joins the temple or (b) they list the field holdings of temples.

Of course, kin-based landholding is historically contingent, governed not merely by scarcity of agricultural land but by long-term cultural templates and social and economic antecedents. Circumstances of agricultural production, land availability, and socially organized land access vary widely, but changes in one affect the others. Corporate land tenure is more than likely to be affected by agricultural intensification, in which labor requirements, labor inputs, land use, and capital investments in land may all change dramatically. Intensification may take many courses. One may entail no more than a simple increase in efficiency achieved by reorganizing agricultural holdings to take maximum advantage of different land resources. This in turn may produce greater yields (Brookfield 1972:32). This form of agricultural intensification is also likely to affect people's access to land, because labor requirements and usage efficiency play a significant role in land tenure (Netting 1982:31). Numerous social histories of post-medieval Europe have emphasized the inefficiency of farming on the increasingly small plots resulting from partible inheritance. The growing scarcity of agricultural land and the increasing inability of all landholders to make a living from farming have repeatedly been implicated in the emergence of a landless class in post-medieval Europe and the beginnings of industrialization through craft specialization in cottage industries (e.g., Skipp 1978; Schlumbohm 1992; Mendels 1972, 1982; Kriedte, Medick, and Schlumbohm 1981). The point is not to draw a facile comparison between the transition to industrialization in Europe and textile specialization in Mesopotamia but to emphasize the significance of observed relationships between land scarcity, land tenure, and social reorganization.

In the case of fiber extensification in southern Mesopotamia, reorganization of labor deprived some members of the corporate group of direct access to the resources used in production. For those who wove, wool may have been obtained from sheep over which they had little or no control. Weavers depending on wool now depended on shepherds. Reorganization of labor within households may have resulted in craft specialization (textile production) by some individuals whose labor was freed from fiber producing. As corporate groups joined temples or transferred landholdings to temple and palace households, such craftspeople were further alienated from land by the transformations in their social relations. As members of temple households maintained by service obligations to gods, crafts-women who had little access to land ultimately formed the basis of encumbered labor in large workshops. Surely the origins of this system lie in unequal access to land and dependent labor in the landholding households. Ultimately it was the producers of agricultural crops who retained access to land, to the means of exchange for wool, and who emerged as individual landholders in subsequent eras.

There remains the critical question of when a shift in corporate-based access to land tenure to individual landholding actually occurred. Within self-sufficient

households, replacing flax with wool would have been unlikely to precipitate immediate changes in coresident kin-based corporate landholding. Even in corporate groups, not all authority is evenly shared within the group. Some members co-opt greater authority. But with agricultural intensification, such authority was eventually transformed into property rights for a few. Certainly, fewer individuals emerged with greater control of the land, among them no doubt the elites who ultimately directed the state and temple households of the 3d millennium. As a few elites gained greater control of landholdings, dependent people attached to corporate groups through kinship relations became increasingly alienated from agricultural land. (This tendency would have been accelerated if a labor-intensive crop had been replaced with one requiring fewer agricultural hands in weeding and processing—e.g., a cereal.) I have suggested that the extensification of fiber production was linked to the processes that ultimately generated individual property rights. Nevertheless, it remains clear that the documentation of this process—the gradual disappearance of “brother-lords of the field” from kudurrus—occurred 700 years after the Uruk period in southern Mesopotamia. This need not imply that the introduction of wool, agricultural intensification, and the partial abandonment of corporate land tenure were nonsynchronous. “Brother-lords of the field” probably fulfilled relict roles (for which they received only token compensation) during the periods from which Assyriologists confidently interpret kudurrus. Land tenure laws and conventions frequently lag considerably behind actual changes in landholding (Netting 1982), and in Mesopotamia conventions regulating inheritance and alienation of property (such as houses) may have changed much more gradually than social circumstances. In a study of Old Babylonian (2000–1600 B.C.) property, Yoffee (1988) suggests that inheritance rights attested to in Old Babylonian archives may have antecedents in the early prehistoric villages of the Neolithic period. If conventions of property rights and inheritance indeed changed very slowly, a 700-year lag between the inception of individual control over land and the expression of individual ownership in textual records seems plausible. Strong formal adherence to the idiom of corporate land tenure even as social relationships and the meanings of kinship were changing may also account in part for the present-day difficulty in interpreting the surviving record of land sales.

The ramifications of agricultural extensification and land tenure changes are of profound significance in understanding the transformation of Mesopotamian political economy and the development of city-states. Loss of access to agricultural resources would have entailed changes in kinship and class. Temple and palace households were developing in tandem with large private households. All three employed encumbered labor, making particular use of women in textile workshops. Changes in access to textile fibers by no means preclude other equally significant alienation processes. Not all

women were equally affected by the changes. Fiber extensification, however, was a major contributor to the status of women workers in late-3d-millennium workshops and a significant, hitherto unrecognized component of the developing Mesopotamian political economy.

## Causes of Extensification

This study has thus far argued the case for the occurrence of fiber extensification during the Late Uruk period and explored some of the possible consequences of a shift in the means of textile production. Fiber extensification is a manifestation of agricultural intensification, the causes of which in ancient Mesopotamia remain difficult to identify. Some researchers have speculated that population increases (Smith and Young 1972) or climatic and environmental changes (Hole 1994) caused agricultural intensification. Other approaches to the development of social complexity in southern Mesopotamia ascribe less importance to agricultural intensification itself than to the development and manipulation of surpluses and exchange networks allowed by production in excess of subsistence needs (Algaze 1993, Stein 1994). This latter approach accords well with recent emphasis on the multiple courses that intensification may take and the problems in differentiating among them archaeologically (Morrison 1994, Costin 1991). One of the many outcomes of agricultural intensification may be the emergence of a range of specialized activities. Costin (1991) emphasizes significant differences between “independent” and “attached” specialists and, ultimately, the causes of these different socioeconomic statuses. Notwithstanding the problems of distinguishing between independent and attached craft specialists in the archaeological record (especially so poor a record as Mesopotamia’s), Costin’s definitions handily summarize differences between the earlier linen weavers and later wool weavers in the 4th- and 3d-millennium Mesopotamian textile industry. Independent specialization she associates especially with market demand, unequal resource distribution, and economic incentives for individuals or communities to substitute craft specialization for subsistence resources where resources are lacking. Attached specialists, in contrast, can occur only where an elite class maintains them in the interest of restricting circulation of their products (Costin 1991:12). The ritual and social significance of linen cloth in later periods (Waetzoldt 1972: xx–xxii) suggests that its production and circulation may have been restricted by elites, but it is also clear from careful accounts of wool workshops that the value of cloth was determined by the labor spent in producing it (Waetzoldt 1972:158–59; see also Pettinato 1991: 249–50 for a similar conflation of flax and wool at Ebla). In the case of Mesopotamian textile producers, our information is almost entirely restricted to the written records about attached specialists serving the elite-

managed institutions, and it is therefore very difficult to speculate about independent specialists.

It has been less difficult to imagine how attached specialization may have emerged (Morrison 1994). I have suggested that independent specialists (household-based weavers with access to land through corporate holdings) were increasingly alienated from resources and that their dependence on powerful landholders (household estates, temples, or palaces) increased. In many ways, this model, while covering only one sector of the economy and fraction of Mesopotamia’s 3d- and 4th-millennium encumbered workforce, builds on earlier discussions. For example, Zagarell (1986:417–18) has suggested that women captives from military forays “represent the earliest stage in the emergence of public/communal production.” Although raiding surely did produce captives (and the use of non-Sumerian names in later workshops would corroborate this suggestion), I suggest that other important processes were also at work. I have here explored the internal processes by which household producers took the first steps to specialization, class differentiation, and encumbered labor *within* Mesopotamian society. I argue that the shift to wool production and the within-household changes that it entailed launched processes that ultimately contributed to a perceived need for the attachment of women weavers to temple households.

Major debate still divides Mesopotamianists who advocate either population pressure (demographic) or exchange (nondemographic) incentives as the most significant factors in the development of social complexity. Although the ultimate cause of a shift from flax to wool production lies beyond the present discussion, one can appreciate that the use of marginal lands for fiber production could have appealed to a population experiencing increasing pressure on limited agricultural land. Wright (1989) has speculated that herding in northern steppes and highlands for the benefit of southern Mesopotamian populations may have provided a significant impetus for territorial expansion during the late 4th millennium. Many of the Late Uruk sites associated with expansion from southern Mesopotamia are the same sites at which archaeozoological evidence of a new large breed of (wool-bearing) sheep appears (e.g., Jebel Aruda, Umm Qseir, and Tell Rubeidheh). Archaeologists have struggled to explain late-4th-millennium expansion. Algaze (1993, 1989) advocates a model of cross-cultural exchange of Mesopotamian goods—including a textile surplus—for essentials and exotics rare on the southern Mesopotamian plain. His critics have pointed to the invisibility of exotics in Mesopotamia’s archaeological record (Johnson 1988–89; Pollock 1992: 327). Textual evidence from the later-3d-millennium records of textile-producing workshops shows that by this time the highest-quality textiles were not exported but consumed internally (Waetzoldt 1972:72), and ration tallies indicate that what was produced was dispensed within the landholding household. Furthermore, the Syrian steppe today and throughout history has been noted for its wealth in wool, and woolen textiles

were one of the major products in the city-state of Ebla during the 3d millennium B.C. (Archi 1988, 1993). Would elites in southern Mesopotamia have used wool extracted from the north to make textiles to pay northerners? Would northerners have required Sumerian textiles in the 4th millennium? Of course, as Helms (1993: 16) points out, imported goods and especially those crafted with recognized skill or knowledge may have political and ideological significance beyond their merely economic function.

#### TEXTILE EXTENSIFICATION AND THE URUK EXPANSION

As other researchers have noted, it is extremely difficult to interpret 4th-millennium exchange networks by referring to historical records from the 3d millennium. The question of the 4th-millennium activities of southern Mesopotamian Uruk intruders into the Syrian steppe will be best explained by the results of current archaeological research in the Syrian steppes and Euphrates basin, which increasingly provide evidence of longer-term contact or occupation (Boese 1986–87, Oates 1993) and a wider range of activities (Zeder 1994a). Apart from the appearance of a robust, probably wool-bearing breed of sheep at sites like Umm Qseir (Zeder 1994a) and Jebel Aruda (Buitenhuis 1988), there is to date no clear evidence of Uruk-period inhabitants' involvement in wool production. The degree to which their herding practices engaged specialized labor from within northern Uruk communities/households has never been examined. From the evidence currently available, it seems that specialized pastoralism first appears in northern Mesopotamia as a component of the development of rural-urban exchange networks in the mid-3d millennium (Stein 1987, Weiss 1990), although Galvin (1987) argues for an even more recent date. From Uruk sites in arid rangelands, faunal evidence points to a mixed strategy of hunting and herding. This suggests a somewhat transient people with an opportunistic approach (Zeder 1994a:117). This picture contrasts to some extent with a strategy more focused on domesticated animals (including sheep and goat) in better-watered areas of northern Mesopotamia (Zeder 1995).

Archaeologists may expect appreciable regional variation in the local economic strategies and population interactions pursued by Uruk expansionists. There are undoubtedly economic aspects and regional experiences in Uruk expansion that cannot be illuminated by textile extensification. This extensification, however, does potentially offer a new perspective on the Uruk use of northern Mesopotamia's rangeland, and in this context it deserves closer scrutiny from archaeologists working in that region. The exponentially greater amount of pasture required to produce wool as a substitute for flax may have fueled northward expansion of Uruk populations already firmly committed to wool production or heightened north-south exchange. Ironically, it is from this expansion and its archaeological record in the Mesopotamian periphery that the best test of the fiber ex-

tensification model expounded here eventually may come.

## Conclusions

Through this study, a new model emerges for the development of some types of workshop production in ancient Sumer, and new insights are gained into the social and economic processes through which rigid social hierarchies first appeared. Mesopotamia experienced a revolution in textile fiber technology with the widespread introduction of wool-bearing sheep, and the most dramatic effects of this revolution were ultimately social and political. The development of workshops attached to large landholding establishments required the development of attached specialists, predominantly women alienated from land. Their alienation—economic, social, and political—cannot be adequately understood outside the context of economic developments in an agrarian-based society in which access to land fundamentally affects the social relationships of producers. The appearance of encumbered laborers here cannot be viewed as a demographic phenomenon divorced from agricultural intensification, nor can these particular textile workers be fully explained as the booty from raids beyond southern Mesopotamia's borders. Instead, this model explores one historical case in the development of complex societies in which women were first alienated through internal processes of agricultural intensification.

Although some of the data archaeologists would most like to see from southern Mesopotamia are still lacking (large exposures of rural and prehistoric settlements, analyses of artifacts, plant, and animal remains convincingly associated with domestic contexts), this model is testable. Distributions of weaving equipment, skeletal stress as evidence of reiterative tasks, and better documentation of crop remains such as linseed and summer crops (e.g., sesame? or summer weeds?) may offer multiple lines of evidence for the changing economic strategies outlined here. And finally, it should be possible to examine some aspects of Uruk expansion in light of the textile extensification model.

Changes in textile production played an essential role in the emergence and transformation of ancient Mesopotamia from a predominantly kinship-organized to a predominantly class-based society. Estates employing weavers embody this process, for such estates, viewed as households of the gods and kings, manipulated the metaphor of kinship to mask the state's control over labor and land. Fundamental conflicts of domination and resistance would have been played out in this arena. One might speculate that flax growing may have become a form of resistance to estate economies because flax growers retained control over the agricultural production of textiles. Linen ultimately became the cloth of gods and kings, perhaps signifying attempts by the estates to dominate textile production. But this remains speculation. Like invisible textiles, the social dynamics

that lie at the heart of this transformation can no longer directly be observed, but it is a materialist approach weaving economic conditions and ecological context into a fabric of social and economic interdependency that offers the best opportunity to infer social processes. Although we may remain unclear about the causes of change in the techno-environmental conditions of fiber production, these changes were critical components of transformation in Mesopotamian society and political economy.

## Comments

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Cultural reconstructions undergo constant remodeling by new information and the application of new informational constructs. McCorriston has identified how the practice of herding wool-bearing sheep in ancient Mesopotamia ushered in the commoditization of textile production, a change from household production of widely used linen to suprafamily workshop production of widely used wool. In agrarian civilizations, spinning and weaving are nearly as essential to life as agriculture itself, and family farm and workshop operations have often intertwined food and textile production at the household level, a gender-based division of labor with many shared facets. As agricultural and textile production are intensified a systemic shift in the status of various subsets of workers necessarily takes place.

The Mesopotamian changes, the effects of "agricultural intensification and territorial expansion," have strong parallels in the central highlands of Mexico in the Aztec (Postclassic) period (ca. A.D. 1150–1521), which ended with European intrusion and the imposition of sheep and cattle ranching—a monumental disaster for Aztec farmers overshadowed only by the cataclysmic loss of population due to introduced disease. But the Aztec period had been created in an earlier episode of intensification and expansion. Beginning ca. A.D. 1000, groups from the north migrated into the Basin of Mexico (Calnek 1982, Smith 1984). Many were agave (maguey, century plant) farmers, and they established farms along the Basin's piedmont, above the already cultivated (and usually permanently irrigated) alluvial plain. Because maguey sap can sustain the farming family's potable-beverage needs, these farmers could thrive in areas with little rainfall (< 500 mm annually). Maguey fiber was widely used—twined into rope, spun into thread for textiles. Maguey farmers were an enormous tributary base by 1519, about half of the Basin's 1.5 million population.

Textiles dominated Aztec tribute demands (Berdan 1996) and also figured in historical annals as a graphic

representation of those demands (as in the Codex Xolotl). Maguey fiber textiles met some tribute obligations, but cotton woven goods were far more common tribute items and represented one of Aztec Mexico's basic exchange media. Raw cotton was imported from warmer regions, spun into thread in the Basin, and woven into cloth by the commoners for the nobles, the only members of Aztec society who could wear cotton.

Cotton and maguey contrast sharply in terms of alienation of labor from product. Basin of Mexico commoners could not grow cotton, and they could not wear the cotton fabric that they were obliged to spin and weave. We do not know how they acquired raw cotton; they may have received it from their ruler's steward to give back as finished textiles and garments, or they may have had to buy it in the marketplace, which would have amounted to ruling-class double-dipping into the peasant tribute budget by making them pay for raw cotton and then invest many hours of time in converting it into finished products. This unknown, one of many, demonstrates the difficulty of modeling the labor invested in tribute payments.

Spinning of cotton and maguey is evidenced by spindle whorls, which have been widely found throughout the maguey-farming villages and represented in surface survey and excavation collections. It is appalling that without spindle whorls the whole Aztec textile industry would be archaeologically invisible. Fortunately, maguey- and cotton-processing whorls are abundant and demonstrate radical dimorphism (Parsons 1972): a maguey-spinning whorl is usually large (about the size of half a ping-pong ball) and showy, incised and highly burnished; the cotton whorl is dusty matte brown and the size of a small gumdrop.

Unfortunately, spindle whorl collections are useful for nominal but not ordinal analyses because the samples do not accurately represent the actual frequencies of the two spindle whorl types, and therefore issues bearing upon changes in textile production over time are beyond the inferential power of the material culture record. The few excavated collections are generally from plow-zone or other mixed context, and surface samples tend to overrepresent maguey whorls, for at least two reasons. First, the surveyor will tend to sample among the objects readily seen and select maguey whorl fragments. Second, maguey whorls are likely to be more widely distributed over the most extensive area of the site because (unlike cotton spinning) maguey spinning is not necessarily sedentary work; the spinner could take her project along when she went to the family's farthest fields to help with farm tasks.

Furthermore, the surface survey collections are inadequate to address culture change issues because they cannot be accurately segregated into separate components within the Postclassic and thus cannot be used to show changes within this period. With the onset of the Spanish Colonial period, of course, the modest degree of indigenous commoditization and alienation of labor was dwarfed by the complex process of economic and ecosystem redesign as maguey farms gave way to ma-

guey plantations, monocropped empires for the production of pulque. Maguey textiles were superseded by mass-produced cotton and wool.

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McCorrison's paper rightly points to the important part played by the evolution of woven products in ancient Mesopotamia. It is probably true that at some point in time dairy-products consumption increased, along with an emphasis on intensive wool production (Sherratt 1983). This shift to woolen textiles had an impact on the part played by women and herdsmen in society, the importance of steppes, the general balance in land use. The shift to wool is a much more productive process than flax cultivation (flax was known from the outset of the Neolithic), but wool and flax have different production requirements. Palaeozoology can help determine when this shift happened because it entails an evolution of the sheep and of its coat. It is therefore an important factor in the evolution of Mesopotamian societies towards greater complexity. However, a few comments are called for.

1. Ancient urban Mesopotamia should not be understood as covering the whole of the 3d millennium or all of the Sumerian world. The first Sumerian archaic texts that can be used (apart from the famous lists of the Uruk period) are those from mid-3d-millennium Lagash. When speaking about the Sumerian world, Sumerologists often quote the numerous texts from the Third Dynasty of Ur, which roughly spans 2100–2000 B.C. In other words, they use texts from the last century of the 3d millennium written within the frame of a very specific society whose overall state-control experiment lasted only 30 years. Moreover, these texts refer to state-controlled exchange networks, but parallel private networks probably existed as well and must have enjoyed much more freedom. Therefore, ancient Sumer should not be confused with Ur III.

2. The comparison with texts from Ebla (ca. 2400 B.C.) would be very useful indeed if it were more balanced and not merely a reference. Ebla's economy was based precisely on a large production of wool because the surrounding region was predominantly sheep-herding steppe, whereas lower Mesopotamia was better suited to irrigated cereals cultivation and used sheep-herding steppe only in a marginal way. The Akkadian world and the world of Ebla were not identical or interchangeable: they were two very different models of economic activities. Quotations from Old Babylonian texts (Dalley 1980) should also be carefully set against their chronological background. The Amorite period (Old Syrian and Old Babylonian) was the time when tribes of seminomadic herdsmen came to power. The political and social background was therefore very different from that of Ebla and Ur III.

3. McCorrison appropriately contrasts the period of emphasis on flax and meat production with the later period of emphasis on wool production. I would like to point out that recent <sup>14</sup>C calibrated datings for Ubaid 4 are 5000–4000 B.C. and not 4500–4000 B.C. (Huot 1994). Unfortunately, as she stresses, the period in which this shift in agricultural production occurred has disappeared from the archaeological record (at least in Mesopotamia) because the excavations of the past 150 years have focused too much on urban historical sites. Rural sites in Mesopotamia are known mostly from (old) surveys and were seldom excavated. Archaeological indicators such as specific tools are of little help: there are no spindle whorls specifically for spinning wool. And whereas good-quality agricultural land is needed for cultivating flax, infertile steppe is enough for producing wool in marginal regions, of which we hardly know anything! In other words, the archaeological indicators for pastoralism in Mesopotamia are very poor.

4. Should one speak about, "Mesopotamia's temple and palace economies, or the great estates that dominated early state society"? This traditional approach deserves to be reexamined. How sure are we that textile workshops only belonged to temples and palaces? They are the only ones mentioned in texts, but that does not mean that they were the only ones that existed.

5. A short overview of the related iconography would be welcome. I am thinking of the peculiar case of the *kaunakes*, a garment which seems to be ill-suited to both warm and cold weather (was it a woolen skirt, or a symbolic imitation of wool?), and the shift to a close-fitting robe (wool or linen?) in the Akkadian period, when, according to many researchers, the real state emerged. The change in garments worn by the social elite was probably significant.

6. Finally, I disagree with the use of the word "chaos" to describe the economic situation of the Guttian period (2150–2110??) (table 3). This period is known only from a few tendentious Sumerian-Akkadian texts, and nowhere is this supposed chaos confirmed by archaeology.

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McCorrison's article is an important contribution to our understanding of the sudden rise of the Mesopotamian wool-based textile industry at the end of the 4th millennium B.C. and in particular the concentration of female (and juvenile) manpower in great temple- and palace-run factories. More evidence in support of her thesis could be cited, especially the well-known diagram on the bone percentages from Arslantepe, with a sudden increase in sheep from phase VII (Late Chalcolithic) to phase VI (A, Late Uruk; B, Early Bronze I), is probably the most impressive illustration available at present (Bökönyi 1983:592–93).

To call attention to the ecological aspect of the choice

of wool versus linen, a comparison of Mesopotamia with Egypt seems appropriate, since both countries had flax and sheep and both developed a complex state economy at the same time and relatively close to each other, yet Egypt became a linen-clothed country and Mesopotamia a woolen-clothed one. In fact, the marginal lands suitable for sheep pastoralism were abundant on the periphery of Lower Mesopotamia (namely, in Upper Mesopotamia, in the Zagros and Taurus piedmont, in the Syro-Arabian steppe) but rather scarce in the area of Egypt. Therefore the former developed by extensification and the latter by intensification within the Nile Valley.

The difference in seasonal timing might also be taken into account. In Mesopotamia transhumant pastoralism was perfectly suited to the winter cereal-growing cycle (see especially the Mari evidence on this point: herds in the steppe during winter-spring and in the valley during the dry season [see Liverani 1997]). In Egypt no such coordination was possible, since the Nile flood took place in August-September, leaving no space for large herds in a season when steppe pastures were not yet ready. Thus comparison with Egypt confirms and strengthens McCorriston's thesis.

As to the reasons for using female and juvenile manpower in the textile industry, my impression is that McCorriston undervalues the well-known basic ones: There is a technical factor (obtaining to this day) in the smaller fingers of women and children and a cultural factor in the assignment of domestic weaving mostly to women. There is also an economic factor that became quite significant with the concentration of labor characteristic of the temple- and palace-run textile factories—the lower wages of women (about two-thirds) and children (about half) as compared with men (see Milano 1989). This is perhaps the critical point at which the great organizations were able to extract surplus from labor. Finally, there is the element of personal control (Mesopotamian textile factories were very close to jails!): women and children were easier to control and less able to run away.

Ancient sources make clear that the workforces of the textile factories were made up of female and juvenile prisoners of war and enslaved wives and children of debtors. Both sources were continually renewed over time; there is evidence for similar concentrations of female labor in textile factories in the 2d millennium (e.g., from Mari [Biro 1960:nos. 24–27; Dossin 1964:no. 1], Alalakh VII [Wiseman 1959a:nos. 252–54] and IV [Wiseman 1959b:no. 298], Assur [Weidner 1935:no. 100], etc. Therefore a specific link with the process of alienation of family land seems not in order.

Moreover, the seven centuries' (or more) lag between the emergence of the wool industry and land alienation is not as irrelevant as McCorriston would have us believe. Two historical processes separated by a millennium must be considered clearly distinct. The rise of the wool industry certainly has to do with the urban revolution and the establishment of a leading economic role for the temple and palace organizations. Land alien-

ation was no doubt set in motion by the urban revolution but became significant only in the Old Babylonian and later periods. This process had a tremendous impact on agriculture (substituting salaried work for the previous *corvée* or ration system) but much less on industry. The selection of wool as the basic raw material for the textile industry was dependent on ecological factors, the necessary workforce was assembled by the great organizations in various ways depending on the socioeconomic conditions of the particular period (a point that it is impossible to detail here), and linen or wool require more or less the same amount of labor at the weaving stage (the stage concentrated in the large factories).

Although McCorriston's explanations for the concentration of a female workforce and the timing of the process seem unacceptable, her keen understanding of the rise of the wool industry and its ecological background is a major contribution toward a proper perception of the complex restructuring of Mesopotamian economy and society in protohistorical times.

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This is an extremely interesting and provocative paper that appears to integrate a great deal of data relating to social, economic, and political organization in Mesopotamia. Although I am not qualified to comment on the specifics of the case study presented here, I particularly appreciate McCorriston's emphasis on the organization and structure of household labor and her recognition of the sometime conflicting scheduling demands of various productive activities. Although the term "extensification" is carefully defined as a component of agricultural intensification, it seems that the term "specialization" might also have been used to refer to the same process. Still, extensification usefully focuses attention on the diminution of labor involved in the shift from flax to wool and on some of the organizational aspects of this shift. As McCorriston notes, it would be helpful to know more about the actual changes in production of nontextile crops. One wonders, for example, to what extent the "surplus" labor released by textile extensification was absorbed by other agricultural tasks (or indeed whether increasing labor requirements of other crops demanded such a shift).

I would question McCorriston's reconstruction on just one point, and that is her use of the Boserup-inspired literature (Boserup 1970, Burton and White 1970, Ember 1983) that suggests that women's contribution to agriculture declines with intensification. This literature, all based on cross-cultural correlation studies rather than on sequences of change, typically discounts the labor of food processing associated with storage and consumption, labor which may increase with intensification. Further, such studies tend to focus almost obsessively on technology such as plowing and pay less attention to ostensibly minor tasks such as weeding or

manuring (and the maintenance of manure piles) or to garden production in or near house lots. Thus they reveal a rather limited conception of what constitutes agriculture. McCorrison hypothesizes that women weavers lost direct access to weaving fibers and that they performed fewer agricultural tasks as a result of intensification. However, there seems little reason to believe that the latter should be the case (especially since we know so little about the crops that may have replaced flax). Indeed, McCorrison's scenario does not really require that women's participation in agriculture decline. It seems to me that the loss of direct access to fiber should be sufficient to propel loss of productive autonomy in her model.

One hopes that reviews such as this will impel Mesopotamian archaeologists to undertake further research and particularly the research directed toward fine-grained rural contexts (and botanical and faunal recovery) that evaluation of this proposition calls for.

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McCorrison is to be congratulated for highlighting the possibility of a very interesting change from flax cultivation and linen production in the earlier periods of Western Asiatic prehistory to sheep herding and wool production by the late preliterate era. Unfortunately, as she herself will be aware, archaeological evidence of textiles from Western Asia, as opposed to Egypt, is so slim that a few new discoveries, made possible by better methods of recovery, could completely alter the picture. This is not to say that I think she is wrong but merely to stress that, at least in Mesopotamia, the number of actual textile fragments recovered in excavation can be counted on several hands (for references to material from the Royal Cemetery at Ur, Uruk, and the at-Tar caves, see Potts 1997:91). Another problem is caused by the written record, for by the time writing emerged in the Late Uruk period, sheep herding and wool production were already paramount and flax cultivation and linen production in decline. Thus, some of the most useful data on the transformation, if it did occur, is hovering, to date largely inaccessible, in the preliterate past. I would like to query several points made by the author. (I will not dwell on Harriet Crawford's thesis that Mesopotamian textiles were exchanged for large quantities of timber, stone, obsidian, copper, etc., a notion I have long contested, except to ask, as I have before, where the cuneiform evidence is.)

Most of the texts dealing with the redistribution of textiles and wool rations concern internal, Mesopotamian consumption. There are a few noteworthy exceptions, but these are statistically insignificant.

The notion that early farmers "relied upon domesticated animals for meat, not wool or hair" is, I think,

flawed. Herds are, among other things, walking water purification systems (Potts 1993:177). As Lancaster and Lancaster have stressed, "herds of goats, camels, cows and sheep . . . convert inaccessible liquids into drinkable milk" (Lancaster and Lancaster 1992:345). Throughout the Arabian desert zone, where much of the groundwater is brackish, late prehistoric sites with barbed and tanged arrowheads, where they have been excavated, have yielded bones of domesticated sheep and goat, and Uerpmann and Uerpmann have argued strongly that early pastoralists would have hunted, fished, and gathered shellfish whenever possible in order to conserve their herds and retain them for their secondary products (Uerpmann and Uerpmann 1996:133–36). Even in later Mesopotamian history, meat consumption was probably low and restricted to the highest echelons of society (Potts 1997:89).

More serious, however, are certain points of fact which require correction. McCorrison states categorically, "Linseed oil is attested in many cuneiform texts recording commercial exchanges from the 3d millennium onward" and cites work by Waetzoldt and Dalley in support of this statement. Nothing could be farther from the truth. Waetzoldt (1985:77) says specifically, "To my knowledge, linseed oil is completely absent in both Sumerian and Akkadian texts."<sup>1</sup> Dalley's contention is based on a view, contested by most recent commentators on the problem (e.g., Waetzoldt, Marten Stol), that the Akkadian word conventionally translated as "sesame" (*shamashshamu*) in fact stood for linseed. Stol (1985:119) has recently shown that Kraus's (1968) identification of *shamashshamu* with sesame is correct. As I have argued elsewhere, following Waetzoldt, in ancient Mesopotamia linseed is not "likely to have been used for human consumption because of the fact that it becomes rancid so quickly" (Potts 1997:67).

Unfortunately, the vast corpus of evidence regarding sheep herding from Drehem (ancient Puzrish-Dagan) is at once misunderstood and largely unexploited by the author. To allege that "at Drehem, animals for butchery and consumption were received from herds whose management is not detailed in the available texts, suggesting the possibility that (by the late 3d millennium) herd management lay outside the control of the administrators who were collecting and butchering animals" is to ignore an enormous body of evidence most recently and conveniently synthesized by Sigrist (1992). Countless articles discuss the extraordinary workings of the livestock processing center established by the Ur III king Shulgi, through which minimally 50,000 sheep passed annually (Sigrist 1992:20). Even a superficial reading of the literature on Drehem will show that, contrary to McCorrison, herd management was very much the concern of Drehem's bureaucrats (see particularly Sigrist's discussion of "Les bergers," which covers such topics as "Leur existence," "Termi-

1. "Leinol fehlt m. W. [i.e., meines Wissens] sowohl in den sumerischen als auch in den akkadischen Texten vollig."

nologie," "Répartition géographique des bergers," "Compte de troupeaux," "Comptabilité des bergers," and "Déplacement des animaux" (Sigrist 1992:35–43).

Since Tepe Hissar and Shahr-i Sokhta are referred to, though not shown, on figure 1, then Tell Abraç, where linen fragments were found in a late 3d-millennium collective tomb dating to ca. 2100–2000 B.C., should also be noted (Reade and Potts 1993).

In conclusion, we need more articles like this one, and it is to be hoped that Assyriologists concerned with social and economic change in Mesopotamian society will examine its thesis and reflect on what is a highly provocative and challenging argument.

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The importance of textiles in the cultural and economic development of human societies can hardly be overstated. Textile technologies such as basketry began in the Upper Palaeolithic (Adovasio, Soffer, and Klíma 1996), while woven cloth proliferated with the sedentism of the Neolithic (Schick 1988, Barber 1991) and cloth textiles have arguably been fundamental in the genesis of urban societies throughout the world. In the Industrial Revolution, textiles and clothing typically formed 50% of output in the first phase of industrialisation (Hoffman 1958:120). Urbanisation, which is based on the import of raw materials and the export of value-added manufactures, requires just such a method of converting labour into commodities. Moreover, textiles are intimately connected with the presentation of the body in everyday life and thus with the creation and transmission of social meaning (Gittinger 1979, Weiner and Schneider 1989), hence also with concepts of civility and systems of social control. Roche (1994:506) has talked of the "production and commercialisation of appearances." It is no coincidence that foreign missionaries tell the natives they are naked and foreign merchants then sell them clothes: the ideological and the practical are two aspects of the same concept of "civilisation" and the *mission civilatrice*.

I am therefore in agreement with McCorriston on the importance of this topic and its role in the genesis of what was perhaps the first dependent labour force: women textile workers. The manufacture of textiles was a way of using the labour time of a group of specialist workers (who doubtless lost none of their other, domestic labour obligations) to produce a high-value, exportable commodity from relatively inexpensive raw materials (for some relevant ethnographic comparisons, see Goody 1982). It was structurally necessary to urbanisation and the trading expansion which sustained it in the Uruk period (though, since Egypt did not adopt wool until the Middle Kingdom, the connection between the emergence of early social stratification and the manufacture of specifically woollen textiles is clearly only a

partial one). Adams classically described how the Mesopotamian economy worked (1974; cf. Schneider 1977), and I have recently suggested how it may have come into being (Sherratt 1995:17–20). What worries me slightly, however, is McCorriston's appeal to the beginning of wool use as a *deus ex machina* in starting the whole process and the suggestion of demographically driven agrarian intensification (rather than temple/elite initiative) as a description of its operation.

In formulating the original concept of a secondary-products revolution, I emphasised the enhanced potential for manufactured commodities brought about by the appearance of wool-bearing breeds of sheep (Sherratt 1981:282–83, 287–89; see now Sherratt 1997). The large number of Uruk pictographs representing sheep, however, points to considerable genetic variety by this time and a long history of breeding. Wool, like wine, is likely to have begun in the highlands surrounding Mesopotamia. The spread of wool from a putative origin in the Kermanshah or the Luristan region seems to have taken place by the later Ubaid period (5th millennium B.C.), and wool fragments and the possible remains of a loom are reported from the Cave of the Treasure in Nahal Mishmar, Israel, around 4000 B.C. Southwestern Iran is likely to have continued as a centre for breeding wool sheep, and it is tempting to see the strong 4th-millennium Uruk influence in Susa as the outcome of a Mesopotamian need for wool as textile production became important for export. These breeds slowly became more common within Mesopotamia itself. The spread of wool-bearing sheep can be followed out into Europe by 3000 B.C., and a landmark study by Josef Winiger (1995) shows the major impact of woollen textiles on an area hitherto using only leather garments and on occasion woven straw capes. While linen was used earlier, it was probably not for large items; the arrival of wool in Europe made possible woven clothing.

The beginnings of a woollen textile industry in Mesopotamia were clearly of enormous importance in regional economic and cultural history, and this paper usefully reminds us of the evidence and the imagination needed to make use of it.

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This paper introduces a new and important element into the discussion of textile production in Mesopotamia and its implications for land and labor in the exploitation of different types of fiber. McCorriston is to be congratulated for bringing together a vast amount of information about the exploitation of flax and wool and for providing a provocative interpretation of its consequences.

As I understand the central thesis of the paper, flax had been the fiber of choice in cloth production until sometime in the 4th millennium B.C. It was a home-

grown product and was cultivated by independent producers in domestic contexts. Women were responsible for the processing of flax for weaving, an activity that required significant amounts of labor and land but that gave them economic and social advantages in the household. The development of wool-bearing sheep whose fleece could be spun and woven into cloth alienated these producers from raw materials for weaving as animal keeping became centralized in temple and later palace and temple estates and sheep grazing was diverted away from farms to “steppe” areas away from the southern alluvium.

While I agree with much of McCorrison’s argument, I raise several points below that argue against some specific aspects of her interpretation. One point challenges McCorrison’s implicit belief that agriculture and husbandry are somehow incompatible under the ecological conditions of southern Iraq. A second point has to do with more fundamental differences in the ways in which McCorrison and I view technologies.

McCorrison assumes that as wool was increasingly used for cloth production, more and more land was required for grazing. Farmers stopped keeping animals in preference to exchanging barley for the wool they needed by trading with specialist pastoralists. Her principal support for this argument comes from textual sources, for example, records kept at Drehem that record thousands of animals brought in by shepherds and disbursed by state personnel for exploitation of their wool and skins. However, even in these cases, the consignment of animals to the labor of pastoralists outside of the alluvium is overdrawn, for the texts demonstrate that animals were maintained in corrals and pens and grouped together in areas called “fields” (Jones 1961: 221). Receipts for grain brought in as fodder for animals attest to the fact that, at least in some cases, animals were stall-fed. My point here is that large quantities of labor were needed to provision sheep and to maintain them even when they were kept by shepherds.

More important to consider is the evidence for animal keeping in southern Iraq during relatively recent periods that attests to the viability of agriculture and husbandry as complementary practices. Poyck’s studies of farming and livestock keeping in southern Iraq, in the Hilla-Diwaniya area, and in southwestern Iran, Dez, and Khuzistan during the extensive periods spent conducting field studies between 1957 and 1959 document the numerous ways in which sheep were kept and provisioned on waste and idle lands, grazed on young barley and irrigated fallow land, and stall-fed (1962:59). As Poyck points out, economic development reports consistently downplay the importance of the keeping of sheep and goats by farmers in southern Iraq, perhaps because they are based on incomplete state records rather than field studies. His more extensive study of small and large farm holdings demonstrates that livestock, in particular sheep, which represent a little more than one-third of the livestock in the several regions studied, play an important role in farmers’ incomes (1962:51).

While reports of economic development agencies may view livestock farming as an adjunct to agriculture, Poyck’s more in-depth studies suggest that it is integral to it. Similarly, Al-Barazi’s studies in the Middle Euphrates Valley (1963) demonstrate that farmers depend as much on stock farming as on the cultivation of crops. According to Al-Barazi, “Cultivation and stock breeding do not seem to have been regarded as complementary forms, yet even in the primitive system of this region they are so” (1963:93). These studies indicate that livestock farming is not incompatible with the ecological conditions of the southern alluvium and that agriculture and husbandry are more complementary than McCorrison has assumed.

These issues aside, a more critical objection to her analysis rests on her conceptions about technology and gender. Throughout her discussion, McCorrison argues for “extensification and a substantial economic restructuring” in a kind of efficiency argument that accommodates to the ecological conditions of the region. The new technology is viewed as a primary source of change as humans accommodate to its requirements. Given the new conditions in which sheep were relegated to pastoralists, female labor was now free for exploitation in the state and temple workshops. My principal objection to this scenario is that technology and gender constructs are social phenomena and not neutral categories. Moreover, the enmeshed nature of the material and ideological in the periods discussed, especially with respect to textiles, is never discussed. Social relationships and ideologies become attached to technologies that underlie important social, political, economic, and symbolic processes.

Imperatives behind the adoption and use of technologies cannot be evaluated solely in terms of efficiency or ecological measures, since their implementation is culturally and socially conditioned. The particular circumstances of female weavers and state practices of livestock keeping were conditioned by the vested interests of the state and other institutions in controlling the production and distribution of cloth for economic and social reasons. This control was essential to state/temple strategies because textiles were central to social and economic activities. Various textual sources document their use for export, for cementing alliances, for distributing to workers, and for signifying status and affiliation in ritual and ceremonial contexts (Wright 1996). While control of the production and distribution of textiles promoted efficiency, it guaranteed that particular grades and styles of cloth were distributed to the “right” people. Linen, reserved for kings and divine images, was sufficiently precious that it was produced in entirely different workshops from the weaving of wool. The use of women (many of whom were prisoners of war, slaves, or indentured citizens and possessed non-Sumerian names) in the weaving workshops played more to the deeply embedded association of women with weaving in Mesopotamian ideology than to their availability as a ready labor source. My point here is that viewing tech-

nology and gender as social phenomena foregrounds the relevance of the social, political, economic, and symbolic in decisions about their implementation.

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Textile finds from Mesopotamian sites are rare, but written documents suggest that wool was the dominant textile fiber from the early 3d millennium B.C. on, while bast fibers were relatively unimportant. Flax was grown mostly in small garden plots, probably on the levee slopes (Waetzoldt 1985:78; Powell 1991:163), and linen probably represented no more than 10 percent of total textile production (Waetzoldt 1980–83:583).<sup>1</sup>

McCorriston suggests that wool-bearing sheep and wool's dominance as a textile fiber may not antedate the late 4th millennium B.C. Prior to that time flax would have been the primary textile fiber. The "fiber revolution," the change from plant to wool fiber, catalyzed the initial development of the large textile workshops with their attached (largely female) labor class attested particularly in administrative records of the Third Dynasty of Ur (2110–2004 B.C.). The scenario that McCorriston outlines is intriguing, and I hope that the comments that follow will elicit clarification and encourage further discussion.

1. Flax or linseed (*Linum usitatissimum*) is susceptible to soil salinity and if cropped more than once every five or six years on the same land becomes vulnerable to flax wilt, *Fusarium lini* (Arnon 1972:393–99). Could flax really ever have been cultivated extensively in southern Mesopotamia?

2. The archaeobotanical record for southern Mesopotamia, especially for urban sites of the 3d millennium and later, is generally poor, and I would hesitate to draw any conclusion based on it. Still, in addition to sites McCorriston mentions, linseed occurs in late Early Dynastic and Old Babylonian contexts at Khafajah in the lower Diyala (Delougaz 1940:154; Jacobsen 1982:20).

3. McCorriston's sections on flax and wool production requirements and consequences of agricultural intensification raise several questions. Since women's labor is at issue, what do we know about the sexual division of labor in early southern Mesopotamian agricultural households both under flax production and under herding and wool production? To what extent would women have been involved in the cultivation (as opposed to the processing) stages of flax production? At

1. Linseed occurs infrequently and linseed oil almost never in Mesopotamian cuneiform sources. McCorriston's statement that it is "attested in many cuneiform sources recording commercial transactions from the 3d millennium onward" is apparently based either on a misunderstanding of Waetzoldt (1980–83:588; 1985:78) or on Stephanie Dalley's mistranslation of the Akkadian *shamashamu*, "sesame," as "linseed" (Powell 1991).

the level of the household, would not women, as well as men, have been involved in herding and wool production (see Tully 1990:72–76)? With the introduction of wool, why would labor freed from flax production necessarily have been "reinvested" in bringing additional prime land under cultivation, double-cropping, or craft specialization? Human labor is a crucial factor in farming, so if additional agricultural land was brought under cultivation, how much of the labor previously invested in flax production would have been "consumed" by other activities rather than in craft specialization? Why didn't flax production promote specialization in weaving?

4. The discussion of the reorganization of labor highlights major lacunae and biases in the archaeological and textual record for southern Mesopotamia, some of which McCorriston herself acknowledges. I will only note, apropos of her discussion of changes in early Mesopotamian social organization, that the floodplain was occupied by the mid-7th millennium (Huot 1996:381–90). Despite systematic surveys, which underrepresent Ubaid sites (Adams 1981:54–60), older excavations at Ubaid, Ur, and Eridu, 1960s salvage work at Ras al-'Amiya, and the recent and more informative French excavations at Tell el-'Oueli, we know little about the earliest phases of occupation in the south. For that matter, what do we really know about the succeeding Early/Middle Uruk (4000–3500 B.C.)? Without understanding the Ubaid and Early/Middle Uruk it is difficult to bring Late Uruk developments into clear perspective.

5. Kudurrus and sale documents provide evidence for early landholding in southern Mesopotamia, but, as McCorriston notes, their interpretation remains subject to considerable debate (see, e.g., Powell 1994). In general, the kudurrus and sale documents attest to multiple forms of land tenure in the mid-to-late 3d millennium (Gelb, Steinkeller, and Whiting 1991:16–17). If corporate holdings represented the dominant form of land tenure in prehistoric periods, then the main question, as McCorriston says, has to be at what point in the 3,000 years before writing developed other forms of land tenure emerged. We cannot currently answer that question, and I am not sure what sort of evidence we would need to do so. Along related lines, while I have suggested that certain of the kudurrus *may* attest to royal and "private" donations of land to temples (Zettler 1992a:211–12), evidence that corporate groups joined or transferred landholdings—and labor—to temples is still lacking.

6. We routinely categorize female weavers in temple and palace households as attached "specialists," but they seem, in fact, to be part of a larger pool of laborers who performed domestic chores such as grinding grain and various sorts of agricultural work as necessary (Englund 1991; see also Grégoire 1970:164–80). Should we then describe those domestic laborers as "specialists"?

Institutional labor forces included socially marginal individuals, prisoners of war, persons described as "donated" and "seized" (Gelb 1972), debt slaves (Englund

1991:267–68), who may be included among those described as “seized,” and persons characterized as “purchased” (Maekawa 1980:87). The administrative archive of the Nippur Inanna temple includes records of sales of slaves to the temple (Zettler 1992a:198). McCorrison needs to integrate what we know of the identity of female laborers with her understanding of the emergence of encumbered labor.

Though McCorrison’s scenario remains hypothetical, “The Fiber Revolution” is a stimulating contribution to our thinking on early Mesopotamia.

## Reply

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*Minneapolis, Minn., U.S.A. 19 v 97*

I thank all for their thoughtful comments, including many excellent points I will not explicitly address. I am particularly grateful to those more familiar than I am with the corpus of texts, for their comments (although sometimes differing from one another in interpretation) greatly enrich this discussion. There are doubtless many other pictographic or cuneiform texts and studies that might be cited in support or refutation of some of my ideas. It is refreshing to see that others have picked up my omissions, shifted emphasis, and added their insight without, it seems to me, substantively changing the major argument that a shift in fiber materials profoundly affected household labor organization and household production in ancient Mesopotamia, contributing to the alienation of women from agricultural land and the formation of temple workshops.

Evans points to a similar trend of extensification with the use of marginal lands to produce maguey fiber in Aztec Mexico. Interestingly, it is to this type of agricultural extensification with the grazing of sheep (in the case of Mesopotamia) on marginal lands, cited as my “implicit belief that agriculture and husbandry are somehow incompatible . . . [in] southern Iraq,” that Wright objects. I think that the potential courses of intensification are complex and variable and probably were multiple and contemporaneous in Mesopotamia, and I cited the possibilities of stall-feeding, grazing stubble and the swampy interstices of agricultural land, and summer cropping. Most of these practices would nevertheless have intensified production on arable land and increased labor specialization. Morrison suggests that women’s participation in agriculture need not have declined—that loss of access to textile fiber alone can account for changes in household labor roles. We do not know what crops replaced flax. Under a scenario in which cereal crops (and food surplus) replaced flax, less labor would have been needed to maintain fields. We may surmise that grazing stubble and stall-feeding, where practiced, would have required barley rather than flax. These practices are not necessarily incompatible

with a simultaneous increased use of steppic pasture lands.

Zettler’s questions about the division of household labor underscore other uncertainties in Mesopotamia’s archaeological record. Wright’s reference to the “deeply embedded association of women with weaving in Mesopotamian ideology” and Liverani’s note of the technical advantage of smaller fingers are perhaps the best answers to Zettler’s concern that we have little means by which to assess women’s labor contributions to various household tasks—agriculture, weaving, and herding among them. I reiterate that within the complex, multiple, simultaneous courses of intensification, one strategy for marginal, land-poor households would have been to extensify wool production and that it is these households in particular in which women would have become increasingly alienated. Examining a range of rural Mesopotamian households surely would help in identifying such interhousehold differences. I intend no slight to the fine archaeological work already carried out in southern Iraq by archaeologists who would no doubt like to examine rural households if conditions permitted. Preservation and taphonomy pose significant challenges. Evans’s remarks on the bias against small cotton whorls in survey collections from Aztec Mexico are an important caveat for this kind of research.

Also interesting are Evans’s comments on the interdiction against Aztec commoners’ wearing cotton, a situation that could have parallels in Mesopotamia, where linens were for gods and kings. But have we definitive evidence that other people did not wear linen? How long did linen production continue in households with access to prime agricultural land? Since the causes of extensification are still obscure, it remains open to speculation whether a temple/elite initiative (Sherratt, Wright) instead of demographic pressures drove the process. Agricultural intensification does have clear archaeological hallmarks, but its causes (especially in the case of social competition, ideology, and power) often do not. Current debates seem to revolve around the same issues in other regions (e.g., Joyce and Winter 1996, Sanders and Nichols 1988). What does seem clear is the consequences, as I have tried to emphasize.

Changes in access to land seem to me inevitably linked to intensification processes. Zettler comments on the difficulty of identifying changes in land tenure through the archaeological record, while Liverani prefers to separate the selection of wool as the basic raw material for the textile industry from a (later) process of land alienation, the latter a view I do not share. Kudurrus have provided intriguing clues to change in land tenure conventions in Mesopotamia but need to be corroborated with independent evidence. I agree with Zettler that archaeologists face a challenge in determining “at what point in the 3,000 years before writing developed other forms of land tenure emerged.” This has proven a difficult process to document archaeologically, in part because prehistoric societies leave no direct material record of how they organized access to agricultural resources. Archaeologists have examined burials

(McAnany 1995), boundaries (Kirch, Sahlins, and Weisler 1992, Killion 1992, Stone 1994), settlement location and land use (Halstead 1989, Wilkinson 1994), field houses (Kohler 1992), household size (Bernbeck 1995; cf. Smith 1987), and community aggregation (Adler 1996) for clues about differential access to land and its products, but as yet there seems to be no universal index by which to measure increasing alienation from agricultural production. The alienation of people from productive resources is in turn the outcome of changes in social relations, implying that we must also search for clues to these changes—again, a process that is difficult to document with material culture.

I agree with the commentators who ask for cross-cultural consideration of textile production, labor specialization, and agricultural intensification that some of these processes might find historically fashioned parallels elsewhere. Such a cross-cultural study nevertheless deserves separate treatment, for this Mesopotamian study is already sufficiently lengthy. I am thus doubly grateful for Evans's comments as a reminder that other prehistoric and historical sequences have much to offer.

In my effort to stay close to Mesopotamia and the 4th millennium, I also skirted other Near Eastern evidence (e.g., Egypt, Anatolia) and periods that ultimately do deserve further consideration, as Huot, Liverani, and Potts in particular note. My skipping perusal of the Ebla evidence, for example, indicated that differences between linen and wool were confounded by grades of textile quality that cut across linen/woolen categories (Pettinato 1981)—it would seem that at Ebla linen itself was not the focus of elite control as Wright suggests it was for southern Mesopotamia. It would indeed be of interest to explore Ebla's texts more thoroughly. This would be better accomplished at the very least in collaboration with an expert in Eblaite.

Archaeological results (including the work of Bernard Geyer, Michel Fortin, Frank Hole, Nicholas Kouchoukos, Glenn Schwartz, Melinda Zeder, Richard Zettler, and others) of recent surveys and excavations in several regions of northern Syria converge in indicating greater steppe occupation and utilization from the first centuries of the 3d millennium B.C. My own analyses of plant remains from a series of sites along the Middle Habur River, a region not conducive to sustained dry-farming, suggest that cultivation of steppe lands may have substantially expanded in the early 3d millennium and that a specialized pastoralism—raising surplus animals with supplemental fodder from barley crops during seasons when herds were crowded along the river—developed as part of increased interregional integration. Potts draws due attention to a wider literature on Drehem texts, including references to barley supplements for sheep (Sigrist 1992:19, 23), a practice that accords well with the archaeobotanical (McCorriston 1997) and archaeozoological record (Zeder 1997) from the Middle Habur. Our understanding of the 4th millennium in these areas is still poor but is a major focus of current research.

Modern ethnographic evidence cited by Potts empha-

sizes the value of herds as water purification systems, but archaeozoological studies from Pre-Pottery Neolithic B onward document herding strategies that maximize meat production. Evidence for wool production just is not there before the 4th millennium B.C., although, as Potts says, "a few new discoveries . . . could completely alter the picture." I cannot at present agree with Sherratt's assessment that breeds of wool sheep "slowly became more common within Mesopotamia itself." The archaeozoological evidence (albeit scant from 4th-millennium southern Mesopotamia) and the texts at Warka attest their presence. Their introduction appears abrupt but only as a consequence of the textual record. We do not have any evidence for gradual incorporation into 4th-millennium or earlier economies, although this would be an extremely valuable point to resolve.

Huot's comment that all of ancient Sumer is not Ur III reminds us of the temptation to apply localized socioeconomic models developed from archives spanning a short historical period too widely. Against the advice of at least one referee, I omitted most 2d-millennium B.C. material, which, although rich in detail about herding practices, is even farther removed from the 4th millennium. I also think it possible that the 2d-millennium northern Mesopotamian sources (Liverani) documenting female and juvenile prisoners of war and enslaved debtors' kin in textile factories do not portray the 4th-millennium origins of textile workshops (in part through alienation of women from poor households). And yet I did cite Dalley's (1977, 1980) translations of 2d-millennium northern Mesopotamian texts. Zettler and Potts indicate that I have misunderstood the *shamashshamu* controversy. Their comments suggest that if linseed oil is absent from texts and linseeds missing from the archaeobotanical record, then there exists less evidence that flax/linseed was cultivated. I expect that its cultivation was never extensive and thereby agree with Zettler's doubts. But little land is required. A settlement of 400 occupants could have raised a year's supply on 2.4 ha (broken into small, dispersed plots) but would, as Zettler says, have needed to rotate the crop in subsequent seasons.

May I defend my use of "chaos" in table 3 (Huot) as a term restricted to the perspective of the scribes and elites whose order was suspended? Needless to say, for those whose tax liabilities and obligatory institutional service were perhaps eliminated or lightened by Gutian rule, the interval would have seemed quite different (might "resistance" be a better characterization of another perspective on the same purported events?).

I have focused my response on the process of extensification, the evidence for it, and the question of which geographical, temporal, and social contexts offer models most appropriate for interpretations of 4th-millennium Mesopotamia. Many of the questions raised here can best be addressed through further archaeological research and the continued contributions and commentary of Assyriologists. Textile production has hitherto too narrowly focused on weaving, weavers, and ex-

change of woven products. Although these remain fruitful avenues of study, it is in a broader examination of agricultural and other conditions of raw fiber production that one may better understand the techno-environmental conditions of social interactions and change. For Mesopotamia, the fiber revolution defines significant transformations in the production and reproduction of the prehistoric social fabric.

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## Institutions

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The School of Architecture of Oxford Brookes University has just introduced an innovative one-year Master's course in International Studies in Vernacular Architecture. The program is directed by Paul Oliver, who has recently edited the three-volume *Encyclopedia of Vernacular Architecture of the World* (Cambridge: Cambridge University Press, 1997), with entries by some 750 contributors from more than 80 countries. Although vernacular architecture accounts for more than 90% of the world's buildings, including some 800 million dwellings, it is largely ignored by the media, by power elites, and by architectural education. In the light of the growing worldwide demand for culturally acceptable housing and for regionally and contextually appropriate

architecture, the course will focus not only on understanding and conserving the vernacular but on supporting and augmenting traditional technologies and skills and expanding environmental knowledge. It will be particularly suitable for architects, planners, and others intending to work in development contexts and will be appropriate for students with an honours degree or equivalent experience in architecture, planning, social studies, development, anthropology, geography, or related fields. For further information, write: Paul Oliver, Centre for Vernacular Studies, School of Architecture, Oxford Brookes University, Gipsy Lane Campus, Headington, Oxford OX3 0BP, England (vmkwalker@brookes.ac.uk).

## Prizes

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The 1996 Awards Committees of the American Society for Ethnohistory announce the recipients of the Society's Erminie Wheeler-Voegelin and Robert F. Heizer Awards. For the best book-length work in ethnohistory, the 1996 Erminie Wheeler-Voegelin Prize was awarded to Patricia Galloway for *Choctaw Genesis 1500–1700* (Lincoln: University of Nebraska Press, 1995). Ellen B. Basso's *The Last Cannibals: A South American Oral History* (Austin: University of Texas Press, 1995) re-

ceived honorable mention. For the best article in the field of ethnohistory, the 1996 Robert F. Heizer Prize was awarded to Janet Carsten for "The Politics of Forgetting: Migration, Kinship, and Memory on the Periphery of the Southeast Asian State" (*Journal of the Royal Anthropological Institute*, n.s., 1:317–35 [1995]). For additional information, write: Frederic W. Gleach, Department of Anthropology, 265 McGraw Hall, Cornell University, Ithaca, N.Y. 14853, U.S.A.

