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Cattle, Co-Wives, Children, and Calabashes: Material Context for Symbol Use among the Il Chamus of West-Central Kenya

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Cattle, Co-Wives, Children, and Calabashes: Material Context for Symbol Use among the Il Chamus of West-Central Kenya

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INTRODUCTION

Maasailand has traditionally been a land of symbols. For 1,000 years, Maa-speaking pastoralists or the Iliokop have traversed the Great Rift Valley with their herds of Zebu cattle. The lifescape of the Iloikop and their neighbors—the Turkana, Samburu, Suk (Pokot), Tugen, and Kipsigis—is sharply accentuated by variations in the form, color, and design of material culture. Numerous visual messages are transmitted within and between tribal populations, clans, subclans, age grades, and families. Pastoralists' cattle exhibit large brands, "drawings," and ear mutilations that denote clan, lineage, and family ownership (Ohta 1987). Maasai women create unique embossed designs near the doorways of their wattle-and-cow dung houses. Items of portable material culture, like the iron spears or the buffalo hide shields of the moran in Maasai society, convey messages regarding one's affiliation to ethnic, social, or sex and age-based groups (Larrick 1987, 1991). The bodies of the Maasai are, likewise, variably decorated with "brands," scars, red ochre body paint, face "makeup," plaited coiffures, shaved heads, and splayed or pierced ears (Saitoti 1980). Layers of "tiaras," headbands, earrings, decorated ear flaps, beaded disk neck ornaments, multiple necklaces, coiled armbands, and bracelets are added by women to declare their status to puberty, circumcision, marital status, and fecundity (Saitoti 1980). Young men adorn themselves with headbands of blue beads (engonongoi) and coiled brass wire ornaments (isurutia), headdresses of lions' manes or ostrich feathers, painted shields, and decorated spears to symbolize circumcision, moran initiation, and seniority (Saitoti 1980). East Africa is an ideal setting for learning about visual communication and the dynamic relationships between symbols, style, messages, and material culture. If Maasailand provides ideal research opportunities, how might archaeologists and anthropologists proceed in order to gain reliable knowledge about symbols, style, and information exchange and how might we integrate such insights into our more general understanding of past and present human behavior?

More than 30 years ago, Binford (1962) proposed that material culture or artifacts retrieved from the archaeological record may have been used within three primary functional contexts. The most frequently recovered artifacts are tools that were used to acquire, transform, or enhance energy and matter (technomic function). Binford

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* See Notes section at end of paper for all footnotes.

(1962:219) stressed that there are also material culture items that had served social and ideological functions. Their primary function had been to articulate individuals within cohesive social groups (sociotechnic function) and to "symbolize the ideological rationalizations for the social system" and to provide the "symbolic milieu" for enculturation (ideotechnic function; Binford 1962:219). In addition, three artifact classes are potentially cross-cut by "stylistic, formal qualities" that stored and conveyed messages about group identity and solidarity. Binford challenged archaeologists to consider these multiple analytical dimensions of artifacts, as well as the systemic contexts, e.g., biophysical, demographic, sociopolitical and religious, within which symbols and stylistic variation appear, function, and disappear. Binford's very significant paper foreshadowed three decades of archaeological field work, analysis, and discussion that has focused on symbols, stylistic variation, and human behavior.

Later, Wobst (1977:317) argued that archaeologists' efforts to view artifact style as a residual category, a set of afunctional attributes, or as a reflection of idiosyncratic behavior provided little, if any, understanding of the past. He (1977:321) asked that archaeologists, and anthropologists, consider the adaptive advantage(s) of stylistic behavior and symbols with respect to information exchange within and between human groups. Wobst's (1977) study, like Binford's, delineated causal linkages between the static characteristics of material culture or artifacts and the dynamic aspects of communication and information exchange in human societies.[1,*]

Wiessner (1983, 1984) has presented a number of theoretical and substantive insights about stylistic variation in material culture, e.g., projectile points and beaded headbands among the Kalahari San. Her field research focused primarily on San expressions of personal and social identity both within and between groups via stylistic variation in material culture. She (1983: 256) defined style as "formal variation in material culture that transmits information about personal and social identity." Wiessner (1983:256) stated that stylistic variation is best understood in terms of human behavior; but, she (1984:195) later argued that an explanatory theory of style should be based on "fundamental human cognitive process[es]." Wiessner (1983, 1984) couched her explanatory approach in terms of information and communication theory (Wobst 1977), human ethology (Eibl-Eibesfeldt 1979), and social psychology (Taifel 1978, 1982; Codol 1981; Turner 1982).

Recently, some archaeologists have chosen to view artifacts or material culture as a means of organizing, manipulating, and assigning meaning to the external or physical world. This external world, in turn, affects material culture in a "recursive" fashion (Leone 1986). Hodder (1991a, 1991b) has equated thought, action, material culture, and in some instances, environment. He (1985a:5) stated, "Material culture provides the environment within which individuals find their places and learn the places of others, their goals and expectations." Hodder (1982:212–214) proposed that symbolic or ideational principles cross-cut, permeate, and integrate the multiple subsystems of culture(s). As a result, some archaeologists have chosen to give precedence to the structure and dynamics of ideation within relatively closed cultural systems that operate independently of their biophysical environment.

There is now a substantial body of archaeological literature that focus on symbols, stylistic variation, theories of style, structures

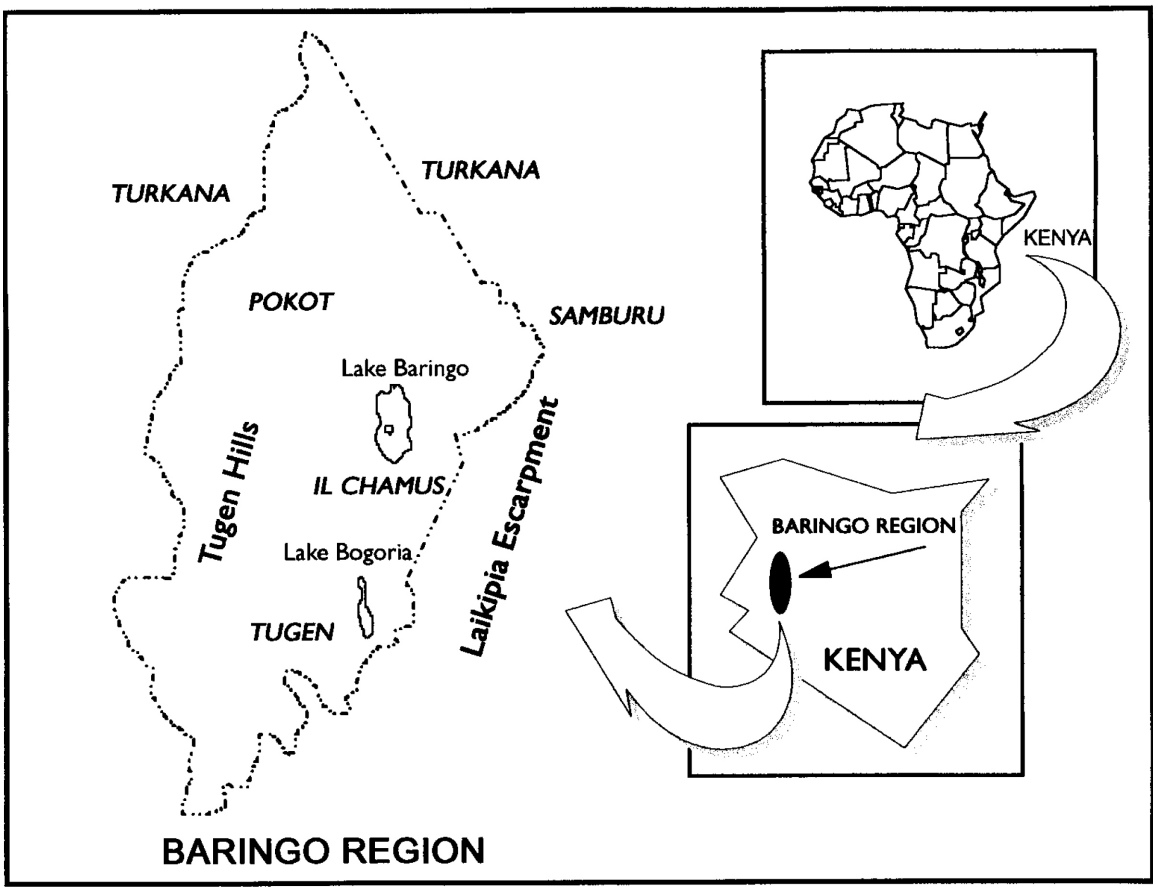


Figure 1. Location of the Il Chamus in the Baringo Region, West-Central Kenya (Adapted from Little 1992:19, Figure 2.1).

of meaning, learning, information exchange, style-mediated interaction (social, economic, and political), social distinction, and power and social inequality (see Plog 1980; Wiessner 1984, 1990; Hill 1985; Shanks and Tilley 1987; Conkey 1990; Conkey and Hastorf 1990; and Hegmon 1992). Recently, Hegmon (1992:532) has stated, however, that "We are still far from an integrated theory of style [and symbols], and some have suggested that such a theory is neither possible nor necessary."

This paper will examine systemic context(s) for symbol use among the Il Chamus in the Lake Baringo region of west-central Kenya (Figure 1). The systemic context for symbols and material culture consists of the environmental constraints and behavioral responses that characterize pastoralist life in East Africa. My interest in this problem developed in response to Ian Hodder's work among the Il Chamus, Pokot, and Tugen in the Baringo District (Hodder 1982, 1985a, 1991a). Unlike Hodder, however, I will argue that symbols and their use in East Africa can be more productively explained from a materialist perspective. Specifically, I will propose that symbols affixed to certain Il Chamus material culture reduce the uncertainties of food allocation within pastoralist compounds. The systemic context for symbol use, in this

case, includes a number of "bottlenecks" or constraints that affect the production and the distribution of essential livestock products.

The ultimate utility of archaeological research is to produce reliable knowledge about past human existence. Reliable knowledge, unlike "common or folk" knowledge, is a systematically-unified and conceptually-based account of the material world (Ziman 1978). It has been subjected to rigorous empirical tests. Reliable knowledge can be used to formulate robust predictions about the biophysical world. Many archaeological studies of symbols, stylistic variation, and ideology have limited utility. Most studies have ignored the biophysical and socioecological factors that create the adaptive contexts for symboling and stylistic behavior and, in turn, account for their appearance, variation, and disappearance.

Following a discussion of livestock ecology, human nutrition, domestic group composition, and food allocation, I will use Hodder's data to evaluate an alternative explanation of symbols and material culture among the Il Chamus of west-central Kenya. Such a theoretically-based approach to symbols, style, and information exchange can be modified and applied to other human groups in the past or in the present.

ENVIRONMENTAL AND ETHNOGRAPHIC BACKGROUND

The Baringo District encompasses nearly 28,000 km^2 (10,000 mi^2) of the Rift Valley between Lake Rudolf to the north and Lake Hannington to the south. Along its margins, the land surface rises abruptly from 900 m (274.4 ft) a.s.l. near Lake Baringo to 2,500 m (762.2 ft) a.s.l. in the Laikipia Highlands in the east and the Tugen Hills in the west (Little 1992:18). In the semiarid lowlands occupied by the Il Chamus, the mean annual rainfall equals 653 mm (26 in.) but it ranges between 400 and 750 mm (16 and

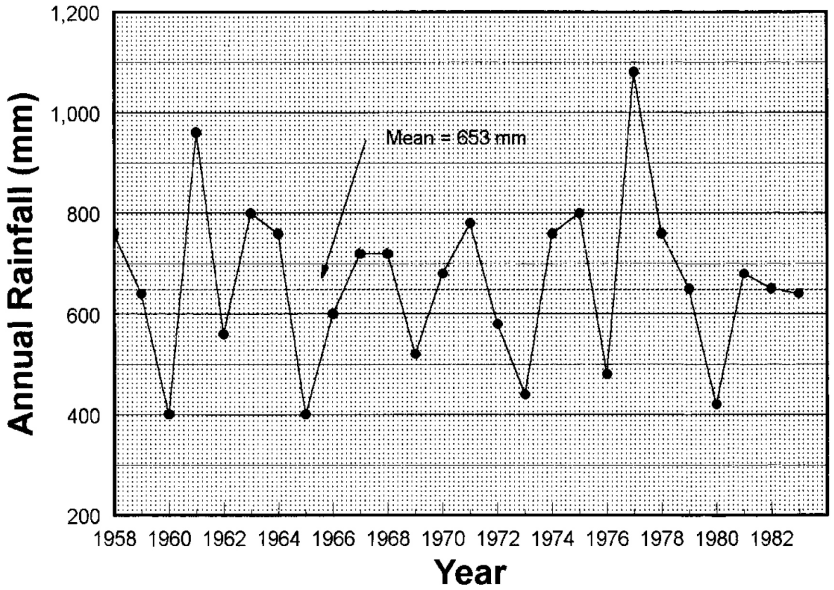


Figure 2. Mean annual rainfall data for Il Chamus area, Lake Baringo, West-Central Kenya.

30 in.; Figure 2). Rainfall increases to 1,200 mm (48 in.) in the surrounding highlands (Little 1992:20, 24). For 8 months of the year, lowland rainfall does not exceed 60–70 mm (2.4–2.8 in; Little 1992:20, 24).

The Baringo District lowlands are quite dry due to the fact that evaporation exceeds precipitation. Consequently, forage for herbivores within the brush Acacia community is scant. In these semiarid lowlands, vegetation covers approximately 20% of the ground surface (Little 1992:21). Given limited access to the mesic upland areas, pastoralists move their herds during the dry season to the marshlands along the southern end of Lake Baringo.

The Il Chamus are a Maa-speaking group who live in the southern Lake Baringo region of west-central Kenya. Their history, like that of the Maasai or Iloikop, is quite complex given the dynamics of population expansion, subsistence shifts, ethnic group formation, economic and political alliances, and conflict (Dundas 1910; Anderson 1982, 1984, 1988; Little 1981, 1982:26–32; Galaty 1991).2 During the late 1500s, the Samburu-Chamus expanded northward from the "pre-Maasai nucleus" in the Central Rift Valley (Galaty 1991:177). The Chamus later "hived off (linguistically) from the Samburu" during the early 1800s (Galaty 1991: 177). In the early 1900s, the Njamus (Il Chamus) people did not "exceed fifteen hundred souls" (Dundas 1910:49). The lowlands near Lake Baringo were settled by the "Il Chamus ... to take advantage of water for irrigation and fishing, and to hunt in the plains south of the lake" (Little 1992: 25).

As Little (1992:8) points out, the Il Chamus were called "'agricultural Maasai' until they began to accumulate cattle herds comparable to those of other pastoral groups." The Il Chamus have made variable use of fishing, hunting, irrigation agriculture, grain and ivory trading, and pastoralism (cattle, sheep, and goats) during the past two centuries (Anderson 1982, 1984, 1988; Hodder 1982; Little 1981, 1992). During the mid-1920s, the Il Chamus abandoned their fortified villages at the southern edge of Lake Baringo and became increasingly dependent on cattle (Anderson 1988:244).

At present, there are 9,000 Il Chamus who are compressed within 750 km2 (269 mi^2) of the semiarid rangeland and marshes along the southern shores of Lake Baringo (Little 1992:21). In the late 1970s, approximately 26,000 cattle, 40,000 goats, and 50,000 sheep also inhabited this area (Little 1992:155–156). Severe droughts in 1979–80 and 1984 reduced the Il Chamus livestock herds to 13,000 cattle, 30,000 goats, and 45,000 sheep (Little 1992:155–156). The average Il Chamus livestock herd consisted of 13 cattle, 47 sheep, and 24 goats (Little 1981).

Increased dependence on pastoralism also occurred in the context of regional trade networks in which Nubian, Indian, Swahili, and Somali traders bought, traded, or sold maize, millet, goats, and cattle (Little 1992:40–41). The stability of this regional economic system was subject to problems created by fluctuations in grain prices, market quarantine restrictions imposed by colonial governments, severe droughts and famine relief programs, and expansion of lands used for production of cash crops, e.g., coffee, pyrthrum, wheat, onions, and red chilies (Little 1992:37–38).

Little (1992:98–104) suggests that the Il Chamus commit themselves to limited agriculture for three reasons: (1) to reduce their dependence on an unpredictable grain market; (2) to purchase livestock after droughts and associated declines in herd size; and (3) to secure and to maintain access to land and water. They have, more

recently, established economic relationships with their neighbors the Tugens with whom they exchange livestock products for maize, millet, and sorghum (Little 1983; Schneider 1984:193; Vedeld 1990).

Despite their efforts to secure land tenure and to produce agricultural crops, food security has steadily declined for the Il Chamus. During the early 1980s, for example, they imported about 80% (1,100 tons) of their total annual maize needs (Little 1992:133). This dependence on imported food included contributions made by Food-for-Work (FFW) sponsored by the World Food Program (WFP; Little 1992:129). In addition, the Il Chamus have had to respond to a number of interrelated problems involving absentee herd owners, marked disparities in herd size and homestead wealth, overgrazing, land degradation, wage employment, and labor shortages (Little 1992: 10).

Since Hodder was initially interested in mapping material culture styles and ethnic group boundaries, we should be aware of the dynamic nature of ethnic group formation, affiliation, and dissolution in East Africa in general. Little (1992:17) reminds us, for example, that "what emerged as the Il Chamus is a mosaic of different ethnic groups and clans who either settled in the area or periodically used its rich resources." Little (1992) discusses recent patterns of ethnic affiliation and ethnic shifting based generally on a preference for pastoralism in the Lake Baringo region. Little (1992:27) points out that the Kalenjin-speaking Tugen in the Baringo District tend "to adopt the dress and cultural style of the Il Chamus—and, indirectly, of the Maasai and Samburu ..." due to the greater wealth, status, and resource control exhibited by the pastoralist societies.

SYMBOLS, STYLE, AND MATERIAL CULTURE: HODDER'S APPROACH

Hodder conducted ethnoarchaeological investigations among three tribal populations (Pokot, Tugens, and Il Chamus) in the Lake Baringo region of western Kenya during the mid-1970s and later in 1983. His study focused on the ethnographic context of material culture within 187 residential compounds. Material culture, in this case, included domestic vessels (calabashes, wooden honey pots, eating bowls, milking jugs, ceramics, and basketry), wooden stools or headrests, spears (nonlocal), and shields; ear and neck decorations; and residential decoration, floor plans, hearth location, and roof type (Hodder 1977a, 1977b, 1982; 1985a; 1987a).

The purpose of Hodder's (1982:11) work was initially to evaluate normative views regarding the "material correlates of social variability." Later, Hodder (1982:12) focused on the study of material culture as symbols and their active role in "forming and giving meaning to social behaviour."

Decoration and Use of Calabash Vessels

Hodder chose to examine the symbolic and conceptual role of decorated calabashes within Il Chamus, Tugen, and Pokot societies in this region. Hodder (1982:68) stated that "Calabashes are of special interest because, in contrast to most of the other artifact types from Baringo, they are often decorated." These decorated calabashes—bottle-shaped gourds with leather caps— are manufactured by women in the Lake Baringo area and they are used solely as milk containers (Hodder 1985a). The milk gourds have a use-life of about two to three years (Hodder 1985a:146).

Throughout Maasailand, milk gourds with leather straps and beaded designs are used to store and to distribute milk within the hearth or matrisegment units (Jacobs 1965; Nestel 1985; Grandin 1988). As in neighboring regions, these milk gourds are kept by the co-wife within her hut in a storage area. They are never to be disturbed by the husband or adult males within the compound (Jacobs 1965:183–184; Nestel 1985: 60–63).

Hodder (1982:68) stated that, "each woman incises her own calabashes which only last for a few years." He (1982:68) observed that the Il Chamus "frequently decorate calabashes and they use exclusively zoned designs." Certain motifs tend to cluster spatially but this "spatial patterning is not clearly related to social boundaries on the tribal scale."

Hodder (1982:68) continued,

> The calabash distributions relate to the local community contacts and relationships of women. Designs are copied between women within small neighborhoods and settlement clusters which sometimes cut across tribal boundaries. Designs are copied between families as much as within families. Thus, the decorative style distributions of calabashes play a part in local dependencies and relationships rather than tribal-wide identities.

More calabashes are decorated among the Il Chamus than among the neighboring Tugen (Hodder 1985a). Interestingly, there are a number of Tugen who have moved from the surrounding hills down to the marshlands adjacent to Lake Baringo. As their cattle herds increased in size and they adopted Il Chamus compound organization, they began to make greater use of decorated calabashes for milk containers (Hodder 1985a;152).

Small calabashes are decorated with incised or burned designs and are used for distributing the milk of cows and goats to children during their first seven or eight years of life (Hodder 1991a:73). Hodder (1991a:86) also states that, "As a young child ..., one of the earliest impressions is of the mother's milk provided in a decorated container." Hodder (1991a:86) continues, "Even at eight years old, the child recognizes his or her own calabash from its decoration .... [T] he importance of milk and of the mother in providing it are emphasized (by the decoration) at an early stage."

The Il Chamus do not decorate calabashes used to collect the milk nor do they decorate beer calabashes, ceramic vessels, or serving baskets.[3] Presently, Il Chamus women continue to make use of decorated calabashes for distributing milk to their children even though they have replaced many household calabash containers with other made of plastic and metal (Hodder 1991a:91).

Context for Symbol Use

According to Hodder (1991a:73–75), decorated calabashes among the Il Chamus are material symbols of the association of women, milk, and children (Hodder 1991a: 73–75).[4] Hodder (1985a:147) suggested, however, that this association is not simply a biological or natural one because, "these relationships are isolated and emphasized by the use of decoration on milk containers but not on the other types of calabashes, by the use of milk in ceremonies, and by the feeding of milk to certain segments of society."

Hodder (1985a, 1991a) down played reproductive strategies and wealth accumulation in the definition of a "multidimensional context of meaning" for decorated calabashes among the Il Chamus. Instead, he focused on the social and economic tensions that exist within Il Chamus society— namely those

between older married males and younger males (the warriors or moran), fathers and sons, and new wives and elder males. Hodder (1985a:150) argued that, "[Il Chamus women] negotiate influence and ... they give meaning to their social position through the use of calabashes decorated with associated symbolism." He (1985a:151) proposed that decorated milk calabashes provide a medium for their expression of their power over older males with respect to their reproductive abilities. Hodder (1991a:89) stated that, "They [women] negotiate a silent, covert, and practical control in a world where the dominant modes of discourse are denied to them."[5] Yet, on the other hand, Hodder (1982:69) stated that Il Chamus males "pay little attention to the decoration" and they "consider it [decoration] to be of peripheral importance." He (1982:69), also proposed that, "The calabashes, then, are appropriate for use as a medium for silent discourse between women."

Hodder (1991a:80) suggested that the Il Chamus women attach relatively little significance to the decorated calabashes; "the decoration is just beautiful!" Hodder (1991a:80–81) concluded that, "For the Il Chamus there is a real sense of beauty, emotional peace, and aesthetic joy in the whole area of activity. In this sense, then, the decoration has no cause. It simply exists as part of Il Chamus culture. It is irreducible."

SYMBOLS, STYLE, AND MATERIAL CULTURE: AN ALTERNATIVE APPROACH

Hodder's investigations of "symbols in action" identified interesting material culture patterns and raised many anthropological questions. For example, why do Il Chamus women only decorate the utilitarian vessels that are used to store and to distribute cow's milk? Why do they choose to "negotiate their influence" within patrilineal, virilocal situations by means of symbols on milk calabashes that are rarely seen or acknowledged by men? Why do Tugen women in more cattle-rich households emulate Il Chamus women with respect to milk gourd decoration and use? Why does the decoration of milk gourds increase among both the Il Chamus and the Tugen as a function of growth in cattle heard size?

In order to address such questions and to view symbols, style, and material culture within a broader context, we must first consider several more general aspects of pastoralism within East Africa. We must examine pastoralist adaptations in order to understand the significance accorded to cow's milk, decorated calabashes, children, and female–male interaction within Il Chamus compounds. What is the significance of milk within this region? How can the critical nature of milk be assessed and measured? Are there any significant environmental and cultural problems that confront East African herders that center on milk production and distribution? Is it possible that symbols within Il Chamus society serve to transmit critical information about milk acquisition and distribution? As anthropologists, we know that information acquisition, storage, and exchange, like food getting or food production, does have costs with respect to human time and energy budgets (Smith and Winterhalder 1992).

Given the special significance of decorated milk calabashes and associated symbols for the Il Chamus, we would expect that the costs of information exchange must be offset by certain adaptive advantages or benefits. Although the Il Chamus have been studied by a number of anthropologists (e.g., Dundas 1910; Little 1981, 1992; Anderson 1982, 1984, 1988; Hodder 1982), published information regarding livestock ecology, human diet

and nutrition, and household food allocation is scant. Consequently, the following discussion relies heavily on data collected among pastoralists groups throughout the Great Rift Valley and adjacent areas. Such cross-cultural data about pastoralists is quite relevant to the Il Chamus given the ecological, biological, cultural, and ethnic interrelationships that characterize East African populations.

East African Pastoralist Adaptations

Pastoralists throughout this vast region make use of domestic livestock, i.e., cattle, camels, sheep, goats, and donkeys to convert generally low quality forage into nutrient-dense and energy-rich food resources for human populations (Dyson-Hudson 1989). The species composition of domestic livestock herds varies according to precipitation regimes throughout East Africa.[6]

Most pastoralists must contend with the problems associated with forage and water acquisition within a patchy environment. As a result, pastoralist groups are generally highly mobile given the need to move their animals across the landscape in response to forage and water demands, parasite and disease threats, land use patterns of neighboring groups, and predator avoidance.[7] Pastoralist homesteads and camps must also consider threats imposed by enemy groups, bandits, and, in some cases, military troops as they move their herds between sources of water and forage (e.g., McCabe et al. 1988:730–731, 733; Dyson-Hudson 1989:179–180).

Pastoralists are subject to considerable risk due to catastrophic losses of livestock caused by drought, epidemic diseases and parasites, raiding, and warfare (Homewood and Lewis 1987; Kerven 1992). For example, during the drought in 1980 and 1981, the Ngisonyoka Turkana lost 37 percent of their camels, 58 percent of their cattle, and 33 percent of their sheep and goats (Dyson-Hudson 1989:182). Similarly, the Il Chamus experienced significant reductions in cattle (50 percent) and goats (25 percent) during the 1979–1980 drought in the Baringo District (Little 1992:155).

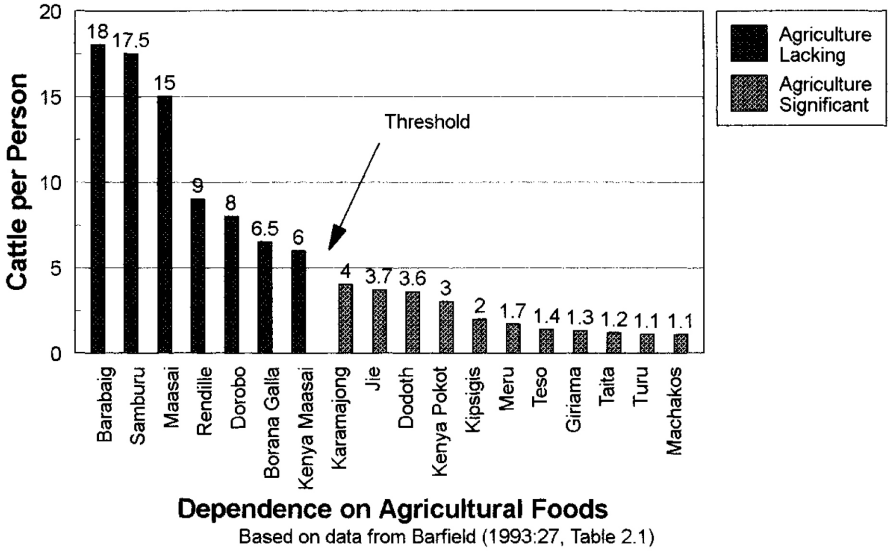


Figure 3. Cattle-to-person ratio and dependence on agriculture for East African groups.

East African pastoralists, like their livestock, experience seasonal hunger, weight loss, and compromised health status during the dry season when rainfall, forage, and milk undergo marked declines (Galvin et al. 1994; Homewood and Rodgers 1991; Little 1989; Little et al. 1988, 1990; Nestel 1985, 1986; Nestel and Geissler 1986). Nathan et al. (1991:9) emphasized that recent nutritional studies of pastoralists demonstrated pronounced food shortages, decreased body fat levels, and slowed growth rates during the long dry season. Such environmental, nutritional, and physiological fluctuations significantly affect female fertility and cause a highly seasonal pattern of births in some East African pastoralist societies like the Ngisonyoka Turkana of northwest Kenya (Leslie et al. 1988:705).

An autonomous pastoralist household must continue to adjust livestock herd size and herd composition in order to satisfy their daily milk demands. Herd size is a function of individual daily food requirements. Schneider (1981:211) stated that, "only the Maasai, Samburu, and Barabaig of Tanzania, and the Somalis could accomplish the required ratio (10 cattle/person) in the wet season, and probably none could reach the 600:1 ratio needed in the dry season."[8] Livestock herd composition, on the other hand, develops in response to the need to balance forage and water requirements, differential reproductive rates, and variable lactational periods (Dahl and Hjort 1976; Dyson-Hudson and Dyson-Hudson 1980:32).[9]

Anthropologists have generally assumed that East African pastoralist diets were specialized and that they primarily consumed milk (cow, camel, and goat), blood (cattle), and meat (cattle, goats, and sheep) (Jacobs 1975; Brown 1971; McCabe 1985; Galvin 1985; Nestel 1986; Coppock et al. 1986; Little 1980, 1989; Little et al. 1990). Homewood and Rodgers (1991:228) have questioned the "formerly widely held idea that Maasai populations traditionally lived on pastoral produce alone...."

A variety of other foods are used to mediate fluctuations in milk yields due to variation in forage and water availability, livestock lactation, calving seasons, epidemic disease, raiding, and external market demands (Dahl and Hjort 1976; McCabe 1987; Dyson-Hudson 1989; Sperling and Galaty 1990;

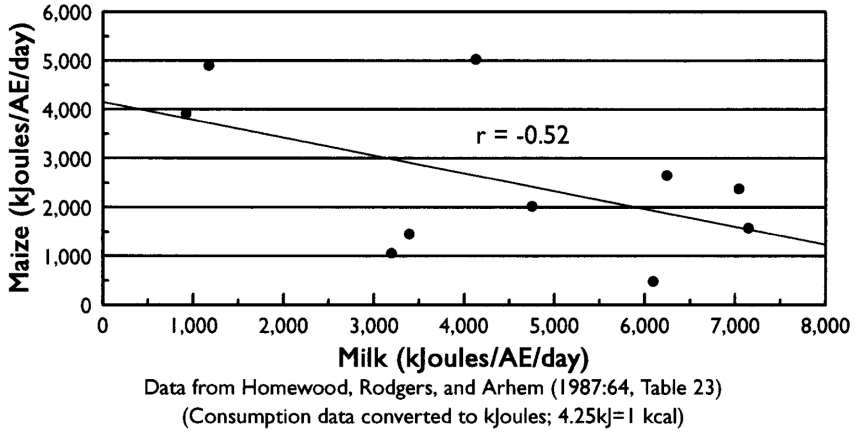


Figure 4. Daily consumption per adult equivalent (AE) of milk and maize for 10 Maasai households in the Ngorongoro Conservation Area, Tanzania.

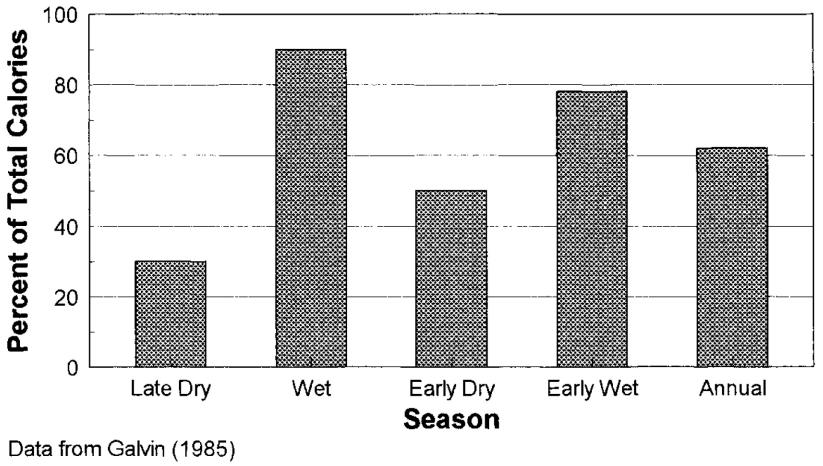


Figure 5. Milk consumption levels for Maasai in the Ngorongoro Conservation Area, Tanzania (based on dry season averages).

Homewood and Rodgers 1991:228–229; Little 1992). Both the blood and the meat of domesticated stock is consumed during the late dry season or after prolonged drought when milk yields are very low and livestock mortality is high (Little et al. 1989:224). Meat consumption among the Maasai in Kenya also increases following outbreaks of livestock disease (Nestel 1985). In East Africa, pastoralists tend to shift toward increased dependence on domesticated crops once minimal cattle herd size declines to approximately six cattle per person (Barfield 1993:27, Table 2.1; Figure 3). Throughout East Africa, human diet tends to exhibit an inverse relationship between domesticated plant products and milk and milk products (Arhem 1985; Hjort 1981; Little 1989; Nestel 1985, 1986; Little 1992; Figure 4).

Milk: Nutrition and Availability

Cows' milk has served as a staple food resource for the Maasai; it represents

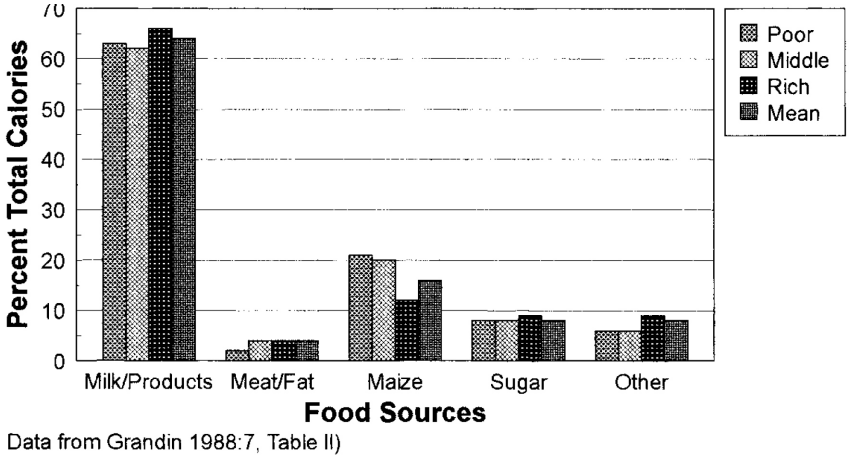


Figure 6. Diet composition for women and children based on economic status in Maasailand, Kenya.

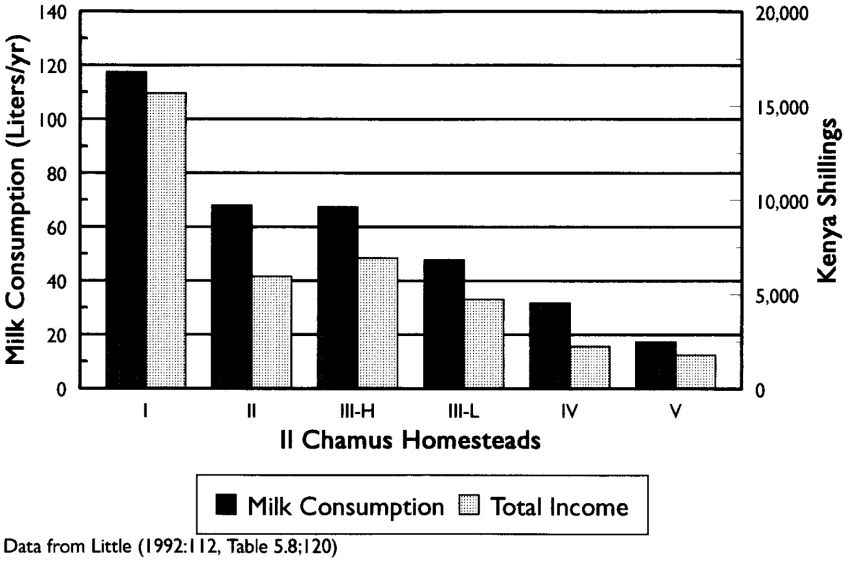


Figure 7. II Chamus milk consumption in relation to total household income.

approximately 60% of their food energy (Galvin et al. 1994; Grandin 1988:7; Little et al. 1988; Nestel 1985, 1986, 1989; Nestel and Geissler 1986; Figure 5).[10] Milk consumption for the Ngisonyoka Turkana in north-west Kenya between the ages of 2 and 21 years provides 65 to 75% of the total caloric intake (Galvin 1985; Little 1989:225, Table 4). Turkana children between the ages of 2 and 3 derived 73 percent of their total food energy from milk; whereas, adult females and males consume about 50 to 56 percent of their calories as milk (Little et al. 1988:716). Grandin (1988:7) found that, despite disparities in herd size among Maasai households in southeastern Kajiado District of Kenya, the "overall per capita milk consumption across strata is virtually

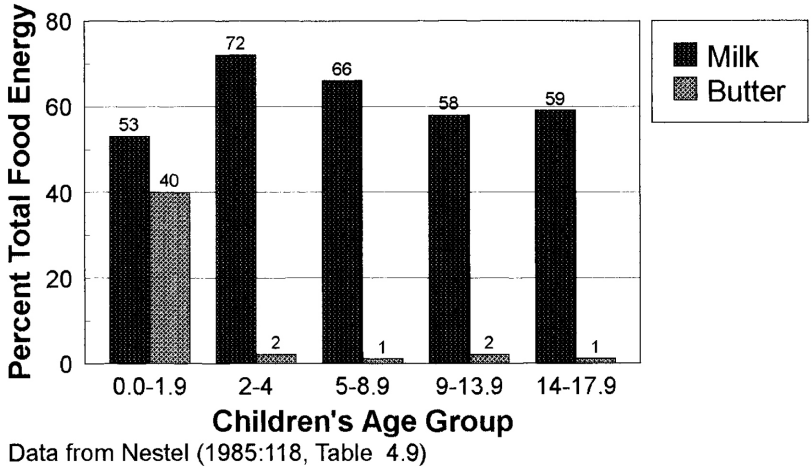


Figure 8. Milk and butter consumption for children in Maasailand, Kenya (July 1982–July 1983).

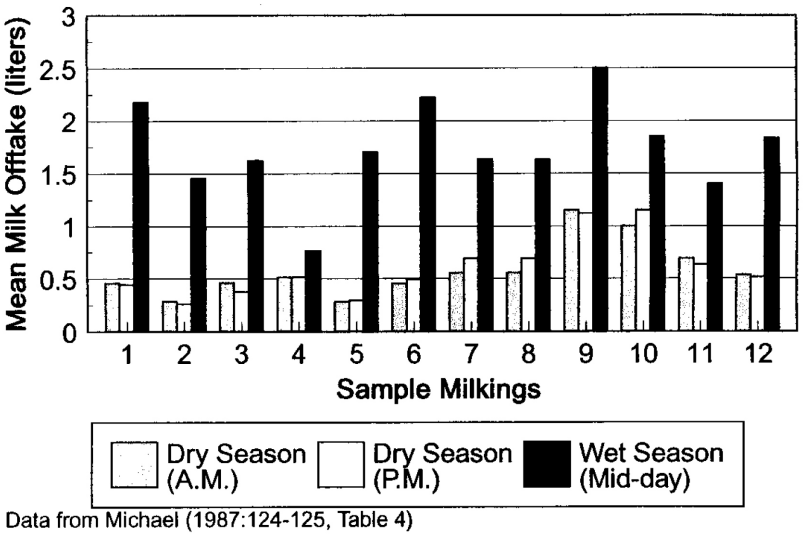


Figure 9. Milk offtake levels obtained by the Hawazma of Sudan during the dry and wet seasons.

identical; in all strata, women and children obtain about 45% of their RDI from milk" (Figure 6).

For the Il Chamus, Little (1992:117) points out that herd growth has not kept up with human population growth and, as a result, they have become increasingly dependent on grain and less dependent on milk. Little (1992:112, 120) has observed marked disparities in both household herd sizes and adult milk consumption among the Il Chamus (Figure 7). Household diet varies throughout the year in response to fluctuations in milk supply. Consequently, "grain consumption per homestead varies from 3.4 kg per day in the dry season ... to 1.1 kg in the wet season" (Little 1992:118). Grain consumption is greater and milk consumption is lower in poorer homesteads. As a result, we might expect to observe increased dietary stress for young children in poorer Il Chamus homesteads.

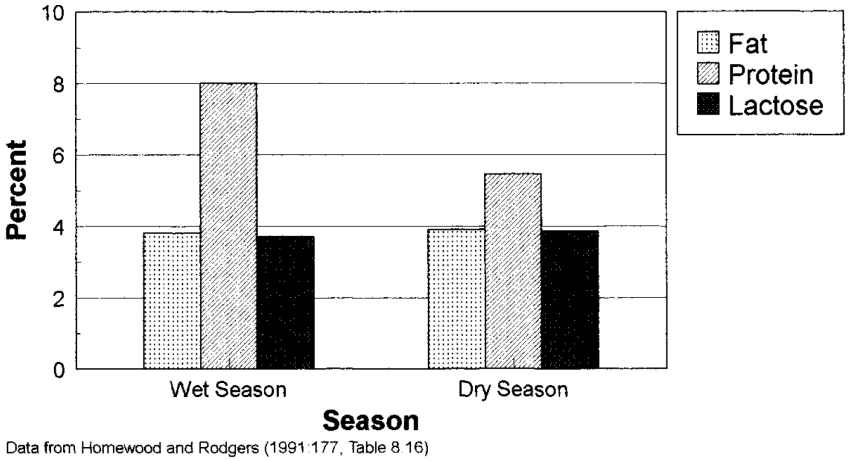


Figure 10. Seasonal changes in milk composition for Maasai zebu cows.

After they are weaned, children in pastoralist societies depend heavily on the milk of domestic animal; butter or ghee may also constitute a considerable portion of the infant's diet (Nestel 1985:119, Table 4.9; 1989; Figure 8). Infants are breast fed on demand but supplemental feeding begins within 2 weeks to 4 months after birth (Nestel 1989). For children under two years old, their caloric intake consists of fat (butter; 67%), protein (12%), and carbohydrates (21%; Nestel 1989:20). In Kenya, Maasai children are generally weaned between the ages of 18 and 24 months (Nestel 1985:119, Table 4.11). Nestel (1985:119) points out that "[cow's] milk is regarded as the most important food for the 2 to 5 year olds" since these children have difficulty digesting the"course locally ground maizemeal ... [that] ... is frequently not cooked properly."

Little (1990:231) notes that, "Pastoral populations are particularly susceptible to seasonal food deficits because they exploit environments with marked seasonality of rainfall and availability of resources." As mentioned, the Il Chamus are subject to marked fluctuations in rainfall within the Lake Baringo region (Figure 2). Offtake levels of cows' milk, as well as its composition, may vary considerably across space and throughout the year in relation to the distribution, abundance, and quality of forage (Dahl 1981; Homewood and Rodgers 1991; Little et al. 1990; Nestel 1985; Nestel and Geissler 1986; Rigby 1969; Figures 9 and 10). Milk production achieves maximal levels "about two or three months after the peak rainfall (Galvin 1985, McCabe 1984)" (Little et al. 1990:411). Dahl and Hjort (1976:143–147) pointed out that milk yield varies markedly between the wet and dry seasons; for example, for East Africa in general milk yields ranged from 2–5 kg (0.91 lb; wet season) to 1–2 kg (0.45–0.91 lb; dry season).[11]

Such variation in yields is, in part, due to the fact that milk production varies directly with cattle feeding time and inversely with travel time to grazing areas (Homewood, Rodgers, and Arhem 1987:62, Table 19; Homewood and Rodgers 1991:175, Figure 8.5). There is also evidence to suggest that variance in milk yield is greater during the dry season than during the wet season (Michael 1987).[12] Human consumption of milk, therefore, varies quite markedly throughout the annual cycle in East Africa (Figure 9).

There are other factors that affect the availability of milk within pastoralist societies. For example, the availability of milk for humans varies in relation to the number of calves and their milk demands (Dahl 1981; Grandin 1988:12; Michael 1987:120–121). Pastoralists realize that the milk offtake used for human consumption results in decreased growth rates for calves. Grandin (1988:10) points out that the Maasai "speak of 'milking calves'" given the "Maasai's perception of the competition between calves and the 'children' for the milk of the same cow." Michael's (1987:120–121) observations among the Hawazama of Sudan reiterates this point; she also described the effects of external market demands for milk on household supplies.

Although all members of pastoralist societies in East Africa are exposed to the threat of seasonal or periodic food shortages, efforts are made to buffer the children in some way. Following the loss of cows in Somali raids, the Samburu in northern Kenya purchased limited numbers of camels during the mid-1960s to supply milk to their children during the dry season (Sperling 1987:7). Adult Ngisonyoka Turkana males and females reduce food consumption during the late dry season in order to buffer children against caloric shortages (Little et al. 1990:412–413;

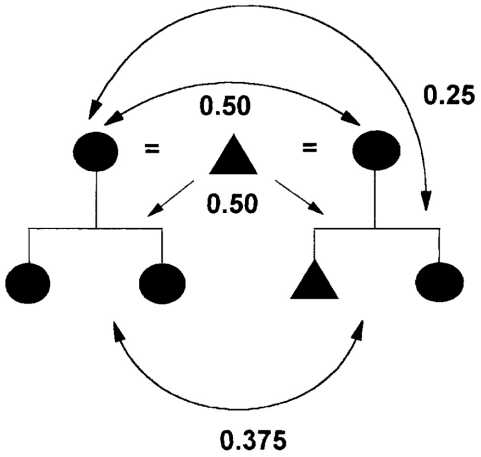


Figure 11. Degrees of relatedness for family members practicing sororal polygyny.

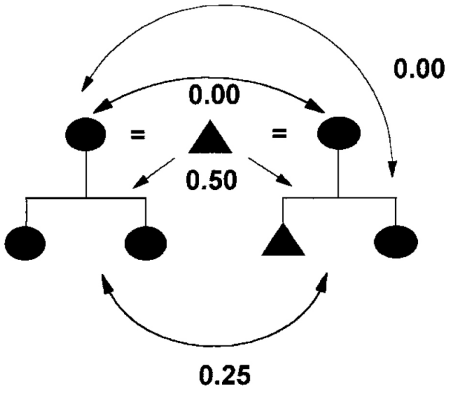


Figure 12. Degrees of relatedness for family members practicing nonsororal polygyny.

Wienpahl 1984: 201). The same is also true for the Maasai in Kenya (Nestel 1985:104). Evans-Pritchard (1951:137) also pointed out that, "Children have first claim in the allocation of milk from the herd, and if there is a shortage it is the adults, and not they, who go without." We might also expect to observe more strict rules and oversight of food allocation within pastoralist compounds—particularly with respect to young children.

Polygynous Households: Cooperation and Competition

Previous studies of material culture, symbols, stylistic variation, and information exchange have given little attention to the internal dynamics of domestic units.

Archaeological studies of symbols and stylistic behavior have generally ignored the implications of social and genetic distance with respect to variation in cooperation and competition within domestic units—particularly extended households including consanguines, affines, distant kin, and adopted or foster children.

Anthropologists have paid particular attention, however, to the dynamic aspects of cooperation and competition between cowives within polygynous households (e.g., Goody 1958; Evans-Pritchard 1951; Gulliver 1955). A number of anthropologists have argued that polygyny is common in East Africa due to the high labor demands of pastoralism (Dahl 1981; Sperling and Galaty 1990; Bonte and Galaty 1991; Fratkin 1991). Bonte and Galaty (1991:7) suggested that, "labor represents the major constraining factor in virtually all systems of pastoral production in Africa...."

Fratkin (1991:70) stated, for example, that,

> Polygyny is valued by both men and women in Ariaal society [in northern Kenya] for its contribution to the labor supply. Men state that polygyny means that they can have more children to herd animals, and women prefer having a cowife with whom they can share household tasks.

Co-wives within polygynous households must cooperate in a number of ways in order to accomplish essential tasks. Klima (1970) has emphasized the need for cooperation within the polygynous households of the Barabaig of Tanzania. He (1970:30)

stated that,

> Herding duties are usually shared by co-wives and their older children. Although each hut-group owns and controls its own livestock, the various stock of the family segments are merged and tended as a single herd.

As a result, cooperation between cowives is especially important when a cowife is separated from her children and her livestock (Gulliver 1955:132). Co-wives also share cooking responsibilities for their husband and his family (Goody 1958; Evans-Pritchard 1951). On the other hand, we know that many polygynous households are characterized by jealously, competition over critical resources, and witchcraft accusations (Goody 1958; Goody 1974; Evans-Pritchard 1951; LeVine 1962; Klima 1970; Clignet 1970; Goldschmidt 1986).[13]

In order to minimize such disputes, more than 50% of known polygynous societies practiced sororal polygyny (van den Berghe 1979:67). Accordingly, more than 90% of the societies that practice sororal polygyny exhibit residential patterns in which the co-wives (sisters) occupy the same dwelling (van den Berghe 1979:68, Table 3). On the other hand, co-wives occupy separate living quarters in a majority of societies practicing nonsororal polygyny (Alexander 1979:164). Bohannon (1964:163) points out that,

> Women in polygyny have grave trouble only when the interests of their children are involved and when real or supposed slights from the father toward one set of children or the other affect the smooth running of the whole.... Here is the source of the difficulty: tension between my mother and the mothers of my half-siblings.

Evans-Pritchard (1951:135) observed that among the Nuer co-wives took turns preparing food for their husband and other members of the byre. Co-wives would also cook for one another and their respective children; however, disputes within the homestead would disrupt this sharing arrangement.[14] Evans-Pritchard (1951:135) stated, "Nuer have told me also that some women, while they give food they have cooked to their co-wives, remove parts of it before doing so and hide it for their own children to eat in secret."

Under conditions of sororal polygyny, a co-wife would obviously be related to the children of other co-wives (their sisters; Figure 11). Genetic distance within households can be expressed in terms of the coefficient of relatedness (Alexander 1979:44, Figure 4). The coefficient of relatedness, in this case, would equal 0.25. The children of these sisters would be half-siblings, as well as first cousins. They would exhibit a coefficient of relatedness equal to 0.375. These values for degrees of relatedness are obviously based on the assumption that the children share a common father.

As van den Berghe (1979:67) has pointed out,

> Sororal polygyny can only contribute to the inclusive fitness of co-wives to the extent that they are in a position to help each other and their respective children. This condition is most likely to prevail if they live close to each other; one would, therefore, expect sororal polygyny to favor co-wives sharing a common residence.

On the other hand, in cases of non-sororal polygyny, co-wives would not be biologically-related and coefficients of relatedness would approach 0.00 (Figure 12). A co-wife would not be related to the children of other co-wives. The children of these cowives would be half-siblings and would, therefore, exhibit coefficients or relatedness equal to 0.25.

The Il Chamus are characterized by patrilineal descent and inheritance of property, as well as virilocal post-marital residence. They are characterized by nonsororal polygyny. Each co-wife and her children, however, form hearth units or matrisegments that are the basic units of consumption within Il Chamus society. There is good reason to suspect that co-wives within the enkangs, like those in many polygynous households, would be competitive in many ways—particularly with respect to the distribution of food within the compound (cf. Hodder 1985a:150–151). Such conflicts within polygynous residential groups can best be understood with respect to genetic distance and resulting disparities in reproductive interests.

The Il Chamus are said to be more polygynous than their neighbors the Tugen (Hodder 1985a:149). The Il Chamus have been more successful in amassing large cattle herds and attendant wealth. As a result, more Il Chamus males can attract and acquire more than one wife. These co-wives are, in turn, capable of producing more children, tending larger herds, procuring more milk, and distributing milk to greater numbers of children.

We would expect to observe frequent conflicts within Il Chamus compounds where a number of unrelated co-wives reside. Each co-wife would want to guarantee a predictable daily supply of milk for each of her children. Their milk needs would vary relative to weaning status, diet composition, and body size. If the Il Chamus are similar to other East African pastoralists, we would expect that they are weaned entirely from breast milk by 18 to 24 months of age and that they are fed supplemental foods, i.e., cow's milk and butter at an early age (by 4 months of age). We could also predict on the basis of cross-cultural studies that disputes among co-wives within Il Chamus homesteads or enkangs would arise due to the practice of nonsororal polygyny. Such disputes regarding food allocation and children would be particularly threatening to Il Chamus children during the dry season and droughts. Periods of milk scarcity would have even more severe consequences in poorer households.

Milk Allocation within Compounds

The allocation of milk is a major responsibility of adult females, particularly cowives, within a number of African pastoralist societies (e.g., Evans-Pritchard 1940, 1951; Grandin 1988; Gulliver 1955; Jacobs 1965; Klima 1970; Michael 1987; Rigby 1969, 1985). Jacobs (1965:183) states, for example, that Maasai women "have sole rights over the distribution of the milk that they draw." Husbands, unauthorized adults, and children are prohibited from disturbing or monitoring quantities of milk stored in a restricted area of a woman's house (Jacobs 1965:183–184; Nestel 1985:60–61; Rigby 1985).

Among the Maasai, as well as a number of other east African pastoralist societies, fresh milk is "drawn off into [and stored in] calabashes or gourds which vary in length between 45 and 60 cm and have a diameter at the base of 7 to 12 cm...." Interestingly, Nestel (1985:115) states, "Each baby had its own small calabash into which the mother allocated its day's supply of milk each morning."

Given such major subsistence responsibilities, Maasai women "appear to have targeted milk offtake of about 1–1.5 litres per capita per day (depending on the season)." Grandin (1988:13) continues, "A woman's maximum targeted offtake is reflected in

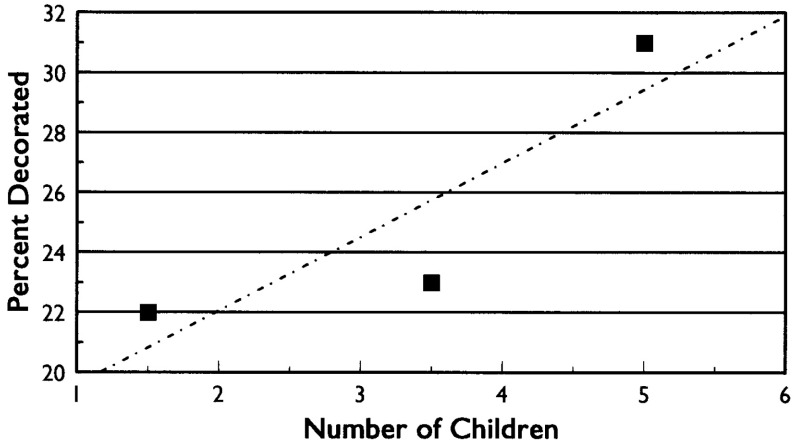


Figure 13. Relationship between number of children and percent decorated calabashes per compound (least squares regression line, $r = 0.8755$).

the storage capacity of her milk gourds." Rigby (1985:149) emphasizes that women are responsible for milking, cleaning, sterilizing, smoking, flavoring, and storing the milk. These food storage vessels require considerable maintenance on a daily basis—particularly during the wet season (Nestel 1985:61).

If a co-wife is absent, a trusted co-wife may take the responsibility for milking her cattle and distributing the milk among the other co-wife's children (Gulliver 1955:132; Klima 1970). Children that are not related to this co-wife would be more susceptible to food deprivation and exposure to other risks. Children may also be exposed to increased risk of food scarcity, morbidity, and mortality under conditions of child fostering (e.g., Bledsoe et al. 1988; Sudre et al. 1990; Pennington 1991; Shell-Duncan 1994).[15] Child fostering is common among the Turkana (Shell-Duncan 1994).

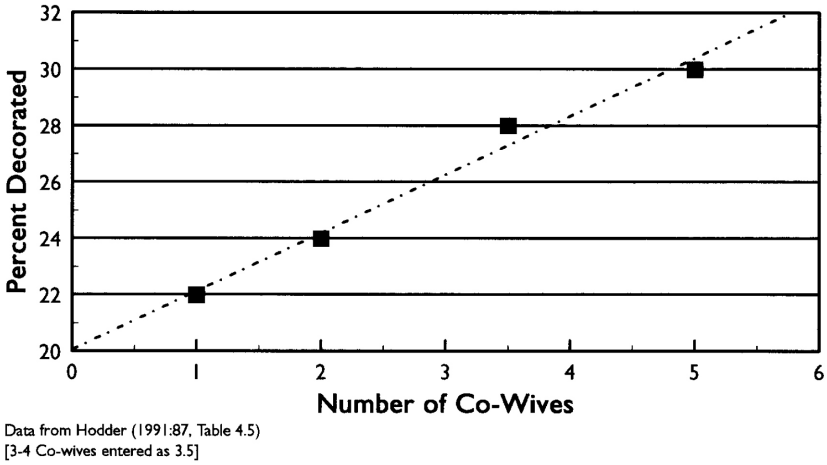
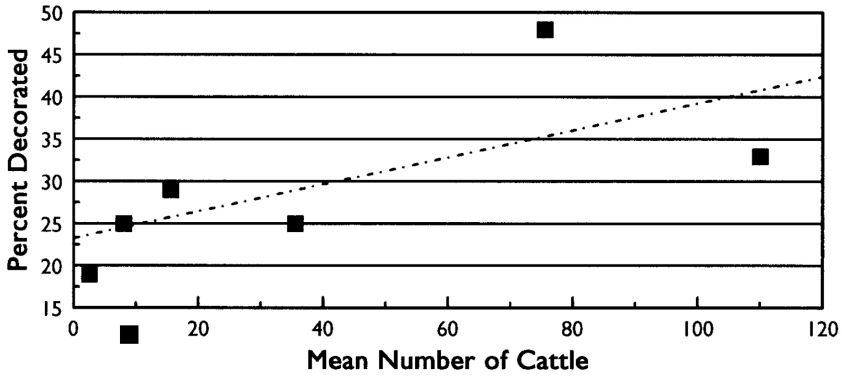


Figure 14. Relationship between number of co-wives and percent decorated calabashes per compound (least squares regression line, $r = 0.9911$).



Data from Hodder (1991:85, Table 4.1)
[Ranges e.g., 0-5, 6-10, and 11-20 entered as means 2.5, 8, and 15.5]
[>100 entered as 110]

Figure 15. Relationship between mean number of cattle and percent decorated calabashes per compound (least squares regression line, $r = 0.6818$).

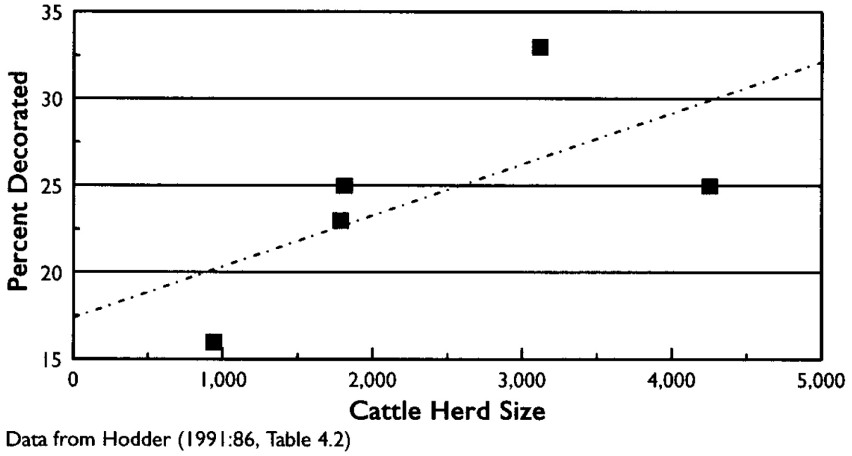
Shell-Duncan (1994:162) states,

> Child fosterage is an adaptation that allows changing labor needs within or between homesteads to be readily valued, and because relocation occurs primarily within kin groups [58.8% with maternal grandmother], fosterage does not seem to have an adverse effect on the health and welfare of the children.

In other cases, foster children frequently experience food deprivation and compromised health status. Bledsoe et al. (1988: 629) state,

> ... small children living with younger women with children of their own may experience discrimination at mealtime. Unlike children with mothers, these fosters rarely have their own bowls.

Such discrimination at mealtime is a potential problem that children might face in residences that contain unrelated caretakers.



Data from Hodder (1991:86, Table 4.2)

Figure 16. Relationship between regional cattle herd size and percent decorated calabashes per compound (least squares regression line, $r = 0.6341$).

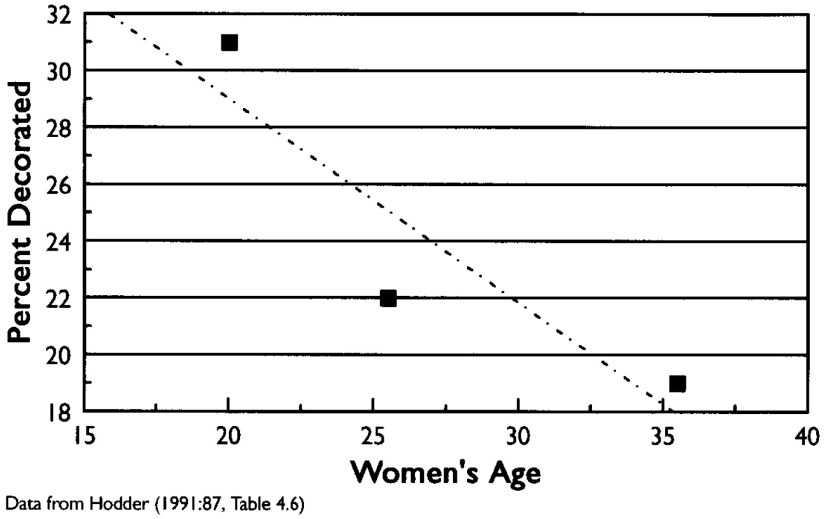


Figure 17. Relationship between women's age and percent decorated calabashes per compound (least squares regression line, r = -0.9017).

EVALUATION

The preceding discussion was meant to demonstrate that milk is a critical food resource in the Baringo District and throughout East Africa in general. Pastoralist societies in this region are particularly susceptible to both short and long-term fluctuations in their food supply. Drought, disease, overgrazing, raiding, and colonial policies have all served to exacerbate the efforts of pastoralists to convert low quality forage into high quality human food. Milk and milk products are particularly important to these East African pastoralist societies since they are supplemental and weaning foods for the children.

Annual declines in milk production during the dry season, as well as longer term declines due to drought, pose a very significant problem for cattle pastoralists. Such an ecological "bottleneck" represents a classic example of Liebig's Law of the Minimum; cow's milk is an essential, limiting resource with respect to the maintenance, growth, and reproduction of pastoralists throughout this vast region. Empirical evidence for the Sudan suggests that cow's milk yields exhibit increased variance during the dry season. Consequently, pastoralist might attempt to reduce the risks associated with household milk allocation and sharing by means of symbols. Nutritional stress for children during the dry season due to reduced quantity and increased variance in daily milk yields could be lessened by means of a carefully monitored allocation system. This allocation system would be particularly useful within large and biologically complex households or compounds. Under these conditions, individualized bottle-shaped calabash vessels could be used to insure that children receive fixed quantities of milk on a daily basis. Child-specific symbols are, then, used to link an individual to a specified quantity of food in an unambiguous fashion.[16] Symbols are used primarily on milk calabashes in order to transmit information and to facilitate

food distribution in households characterized by resource competition and conflicting reproductive interests.

Given the previous discussion of pastoralist adaptations in the Baringo District and East Africa in general, it is now possible to propose a number of expectations for symbol use and material culture among the Il Chamus. The graphical data displays are meant to demonstrate general relationships between variables. They are not to be construed, at this point, as robust linear regressions. These expectations are as follows:

(1) The number of decorated calabashes should be directly related to the number of children within Il Chamus enkangs or polygynous compounds. Using data from Hodder (1991a:87, Table 4.7), we find that this expectation is met (Figure 13).

(2) In turn, the number of decorated calabashes should also be directly related to the number of co-wives within Il Chamus enkangs. This expectation is supported by the data from Hodder (1991a:87, Table 4.5; Figure 14). (3) Given the dietary requirements of the children, their mothers, and other compound members, we would also expect to observe a positive correlation between numbers of decorated calabashes and the number of cattle for each Il Chamus compound, as well as for the neighborhoods within the Lake Baringo region. Data from Hodder (1991a:85, Table 4.1;86, Table 4.2) supports both of these expectations (Figures 15 and 16, respectively). The former expectation was mentioned by Hodder (1991a:85).

(4) Finally, women would make and use fewer decorated calabashes within her hearth unit as her children aged and as she completed her reproductive career. Using Hodder's (1991a:87, Table 4.6), we find that the percentage of decorated milk calabashes owned by women decreases as they grow older (Figure 17). There are several additional expectations regarding symbols and material culture that can be proposed for East African pastoralists including:

(1) The degree of symbol use on milk vessels (storage and serving) should vary directly with the degree of nonsororal polygyny within these groups. We would expect to observe strict resource allocation rules and use of symbols in the relatively rare instances where co-wives (unrelated) or care givers reside in close proximity to one another (see Alexander 1979:164).

(2) The degree of symbol use on milk vessels (storage and serving) should vary indirectly with the degree of sororal polygyny within these groups.

(3) The degree of symbol use on milk vessels (storage and serving) should vary directly with the proportion of cattle-to-camels in pastoralist herds. Milk offtake levels for cows decline and become more variable during the dry season. On the other hand, camels lactate throughout much of the annual cycle (Coughenour et al. 1985:622; Yagil and Etzion 1988).

(4) The degree of symbol use on milk vessels (storage and serving) should vary directly with the degree of separation between co-wives and their children during

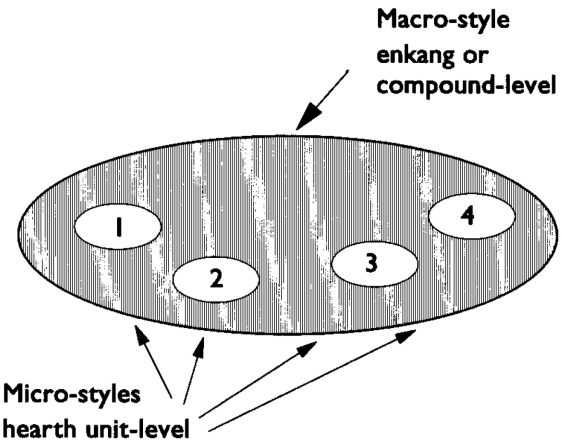


Figure 18. Possible social and spatial scales for stylistic variation in Il Chamus compounds.

the annual cycle—particularly during the dry season.

SUMMARY AND CONCLUSIONS

Symbols and artifact styles, as well as ideology in general, continue to pose a significant theoretical and methodological challenge to contemporary archaeological research. Some archaeologists have recently chosen to reject a materialist research strategy and to adopt an emic approach that attempts to view past cultures—particularly their ideological component from the "inside." For Hodder (1982, 1985b, 1987b, 1991a, 1991b), Shanks and Tilley (1985, 1987), and others such an approach to "remote sensing" required that they equate artifact, action, and human thought. Artifacts or material culture then become, once again, mental templates, ideal types, and fossilized ideas. Hodder (1985b:5), Leone (1986), and others have, by extension, adopted a recursive view of culture; human thought is transformed into material culture that, in turn, comprises the effective human environment. Such symbolic and cognitive approaches have been seriously challenged by anthropological studies that demonstrate the lack of correspondence between human thoughts (emic aspects) and human actions (etic aspects; Harris 1974, 1979, 1990; Yengoyan 1968, 1970, 1972). Further complications arise when investigators strive to "read" the archaeological record as "text." The archaeological record has no "literal translation"; instead, it consists of static material remains that have been produced by past human behavior (as opposed to past human thought). In addition, symbolic and cognitive approaches to archaeology have failed to consider the significance of the biophysical environment and the role of natural processes in the formation of the archaeological record.

The recent rejection of a materialist research strategy in archaeology has arisen, in part, as a result of archaeologists' limited success in expanding cultural materialists theory to account for symbols, styles, ritual, cosmology, and belief or knowledge systems. The cultural materialist strategy provided, and will continue to provide, very important substantive and theoretical insights about 3 to 4 million years of human evolution. It has produced a considerable body of reliable knowledge about past land use, food getting, diet and health, demography, mortuary practices, technology, trade and exchange, and the development of complex cultural systems. Significant progress has been made toward delineating complex interrelationships between these various aspects of past human life. Very little of this research, however, has focused on past information management systems and their potential role in reducing the uncertainties and risks associated with a range of human adaptive responses involving foraging, farming, herding, labor recruitment and coordination, resource storage and allocation, mate selection, parental investment, local and regional level political integration, trade and exchange, and warfare.

Evolutionary ecologists have emphasized that organisms require variable, yet critical, quantities of energy, nutrients, matter, and information for growth, maintenance, and reproduction (Pianka 1983). Ecologists have begun to explore the implications of information for investigating community organization and diversity, animal communication, and foraging behavior (Margalef 1968; Wilson 1975; Dawkins and Krebs 1978; Stephens 1990; Stephens and Krebs 1986). Human behavioral research can make effective use of this perspective. In many cases, we will be directly applying, and not

borrowing, concepts and theory pertaining to information exchange, behavior, and adaptation (Cashdan 1990; Ellen 1982; Hartley 1992; Johnson 1978; King 1994; Moore 1981; Rappaport 1968, 1971; Reynolds 1978; Smith 1981; Smith and Winterhalder 1992).

It will be possible to construct a robust theory of artifact style. This explanatory theory will, no doubt, incorporate evolutionary ecology (Pianka 1983), behavioral ecology (Krebs and Davies 1978), socioecology (Smith and Winterhalder 1992; Winterhalder and Smith 1981), and information and communication theory (e.g., Krippendorf 1986; Losey 1978; Shannon and Weaver 1949). The theory of material culture style will, then, be subsumed within a much broader explanatory framework that will account for broad range of subject areas that anthropologists have traditionally studied including ritual, art, music, dance, body decoration, costumes, calendrics, astronomy, and other knowledge systems. A unified theory will be achieveable once researchers recognize the significance of information and nonverbal communication within the broader context of evolutionary ecology. Given this view, individuals or groups of varying size(s) may make use of symbols to transmit critical information regarding individual identity, group composition and affiliation, access rights, and boundary maintenance.

Among the Il Chamus, I have proposed that the decorative motifs used on milk calabashes possess information potential. The pyroengraved symbols, as well as possibly calabash size and shape, have a functional, adaptive role within Il Chamus society. Hodder's data supports a socioecological explanation for symbol use on milk gourds. We find that the relative frequencies of Il Chamus decorated vessels vary positively with numbers of cattle, co-wives, and children within various enkangs or patrilineal,

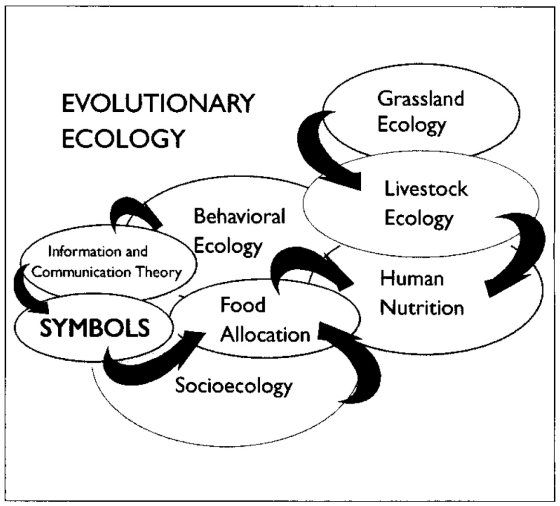


Figure 19. Theoretical framework for archaeological and anthropological explanation of symbols, styles, and information exchange.

Such symbols provide a nonverbal means for reiterating information regarding rules and expectations within socially complex households about the use rights and the daily allocation of a critical, yet fluctuating food resource—fresh milk (Figure 18). Within these socially complex households, the reproductive interests of the husband cross-cut all of his co-wives' hearth units and operate at the spatial and social level of the compound. Husbands have allocated certain milk producing animals to their respective wives. Husbands are dependent on these adult females for domestic labor and for producing additional laborers or offspring. Yet, as Elam (1973:52–57) has argued, these compound heads view their wives' children as potential threats to the viability of their herd since they compete with calves for milk. Adult females, on the other hand, focus most of their time and energy on their own offspring within separate, somewhat autonomous hearth units. A co-wife's reproductive interests operate primarily at

the matrisegment or hearth unit level. The milk she distributes is to be derived from the cows that have been allocated to her by her husband.

Maasai, as well as other East African pastoralists, do share milk within the enkang or compound during periods of scarcity. Also, co-wives do, in fact, take care of another co-wife's children during her absence. These women, however, are more likely to take preferential care of their own children—especially during periods of stress. We would predict that milk allocation becomes critical for infants, as well as weanlings and older children during periods of low milk production such as the late dry season, longer-term droughts, or catastrophic declines in cattle herds. Symbols on decorated milk gourds, then, serve to facilitate and regulate milk allocation within and between hearth units in the compound. Symbols provide information that can reduce the uncertainties of milk allocation. They link specific children with specific milk vessels, milk volumes, and hearth areas. We might also expect, in similar cases, that these symbols can be found on other classes of material culture—even on the bodies of the women themselves.

From an ethological perspective, communication is comprised of more than a sender, a receiver, and a message. Wilson (1975:176) stated, "Biological communication is the action on the part of one organism (or cell) that alters the probability pattern of behavior in another organism (or cell) in a fashion adaptive to either one or both participants." Given this view, symbolic communication among humans must ultimately be assessed and explained with respect to behavioral responses of either the sender, the receiver, or both. Furthermore, one must examine the possible adaptive advantages that such nonverbal communication confers to the sender and/or the receiver. I believe that symbol use among the Il Chamus does, indeed, confer adaptive advantage to children exposed to risk and uncertainty related to the procurement and allocation of fresh milk. Such nonverbal communication and resulting behavioral responses also contributes to the inclusive fitness of the husband and his respective co-wives. If this environmental and nutritional constraint is not ameliorated through an effective livestock management and food allocation strategy then the realized fertility of Il Chamus females is drastically reduced.

Wobst's (1977) model of material culture styles and information transfer could be modified, particularly for subsistence-level societies, so that social distance and interaction might be operationalized in terms of genetic distance or coefficients of relatedness. This genetic measure enables us to map a variable social environment within which two or more individuals are then expected to share or to compete for critical resources. Sociobiological studies also provide us with a number of expectations regarding a range of conflicting reproductive strategies that exist within groups of variable size and composition. Although archaeologists may not be able to make direct use of genetic distance measures, they could explore the range of cooperative and competitive relationships that exist both within and between residential units. Certainly, degrees of relatedness could become more important within the context of ethnoarchaeological research. A socioecological perspective can provide a more powerful characterization of the social and biological context within which material culture styles may vary spatially, temporally, and demographically. We must begin to reformulate our ideas regarding social or kin group size and composition. Recent failures to delineate isomorphic patterns between material culture styles and bands,

tribes, and ethnic groups result primarily from archaeologists' reliance on inadequate models of group formation, composition, and dynamics.

As archaeologists, we must also recognize that symbolic systems may crosscut more than one class of material culture including clothing, headdresses, jewelry, weapons, shields, ceramic vessels, "makers marks," granaries, houses, livestock brands, boundary or territory markers, and different forms of body decoration, e.g., facial painting, hair styles, tatoos, and scarification. For example, among the Wodabe of Nigeria, decorative patterns on gourds are the same as the facial markings of women (Chappel 1977:30; Plates 21–23; Figure 219a–e, 203). Hodder (1982) provides several examples of correspondence between decorative motifs on calabashes and ceramic vessels and scarification motifs on both men and women's bodies among the Nuba in Kordofan, Sudan. Hodder (1982) does, in fact, discuss these linkages between symbols used on various classes of material culture. He does not account for the observed associative patterns within a theoretical perspective that produces reliable knowledge, integrates extant information, or predicts new facts.

Socioecological concepts and theory, on the other hand, can provide greater insights about the role of symbols in nonverbal communication within social groups of varying size and composition. The socioecological approach allows us to link what we do not understand to what we already know; it provides the organizing framework that integrates our knowledge about East African climate, livestock ecology, human physiological and reproductive ecology, herd management strategies, domestic group formation, information transfer, and material culture (Figure 19). The ultimate utility of archaeology for the behavioral sciences, as well as for humanity in general, will be assessed in terms of the reliable knowledge that we generate. This body of reliable knowledge about the past will be more relevant and more useful to archaeologists, as well as biological and social scientists and the general population.

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NOTES

[1] Wobst (1977:323–328; 325, Figure 1) presented a model for anticipating the nature of stylistic behavior, information exchange, degree of interaction, and social network (target group) size. He (1977:326) proposed that "the amount of stylistic behavior should positively correlate with the size of the social networks that the individuals participate in." Wobst (1977:325–326) also suggested that stylistic behavior becomes increasingly efficient as a means of information exchange in social networks that contain large numbers of "socially distant, non-close friends, and non-relatives." He (1977:328) also discussed the visual aspects of information exchange in relation to the size or visibility of artifacts, the size of the target population, the number of social use contexts, and message content.

[2] Dundas (1910:50–52) suggested that many of the Njamus were, in fact, Il Doigio who had left the Samburu tribe in the early 1800s; they had then occupied the Loroghi Plateau along the edge of the Rift Valley. The Doigio became allies of the Laikipiak Maasai. They were nearly decimated by the Segellia Maasai and most of their livestock was taken (Dundas 1910:51). At this time, they moved to the Njemps Flats at the edge of Lake Baringo and sought protection among the Suk and the Turkana (Dundas 1910:52). The Diogio adopted cattle and their herds began to increase. They, like the Il Geroi in this area, became the target of numerous raids. Little (1992:25) states, in this regard, "The constant threat [of raiding] limited pastoral activities in the precolonial period to goats and sheep rather than cattle rearing since the smaller animals were not sought after by neighboring groups." In response to this threat, the Njamus aggregated in two fortified villages, Njemps Kubwa and Njemps Ndogo on the Molo and Tigrish rivers, respectively (Dundas 1910:49–50). Their enemies had now become the Suk, Turkana, and the Laikipiak Maasai (Dundas 1910:52). The inhabitants of Njemps Flats in the early 1900s consisted of the Laikipiak Maasai, Samburu, Il Diogio, Kamasia, Uasin Gishu (Il Moiven), Il Geroi (Dundas 1910:52–53). The Baringo region became a significant political and economic "border zone between [the] two most important pastoral groups of the Rift Valley, the Turkana and the Maasai" (Little 1992:26).

[3] Decoration is not used on all classes of vessels. Chappel (1977:42) states, "It seems that, in general, pastoral Wodabe only decorate those gourds in which milk is carried to market for sale, and also the gourds in a woman's collection of reserve materials which are displayed on ceremonial occasions. Food bowls are sometimes decorated but churns, dippers, water-bottles and milking gourds, all of which may be described as 'working' gourds, are not usually decorated."

[4] Hodder (1991:75) tells us that milk is a very significant component of Il Chamus society given its central role in ceremonies linked to fertility and reproduction. White is, therefore, the color that symbolizes women, their special status as milkmaids, their dominant role in the distribution of milk, domestic life, and children. Even though men control such ceremonies, women are represented symbolically by milk (Hodder 1991a:75).

[5] Interestingly, the decorations on the calabashes consist of "double V" and "zig-zag" incised designs (see Hodder 1985:143, Figure 7.1). The "V" design is said to be related to the red ocher "V" patterns that are painted on the chests of the young warriors or moran (Hodder 1991:78). These young, unmarried males are said to pose a threat to the older males since they can potentially compete for the affections of single and married females (Hodder 1991:89–90).

[6] Livestock herds in desert areas (mean annual rainfall between 250 and 300 mm (10 and 12 in.) are camel-dominated, whereas in semiarid areas (mean annual rainfall between 250 and 500 mm; 10 and 20 in.) they are cattle-dominated (Bonte and Galaty 1991:12). Cattle pastoralism is generally abandoned in regions with mean annual precipitation greater than 1,000 mm (40 in.) due "to the proliferation

of parasitic diseases, lack of palatable and nutritious forage, and agricultural intensification" (Bonte and Galaty 1991:13).

[7] Among the Ngisonyoka Turkana, for example, the main residential group or awi moves from eight to fifteen times and covers at least 40–60 km (24–36 mi) during an annual cycle; maximal distances moved per year averaged between 120 and 172 km (72 and 103 mi; Dyson-Hudson 1989:187; McCabe et al. 1988:733, Table 1).

[8] Jewell (1980:372) estimates than an average pastoral family of eight persons (on a diet based 75% on milk) needs a minimum herd of 44 head of cattle and some 100 small stock, which means between five and six head of cattle and 12–13 small stock per capita.

[9] For example, the doubling times for female herds of sheep, cattle, and camels equal 3 years, 21.5 years, and 50 years, respectively (Dahl and Hjort 1976; Dyson-Hudson and Dyson-Hudson 1980:32). Also, Dahl and Hjort (1976 in Dyson-Hudson and Dyson-Hudson 1980:32) state, "a camel may lactate for 18 months out of a 2-year period (p. 187); a cow may lactate for about 7–8 months twice every 3 years (pp. 92,211); a goat may lactate for three 100-day periods every 2 years...."

[10] Cow's milk provides a variable calorie supply throughout an annual cycle. For the Ngisonyoka Turkana of northwest Kenya, milk from cattle, goats, and camels fluctuates from 30 percent of total calories in the late dry season to 90 percent in the wet season (Little et al. 1940:412, Figure 14.7). Seasonal variation in milk supplies is also a serious concern for the Barabaig of Tanzania (Klima 1970:11). With respect to diet, Little et al. (1990:417) state that the Turkana consume very high levels of animal protein (milk, meat, and blood) but overall caloric intake is low. Drought forced the Turkana to consume high levels of meat so that the next year's herd sizes were reduced and milk production was low (Little et al. 1990:417).

As Little (1980:484) points out, east African cattle produce less milk on a daily basis (ca. 0.6–3.5 liters/day) than modern Western cows. On the other hand, Maasai cattle milk contains a greater amount of fat (ca. 4.4–10.4 g/100 ml) than cattle in the United States and its caloric level may exhibit a 35% increase between the dry versus the wet season (Little 1980:484, Table 1). Protein levels vary from 3.5 to 4.3 g/100 ml (Little 1980:484, Table 1).

[11] Data for milk yields in the wet versus the dry season in East Africa included: Samburu, 2.7 kg vs 3.2 kg; Barabaig, 1.9 kg vs 2.8 kg; Maasai, 1–1.5 kg vs 0.5 kg; and Pokot, 2.4 kg vs .2 kg (Dahl and Hjort 1976: 143–147).

[12] Michael (1987:124–125, Table 4) presented detailed data regarding milk yields for cows herded by the Hawazma (Baggara) in Sudan. A statistical analysis of this data reveals that mean wet season yield (1.80 kg) is slightly greater than mean dry season yield (1.39 kg); however, cows are milked twice during the dry season (morning and evening) and only once during the wet season (midday; Michael (1987:124–125, Table 4). The morning and evening milkings during the dry season exhibited mean yields equal to 0.70 kg and 0.69 kg, respectively. More significantly, the dry season milkings exhibited higher coefficients of variation (0.5461 a.m. and 0.5234 p.m.) than the single midday wet season milking (coefficient of variation, 0.2741).

[13] LeVine (1962) has described the correlation between co-wife proximity and witchcraft accusations and sorcery in southwestern Kenya. He (1962) demonstrates that jealousy, competition, frequency of witchcraft attribution, and sorcery increase directly among three southwestern Kenyan societies (Luo, Gusii, and Kipsigis, respectively) as a function of increased physical proximity of co-wives and their offspring. All three societies are "highly polygynous and are characterized by patrilineal inheritance, the house-property complex, and separate houses for plural wives" (LeVine 1962:40). Although LeVine (1962) attributes intense jealousy and high frequencies of witchcraft accusation and sorcery to conflicts resulting from the role of co-wives in patrilineal inheritance of property, he does suggest that population density, crowding, and food scarcity may also be implicated.

[14] Like the Il Chamus, the Nuer were also patrilineal, virilocal cattle pastoralists. Their large polygynous families formed individual homesteads or byres. Interestingly, among the Nuer the term Nyak means both "to be a co-wife" and "to be jealous" (Evans-Pritchard 1951:134-135). But within each homestead each co-wife and her children lived in a separate hut (dwil) and shared food around the wife's (mac) or cooking fire (Evans-Pritchard 1951:127).

[15] In western Kenya, approximately 16 percent of all children do not reside with their biological mother (Shell-Duncan 1994:157, Table 8.1). Unlike other cases of child fostering in Swaziland (Sudre et al. 1990) and Sierra Leone (Bledsoe et al. 1988), foster children among the Turkana pastoralists of Kenya did not exhibit compromised nutritional or health status. The lack of adverse impacts on fostered children in this case is due to the fact that the maternal grandmother was most frequently the guardian. In other instances, however, when the foster child lives with nonrelatives they are subjected to more severe work conditions, food deprivation, and other forms of abuse.

[16] The concepts of noise, entropy, uncertainty, variety, redundancy, information, and risk are central to communication theory (Krippendorff 1986; Losey 1978; Shannon and Weaver 1949). Losey (1978:13) states, for example, that "The amount of information a [particular] message—[a of a set of messages A] conveys then becomes the difference between two states of uncertainty, the uncertainty U(A) before or without knowledge of that message and the uncertainty U(a) after or with knowledge of that message ..." An efficient message is one that requires a receiver to ask few "yes-or-no" questions in order to reduce their initial uncertainty (Losey 1978:13). Noise can contribute variety to an information stream; it also creates ambiguity. Ambiguity in the information stream can be reduced by increasing redundancy of the message. Symbols can be utilized to schematize or map direct linkages between individuals or groups with specific critical resources, e.g., portions of meat, specific prey animals, plots of land, waterholes, or storage vessels. Symbols code information that reduces uncertainties related to critical resource ownership, use rights, and allocation. As mentioned, uncertainty in information transfer may be reduced by means of increasing the redundancy in the use of symbols. Symbols on decorated calabashes, ceramic vessels, and granaries might also be reiterated on the bodies of women, or men, who control resource allocation in various societies.