Philip J. Wilke
University of California, Riverside, CA,
USA

**Philip J. Wilke**

# Housing and Transport at the Origins of Nomadic Pastoralism

## Introduction and Purpose

Several decades of intensive research have not resolved major issues surrounding the origins of nomadic pastoralism in Jordan (e.g., Köhler-Rollefson and Rollefson 1990, 2002; Köhler-Rollefson 1992; Goring-Morris 1993; Martin 1999; Horwitz *et al.* 1999). Most of the effort is directed at assessing the significance of goat and sheep remains from the main towns in the highlands, and from lesser sites in the steppe/desert, in the overall Neolithic economy. Some writings focus on mechanisms that gave rise to, or necessitated, the emergence of nomadic pastoralism. Less attention is paid to nomadic pastoralism as an adaptation or life-way, how it was organized, what subtle things made it work, how it evolved into the life-way of the contemporary Bedouin. It is these latter topics with which this paper is concerned.

It is accepted here that the *origins* of nomadic pastoralism in what is now Jordan occurred toward the end of the Late Pre-Pottery Neolithic B (LPPNB), a little before 8,000 radiocarbon years ago[1]. Thereafter the nomadic pastoral life-way grew in importance and persisted through the end of the Neolithic and down to the present. In some regions, such as parts of the Black Desert of the Jordan panhandle, the extent of the archaeological record that has accumulated from this adaptation is almost overwhelming.

Establishment of this socioeconomic adaptation was an innovative paradox. The problem of providing a daily food supply for human herders, especially in a steppe/desert environment where plants were mostly unpalatable to humans, without compromising viable herd structure and size by reliance on meat, had to be resolved. This matter has received some attention in literature.

Beyond that significant problem, temporary housing and associated equipment for herding trips of several months duration had to be organized and provided, along with practical means of transportion. The establishment of a functional, mobile, pastoral economy in the absence of the pack animals of later prehistory is widely thought to have presented major technological challenges.

The nature of these problems and their Neolithic solutions can and must be addressed and speculated upon in order to anticipate the nature of the archaeological record that may have resulted from early pastoral activities, and to devise means of accessing that record. Without such a perspective there is little recourse but merely to react to what is found in archaeological contexts and to try to interpret it. This latter approach provides neither predictive potential nor clear means for discovering critically important new evidence that can be brought to bear on recognized problems. The admittedly speculative discussion offered here addresses these issues and attempts to anticipate and characterize some aspects of the life-way of the earliest paleo-Bedouin on the eastern Jordan steppe/desert more than 8,000 years ago.

## Origin and Nature Of the Nomadic Pastoral Life-Way

This discussion builds on an earlier synthesis by Quintero *et al.* (2004). That work developed an explicit model of the origins of nomadic pastoralism late in the LPPNB of the Jordanian steppe/desert, and how it articulated with the socioeconomic structure of the main Neolithic towns. As summarized there, goats were the first common herd animals

[1] All dates given here are in uncalibrated radiocarbon years before the present.

to be added to the village farming economy of the southern Levantine Neolithic, and they were present in the Jordanian highlands well before 8,500 years ago. How goat herds were managed in the vicinity of Neolithic towns without seriously impacting nearby fields of cultivated plants is an important issue, the nature of which has been weighed elsewhere (Köhler-Rollefson and Rollefson 1990; Köhler-Rollefson 1992; Quintero *et al.* 2004). Even today these highly independent animals are not necessarily impeded by stone walls, and this situation must have prevailed from the beginnings of goat husbandry.

The addition of domesticated sheep to the Neolithic economy occurred, at least in northern Jordan, about 8,500 years ago, apparently introduced from what is now Syria (Horwitz *et al.* 1999). By 500 years later they are reported to have comprised a major part of the fauna at the Neolithic town of 'Ayn Ghazāl (Wasse 1997). Together, domesticated sheep and goats had to have constituted a significant threat to the fields of wheat, barley, lentils, etc., and competed with humans for cultivated crops. In the Mediterranean climate, wheat and barley were and still are planted in the fall, and the young plants make their early growth on the highly seasonal winter rains. Ethnoarchaeological research suggests that the solution to this dilemma of herd animals trashing cultivated fields was to take the sheep and goats afield, both in the highlands and to the steppe/desert of the eastern *bādiya* in the late autumn. Here, it was argued (Quintero *et al.* 2004), the herders spent the winter months, moving through a series of short-term camps as their animals foraged on the seasonal vegetation. The return to permanent towns would have occurred in the late spring or early summer after the grain was harvested, and after aridity had again reclaimed the steppe/desert zone.

It seems reasonable to suggest that then, as now, a mix of goats and sheep together constituted a viable herd for Neolithic nomadic pastoralists. It is tempting but unrealistic to conclude that such herd structure was necessary if for no other reason than that goats help lead the sheep and keep these dumb animals moving in the right direction. Colleagues have rightly criticized me for my earlier reasoning on this matter. They have pointed out that the decline in intelligence of domesticated sheep must have resulted during thousands of years of genetic manipulation by humans. During the LPPNB, sheep were but little evolved from their wild progenitors. They must have been as smart, wary, independent, and agile as wild sheep of today, notably the mouflon from which they are believed to have descended. They must still easily have been capable of living on their own and contending with natural enemies. So early domesticated sheep may have been difficult to manage as herd animals, and this issue has to be considered in research on early pastoral strategies. To return to the goats, while they may have been important in herd management, their essential presence has long been viewed as suppliers of meat (e.g., Bar-Yosef and Meadow 1995: 91). But while they may have been kept to supply meat to a certain extent, it was their milk, hair, probably kid skins, and other useful products for which they were really valued (Quintero *et al.* 2004).

The same winter rains that nourished cereal crops in the highlands returned life to the eastern steppe/desert zone. Perennials were revitalized, and annuals sprang to life. It seems likely that very little of this annual bloom of vegetation was palatable to humans or could be metabolized directly by the human gut. However, sheep and goats can metabolize both green and dry forage, including all manner of plants inedible to humans. In so doing, they convert otherwise worthless desert vegetation into milk (Köhler-Rollefson 1992; Köhler-Rollefson and Rollefson 2002), and goats were, and remain, the greater producers.

But it is unlikely that the milk of these small ruminants could generally have been consumed directly by Neolithic herders, and it did not have to be. Over much of the world, many adult human populations are overwhelmingly unable to metabolize lactose, the common sugar in milk. In these populations people lose their ability to produce adequate lactase, the enzyme that in the small intestine converts lactose into the simpler absorbable sugars galactose and glucose, by about the age of four years. From childhood on, most people who are lactase-deficient suffer great discomfort if they consume milk or milk products. The ability of adults to metabolize lactose in some populations evolved coincidentally with the evolution of dairy economies. Among Neolithic herders, lactose intolerance would have been a serious problem for most adults. Lacking refrigeration, milk, possibly contained in skin bags, would have soured within hours. This was a fortuitous and happy event that was to have great historical ramifications. "Domes-

tication" of the right strains of the *Lactobacillus* bacteria, which metabolize lactose, would have occurred automatically, ultimately leading to the production of yogurt, cheeses, and other useful milk products. And a skin bag having once produced a useful cultured-milk product was irreversibly contaminated with the requisite bacteria, and it would make the same product the next day and forever after. Surpluses of some of these products, notably cheeses and yogurt, can be dried and reconstituted in water when needed. Importantly, after conversion of the lactose into more user-friendly agents, milk products could be metabolized by humans without further significant problems. Consequently, cultured-milk products must have formed a major part of the diet of the earliest paleo-Bedouin.

Today Bedouin and other nomadic pastoralists rely heavily on the products of cultured milk. They use the meat of their herd animals less frequently, and especially on socially important occasions. Older, barren female and younger male animals are eaten, but careful herd management must first consider the singular necessity of maintaining a reliable milk supply. It seems therefore that reliance on milk products would have been logical, fortunate, and necessary for nomadic pastoralism in the Neolithic as well. Regular meat supplies must have been obtained by hunting gazelles, ibexes, hares, and other desert animals, and projectile points are common artifacts in the site assemblages of early herders. In this regard it is tempting to speculate also on the antiquity of falconry and its possible role in game-getting during the Neolithic.

The sheep and goats of Neolithic herders provided other renewable resources. As with the familiar black tents of contemporary Bedouin, since ancient times goat hair must have been spun into yarn and woven on ground looms into coarse fabrics and rugs. Goat hair may also have been made into some forms of bedding and clothing. In terms of their coats, sheep of the LPPNB would have been similar to their wild ancestors, with outer coats of hairlike *kemps* concealing an undercoat of fine wool, as is seen today in wild sheep the world over. The undercoat molts and slips away in the spring a few weeks before the outer coat of kemps is shed and replaced. Ethnoarchaeological and archaeological evidence suggests the likelihood that in the Neolithic the undercoat was combed out as it began to molt (Quintero *et al.* 2004). This practice was recorded in recent decades in northwest China and Tibet where cashmere goats and hairy sheep are combed to obtain their fine undercoat (Ryder 1987; Goldstein and Beall 1990). The evolution of fleece occurred as a result of selective breeding, perhaps capitalizing on favorable mutations, probably no earlier than 7,000 years ago. But in the LPPNB, such sheep's wool as could be obtained probably was spun into yarn and woven into fabrics as it is today to make rugs, bedding, and warm clothing. Felt, the most elementary fabric, could also have been made by wetting the wool and pounding it out flat.

As suggested elsewhere, the annual cycle of herding on the steppe/desert, begun in Neolithic times, would have depended on seasonal vegetation for forage for herd animals. It would have taken advantage of seasonal rainpools, and knowledge of where seasonal or permanent subterranean flow could be tapped in the beds of wadis by digging shallow wells for water supplies. Departure from the highland towns would have been prompted by emergence of the next season's wheat and barley crop. So in effect it was the autumn rains that initiated the annual cycle of pastoral nomadism. Following perhaps six months of wandering on the steppe/desert, the herders would have returned to the Neolithic towns. They would have brought with them well-managed herds of animals, hair and wool, perhaps supplies of yarn spun from hair and wool, hides or tanned leathers, bags made of kid skins, dried yogurt and cheese, braided leather or goat-hair ropes, sinews, maybe woven textiles such as clothing items, blankets, and rugs, supplies of "Dabbah marble" for the lapidary industry, and other essential raw materials picked up along the way, all integral to the dual economy that now typified Neolithic culture.

But how would these paleo-Bedouin have housed themselves during their half-year wandering through countless seasonal camps? What was the nature of their domestic structures, and how would they have transported them, or the transportable parts of them, from one camp to another? How would they have handled these problems of transport 2,500-3,000 years before the domestication of the donkey and perhaps 4,000-4,500 years before the domestication of the horse and camel? None of the standard pack animals of the Near East today were yet part of the Neolithic adaptation.

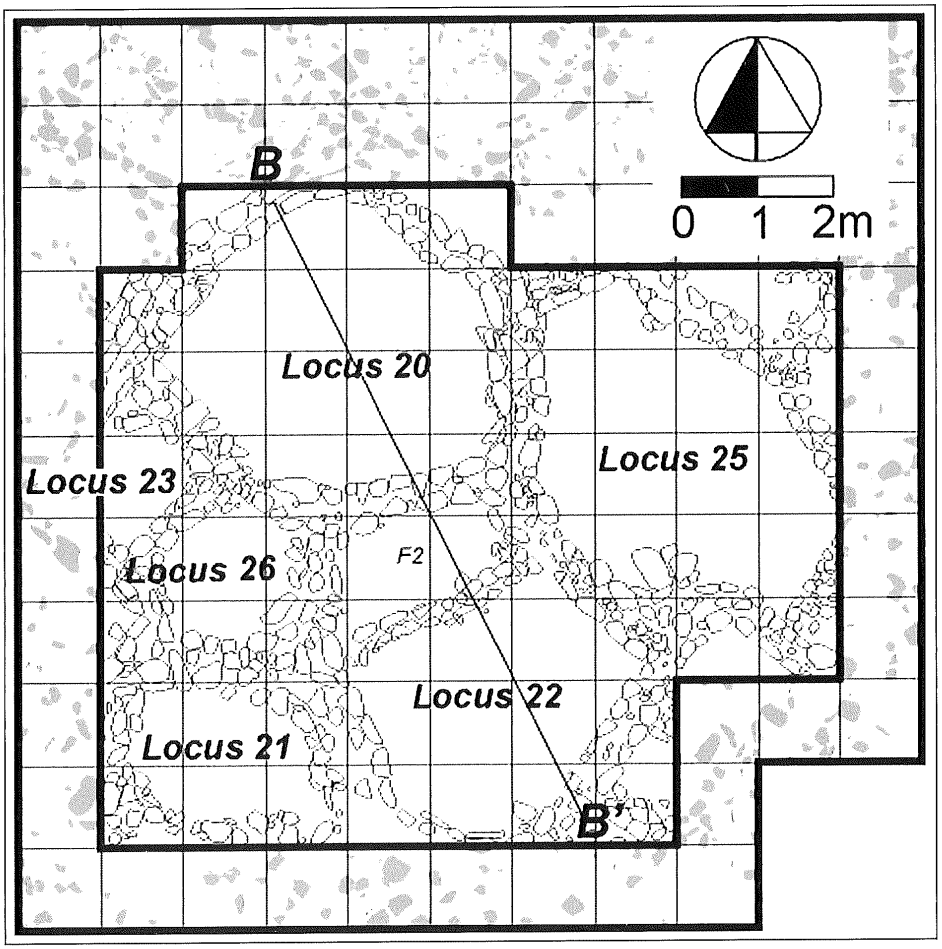
## Paleo-Bedouin Housing

By the LPPNB, goat-hair fabrics must already

have been part of the Neolithic industrial package for some time. It seems reasonable to suggest that the black goat-hair tent of the contemporary Bedouin has its origins in early nomadic pastoralism. Contemporary Bedouin social organization and its attendant residential arrangements certainly must be different from their Neolithic counterparts. So the design of the tent is likely to have been quite different. Immediately important would have been the need for a tent that could be accommodated by limitations of transport. Archaeological data from the southern Levant suggest ways in which paleo-Bedouin may have solved the mobile housing problem.

Examples of oval or circular stone houses, generally 3-4 meters in diameter, are described from several sites dating to the MPPNB/LPPNB, and later. Well-illustrated examples were excavated at 'Ayn Abū Nukhayla in Wādī Ramm (Henry *et al.* 2003) (FIG. 1), Nahal Issaron west of the southern Wādī 'Araba (Goring-Morris and Gopher 1983), Wādī Tbeik (Gopher 1981) and Wādī Jibba I (Bar-Yosef 1984) deep in the Sinai, Shaqārat al-Musay'id in the mountains north of Petra (Kaliszan *et al.* 2002), and elsewhere. Some of these sites and structures suggest more permanent occupation than others. The structures seem to represent either foundations of some kind of tent structure, or low stone-walled houses or pit-houses that often were built surrounding a shallowly excavated floor, and that once were roofed with materials no longer present. Or they represent a combination of these house types. It is significant that traces of the roofs of most of these structures are absent. While they simply may have collapsed and decayed, it seems more likely that these elements were emplaced each time the houses were occupied, and that they were taken away each time the houses were vacated. Whatever roofing material these houses once had must have been waterproof and thus capable of shedding the winter rains. A fabric cover woven from goat hair, which in contemporary Bedouin tents swells when wet and becomes waterproof (Weir 1976: 1), would have served the purpose then as it does now, and the sites date to the time when goats are expected to have been part of the local economies.

Roofing such structures with goat-hair fabric could have been accomplished with a single, light,

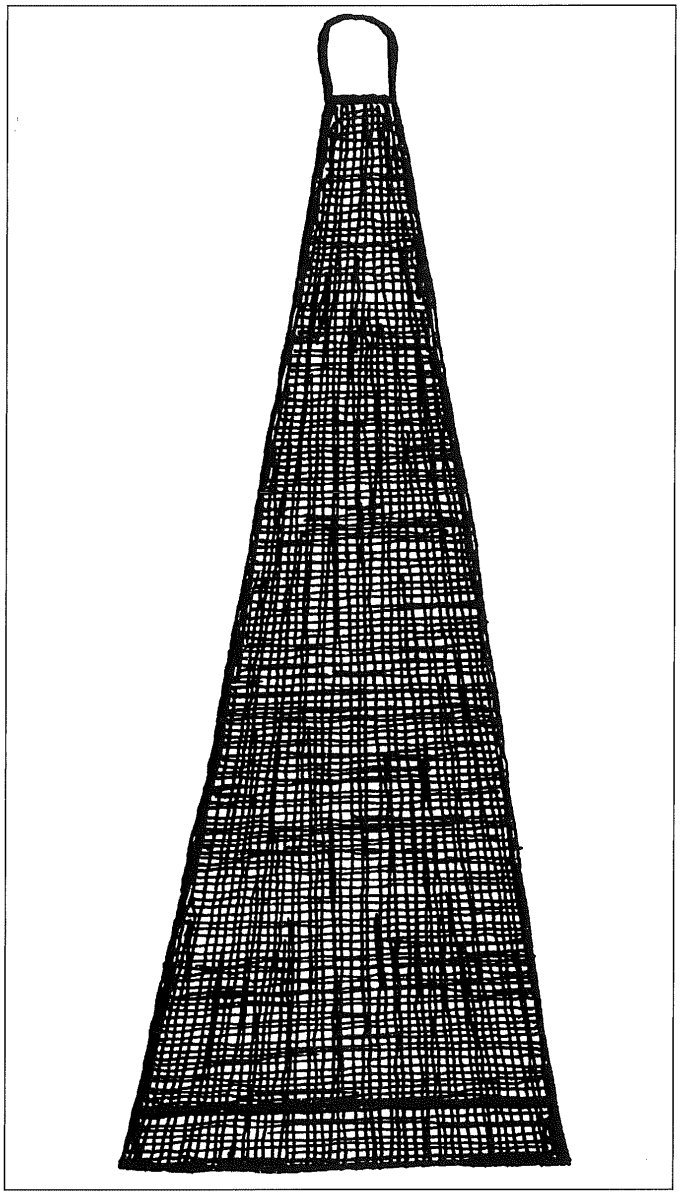



1. Excavated room block at 'Ayn Abū Nukhayla, Wādī Ramm.

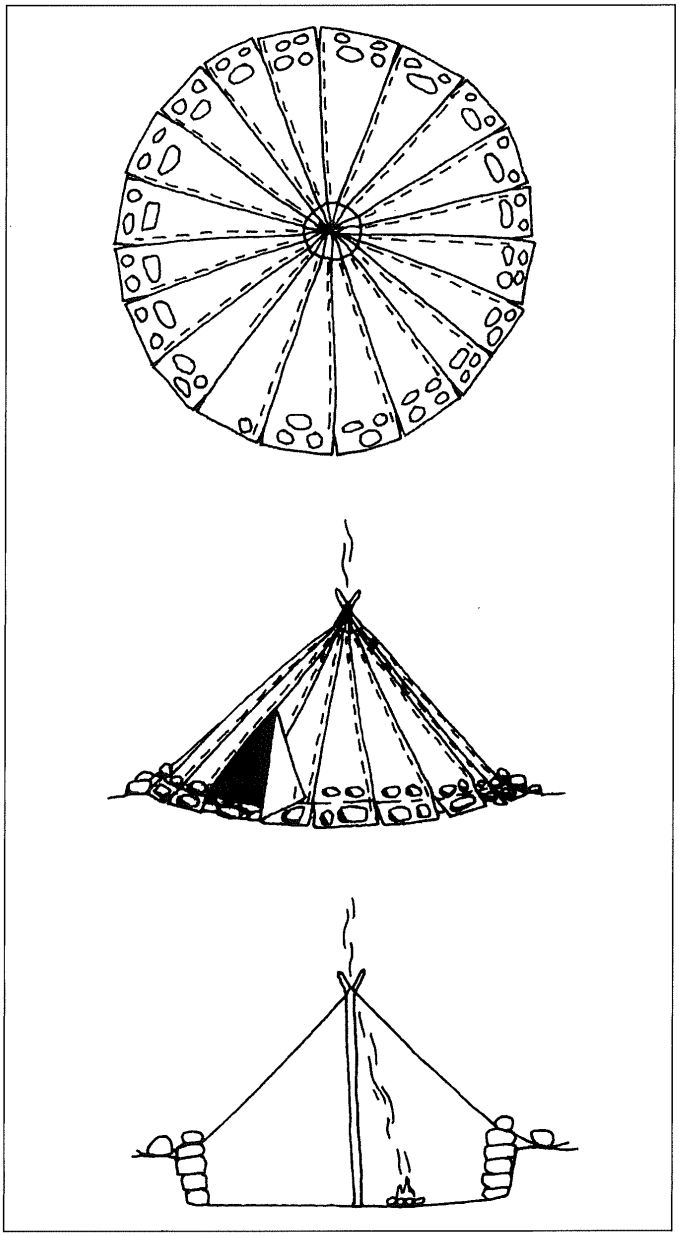
center pole of tamarisk or other timber supporting a series of joined, tapered, woven panels, each with a yoke at the narrow end (FIG. 2). Panels of this sort can be woven on ground looms with the taper accomplished by retiring warps as every few wefts are added. Contemporary Bedouin tent panels are joined together with tapered pins carved from wood (Weir 1976: 1-3, Fig. 4; Cribb 1991: 376) (or today often with iron nails). A similar pin mechanism would have worked in antiquity (FIG. 3). Somewhat similar coverings were suggested for houses excavated at Nahal Oren just south of Ḥaifa (Stekelis and Yizraely 1963). In thinking about structures such as these, it is necessary to reconcile what, especially in the Western world, are usually conceptualized as *either* "houses" *or* "tents" into a single hybrid entity. Cribb (1991: 376) termed such structures *composite dwellings*.

One aspect of the composite dwellings postulated here would be that the fire hearth, if present inside the structure, likely would be positioned somewhat away from the center of the house floor to avoid the center pole (FIG. 3). Such off-center hearth positions are suggested in published drawings of domestic structures at Nahal Oren, Nahal Issaron, and Shaqārat al-Musay'id; they are also present in some of the structures at 'Ayn Abū Nukhayla (D.O. Henry, pers. comm. 2005).

Not all camps occupied by LPPNB and later



2. Tapered panel of woven goat hair.



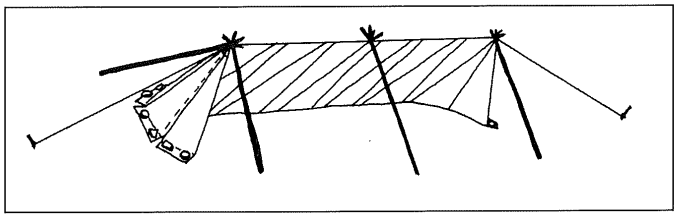
3. Composite tent/house structure suggested by oval and circular PPNB and later buildings, and a little imagination, top, side, and profile views.

pastoralists occurred in areas that lent themselves to the building of such composite dwellings. An example is the LPPNB site of Bawwāb al-Ghazāl on a slough in the former marshes of the al-Azraq Oasis (Rollefson *et al.* 1999). The sandy nature of the site area in the flat, once-marshy setting is marked by several rows of caliche blocks. The blocks were excavated on the site, perhaps during mining of green "Dabbah marble" exposed there, and were used elsewhere on-site for building stones. These rows of stones are positioned perpendicular to current prevailing winds, and they suggest use as anchors for windbreaks. Simply alternating the orientation of the same tapered panels that elsewhere served to cover round houses could result in a linear windbreak arrangement supported by several poles with tension lines (FIG. 4). The al-Azraq Oasis still contains abundant tamarisk trees, and in prehistory they or other species could have supplied the necessary poles for these shelters.

**Transport without Pack Animals?**

To think that early nomadic pastoralists in Neolithic Jordan would have themselves transported all the impedimenta discussed here is beyond reason. The world over, if any animals or mechanical contrivances can be brought to bear, they are always employed for transport. People are too practical, too lazy, or too smart, to become beasts of burden if they can possibly avoid it. Given all the baggage postulated above as essential for Neolithic pastoral adaptations, it is necessary to identify pack animals that could have transported it.

All nomadic pastoralists use pack animals, be they yaks, reindeer, camels, or whatever. What defines a pack or draft animal in a prehistoric context is not entirely clear. Usually it is the presence of a species known in other contexts to have been used for such purposes. Sometimes skeletal or dental modifications (such as tooth wear from use of bitted bridles) suggest that animals were controlled and used in transport or draft contexts. But none of the present Near Eastern pack animals are known with certainty to have been domesticated by the LPPNB. Accepted evidence for domestication of donkeys appears no earlier than the Chalcolithic (Grigson 1995; Sauer 1995). Other draft animals, such as oxen, are less able to metabolize dry vegetation and their water requirements are too great. In any case, there are no data that demonstrate their presence in steppe/desert Neolithic sites. Among traditional pack animals, then, conventional wisdom holds that there are no likely candidates. But such is not the case. Both goats and sheep need to be considered as possible pack animals.



4. Windbreak suggested by rows of rocks at Bawwāb al-Ghazāl. The same tapered panels shown in Figure 3 are oriented alternately end-for-end. Several different support and tensioning systems could be used to stabilize such a structure.

Certain breeds of goats and sheep have long been used as pack animals by nomads across much of Asia, and they are still used that way in western China, Tibet, Nepal, and India (Miller 2000). A well-documented example is in contemporary western Tibet where nomadic pastoralists tend yaks, sheep, and goats. There, adult male sheep and goats become pack animals when nomads are on the move. These people regularly travel to distant dry lake beds to obtain salt, which they transport by sheep and goat caravan for 225 kilometers in a month-long trip back to their home territory. Each animal must carry a load of up to 13.6 kilograms (30 pounds) of salt, and during the entire trip the laden packs are never removed. Then they caravan a similar distance to market areas to barter the salt for grain and other supplies, and the animals survive the ordeal (Goldstein and Beall 1990).

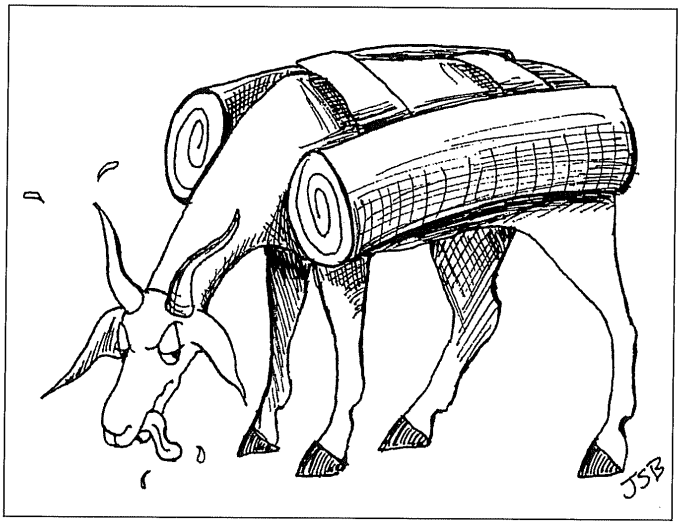
In the Neolithic Jordanian context considered here, the modular design of the housing panels postulated to cover the archaeologically documented structures would have enabled these tent-like coverings to be disassembled and rolled up into compact parcels of light weight. Balanced loads of rolled-up tent panels and other accoutrements discussed above, perhaps even in some sort of saddle-bag arrangement, would have been easily within the transport capability of small domestic ruminants (FIG. 5). Thus there is every reason to believe that goats, and possibly sheep, were used as light pack animals in the Neolithic. The goat is present at Bawwāb al-Ghazāl by about 8,100 radiocarbon years ago (Rollefson *et al.* 2002), where recovered horn cores are morphologically indistinguishable from those of modern goats. Analysis of the fauna recovered during the excavations has not

been completed, so the presence of domestic sheep there remains to be determined. Reported faunal data from 'Ayn Abū Nukhayla (Henry *et al.* 2003) show ovicaprids to be poorly represented, but if the animals were essential for transport, and if such sites are nodes in a nomadic pastoral context, perhaps few of their bones would be likely to enter the archaeological record there.

**Discussion and Prospectus**

Much has been written and alleged about the reasons goats and sheep were added to the Neolithic economy and on how nomadic pastoralism emerged and operated as a viable economic strategy. Some authors have claimed that the original impetus for the origin of herding was to supply meat for the Neolithic economy (e.g., Bar-Yosef and Meadow 1995). Following the seminal work of Sherratt (1981), it has often been argued that the benefits of the so-called secondary products of ruminant domestication (milk, wool, hair, etc.) were realized only later. It is an error to think of primary and secondary products of herd animals, especially with regard to sheep and goats in the contexts of village farming and herding, and of nomadic pastoralism. Unless carefully managed, eating the meat of domestic animals can have deleterious effects on herd structure and vitality. But beyond that, there are significant benefits to be derived from viable herds of small domesticated ruminants beyond just the useful products (meat, hides, etc.) of dead animals.

It is more reasonable to think that Neolithic peoples were fully aware of the costs and benefits of sound herd management, and that they viewed milk, wool, hair, and manure all as renewable resources of domestic herd animals from the beginning of their association. In this light, it is more realistic to think that production of yogurts, cheeses, and butter from raw milk, the manufacture of milk bags from kid skins, textiles from animal fibers, roof and floor coverings from textiles, and other innovations that came from managing herd animals were all known and in place by rather early in the LPPNB. All were essential precursors to a nomadic pastoral life-way. And all that remained to launch nomadic pastoralism as an economic adaptation or strategy was some form of triggering mechanism.



5. Domestic goat as a beast of burden.

It was suggested above, and by others, that this mechanism came about from competition between townspeople and their herds for fields of cultivated crop plants. Resolution of this problem occurred through scheduling a necessary spatial separation of the herds from the areas devoted to cultivation during the critical growing season. If this reasoning is correct, then it must be the case that the onset of winter rains prompted the annual nomadic migration. Textiles were adapted to mobile house construction, and cultured milk products became the basic food group for nomadic pastoralists. Goats and perhaps sheep were pressed into their new role as beasts of burden, and all of the other minor details were organized. Everything necessary emerged from existing technology. There was no need to invent anything new or complicated. All of the personal and field equipment simply had to be configured for transport.

Certainly the kind of composite dwelling I have suggested here is rather unique, and it has no counterpart in the tent architecture of today's nomads (Faegre 1979). But the housing requirements and physical alternatives, and the available options for transport in the paleo-Bedouin setting of Neolithic Jordan, as compared with almost all nomadic settings elsewhere in the world today, were also markedly different.

Social adjustments to the new dual life-way must have required the most serious accommodation. And this accommodation must have been serious, because the new economic arrangement was to divide forever what until then had been single social units. The social and economic relations between today's Bedouin nomads and their urban-dwelling kin are artifacts of those very choices made more than 8,000 years ago.

As anthropologists and historians it is important

that we try to view Neolithic life in a more dynamic way, with greater attention to details, technological linkages, and possible alternative choices that were made and that could have been made. We should try to view the Neolithic in a more humanistic way also. Often our interpretations are narrowly constrained by the stone and bone remains we recover, and we fail to envision the colorful, perishable organic elements that we can be certain were present, and that gave beauty, warmth, vibrancy, and a sense of home and of place to people in the archaeological cultures we study[2]. When we look at the world of the contemporary Bedouin, the progeny of the economic revolution that began in the Neolithic, we view a measure of the essence of the early nomadic pastoral life-way. Pictured and described so well in Shelagh Weir's book *The Bedouin* (1976), we see woven tent panels with white stripes, colorful flat-woven kilims covering the tent floors and used as dividing curtains, elegant embroidery on clothing, decorated woven bags and camel harness, and intricate mechanisms for anchoring one's world against the relentless winds. And we see the means of production of it all. It is such impressions that enrich our studies and prompt us to look harder to see more clearly into the past, as I have attempted here.

Some will not be responsive to my arguments. They will correctly point out that there is no archaeological evidence for most of what I have suggested. They will correctly observe that almost every argument I have made includes the phrase "probably was," "could have," or "would have." Provocative ideas can simply be dismissed, or they can provoke problem-driven research. The latter is my purpose.

If we try to predict and anticipate the nature of the archaeological record of early nomadic pastoralism, we will have a better idea of what to look for, how and where we might find it, how we might recognize it if and when we do find it, and what it might mean. Otherwise our archaeology is only ever reactionary, and we will never be able to fit what we do find into a well-reasoned theoretical framework. With a more imaginative approach we can get beyond the limits of informed description to discovering what until now has been archaeologically invisible. It is time to seize the opportunity to understand better and appreciate more the web of complexities and practicalities of the daily lives of people who lived in prehistory. The role of the paleo-Bedouin in shaping the prehistory of the late Neolithic was profound, and it is time for their life-way to be seen in a better light.

**Acknowledgements**

I thank Eugene Anderson, Walter Goldstein, Gary Rollefson, and Leslie Quintero, who all made valuable comments on a draft of this paper. Their criticisms enabled me to correct certain significant errors; those that remain are my own. I also thank Nigel Goring-Morris and Uzi Avner for information on nomadic pastoral sites in the Negev, Julie Scrivner Brodie for drawing Figure 5, and Donald Henry for unpublished information and for permission to use Figure 1. Partial support was provided by a fellowship at the American Center of Oriental Research in Amman. This paper is dedicated to H.G.K. Gebel, whose commitment to research and publication in the Near Eastern Neolithic has been a source of inspiration.

**References**

Bar-Yosef, O. 1984. Seasonality Among Neolithic Hunter-Gatherers in Southern Sinai. Pp. 145-159 in J. Clutton-Brock and C. Grigson (eds.), *Animals and Archaeology, 3: Early Herders and Their Flocks*. Oxford: British Archaeological Reports, International Series 202.

Bar-Yosef, O. and Alon, D. (assemblers) 1988. Nahal Hemar Cave. *'Atiqot* 18.

Bar-Yosef, O. and Meadow, R.H. 1995 The Origins of Agriculture in the Near East. Pp. 39-94 in T.D. Price and A.B. Gebauer (eds.), *Last Hunters–First Farmers*. Santa Fe: School of American Research.

Cribb, R.L.D. 1991. Mobile Villagers: the Structure and Organization of Nomadic Pastoral Campsites in the Near East. Pp. 371-393 in C.S. Gamble and W.A. Boismier (eds.), *Ethnoarchaeological Approaches to Mobile Campsites: Hunter-Gatherer and Pastoralist Case Studies*. Ethnoarchaeological Series 1. Ann Arbor: International Monographs in Prehistory.

Faegre, T. 1979. *Tents: Architecture of the Nomads*. Garden City: Anchor Books.

Goldstein, M. and Beall, C. 1990. *Nomads of Western Tibet: The Survival of a Way of Life*. Berkeley: Uni-

[2] For now, the best glimpses of this organic side of Neolithic life-way are in the perishable artifacts from Nahal Hemar Cave at the southern end of the Judean Desert (Bar-Yosef and Alon 1988).

versity of California Press.

Gopher, A. 1981. *The Stratigraphy and Flint Industry of Wadi Tbeik, a Pre-Pottery Neolithic Site in Southern Sinai.* M.A. Thesis, Hebrew University (Hebrew).

Goring-Morris, N. 1993. From Foraging to Herding in the Negev and Sinai: the Early to Late Neolithic Transition. *Paléorient* 19/1: 65-89.

Goring-Morris, A.N. and Gopher, A. 1983. Nahal Issaron: A Neolithic Settlement in the Southern Negev. *IEJ* 33(3-4): 149-163.

Grigson, C. 1995. Plough and Pasture in the Early Economy of the Southern Levant. Pp. 245-63 in T. Levy (ed.), *The Archaeology of Society in the Holy Land.* New York: Facts on File.

Henry, D.O., Cordova, C., White, J.J., Dean, R.M., Beaver, J.E., Ekstrom, H., Kadowaki, S., McCorriston, J., Nowell, A. and Scott-Cummings, L. 2003. The Early Neolithic Site of Ayn Abu Nukhayla, Southern Jordan. *BASOR* 330: 1-30.

Horwitz, L., Tchernov, E., Ducos, P., Becker, C., Von den Driesch, A., Martin, L. and Garrard, A. 1999 Animal Domestication in the Southern Levant. *Paléorient* 25/2: 63-80.

Kaliszan, L.R., Hermansen, B.D., Jensen, C.H., Skudbūl, T.B.B., Bille, M., Bangsgaard, P., Ihr, A., Sūrensen, M.L. and Markussen B. 2002. Shaqarat Mazyad–The Village on the Edge. *Neo-Lithics: A Newsletter of Southwest Asian Lithics Research* 1/02: 16-19.

Köhler-Rollefson, I. 1992. A Model for the Development of Nomadic Pastoralism on the Transjordanian Plateau. Pp. 11-18 in O. Bar-Yosef and A. Khazanov (eds.), *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives.* Monographs in World Archaeology 10. Madison: Prehistory Press.

Köhler-Rollefson I. and Rollefson, G.O. 1990. The impact of Neolithic Subsistence Strategies on the Environment: the Case of 'Ain Ghazal, Jordan. Pp. 3-14 in S. Bottema, G. Entijes-Nieborg and W. Van Zeist (eds.), *Man's Role in Shaping the Eastern Mediterranean Landscape.* Rotterdam: A. Balkema.

—— 2002. Brooding about Breeding: Social Implications for the Process of Animal Domestication. Pp. 177-181 in R.T.J. Cappers and S. Bottema (eds.), *The Dawn of Farming in the Near East.* Studies in Early Near Eastern Production, Subsistence, and Environment 6. Berlin: ex oriente.

Martin, L. 1999. Mammal Remains from the Eastern Jordanian Neolithic, and the Nature of Caprine Herding in the Steppe. *Paléorient* 25/2: 87-104.

Miller, D.J. 2000. Tough Times for Tibetan Nomads in Western China: Snowstorms, Settling Down, Fences, and the Demise of Traditional Nomadic Pastoralism. *Nomadic Peoples* 4(1): 83-109.

Quintero, L.A., Rollefson, G.O. and Wilke, P.J. 2004. Highland Towns and Desert Settlements: Origins of Nomadic Pastoralism in the Jordanian Neolithic. Pp. 153-165 in H.D. Bienert, H.G.K. Gebel, and R. Neef (eds.), *Central Settlements in Neolithic Jordan,* Studies in Near Eastern Production, Subsistence, and Environment 5. Berlin: *ex oriente.*

Rollefson, G.O., Quintero, L.A. and Wilke, P.J. 1999. Bawwab al-Ghazal: Preliminary Report on the 1998 Testing Season. *Neo-Lithics: A Newsletter of Southwest Asian Lithics Research* 1/99:2-4.

—— 2002. A Short Note on Radiocarbon Dates from Bawwab al-Ghazal. *Neo-Lithics: A Newsletter of Southwest Asian Lithics Research* 2/02:7.

Ryder M.L. 1987. The Evolution of the Fleece. *Scientific American* 216(1): 112-119.

Sauer, J.A. 1995. Artistic and Faunal Evidence for the Influence of the Domestication of Donkeys and Camels on the Archaeological History of Jordan and Arabia. Pp. 39-48 in K. 'Amr, F. Zayadine, and M. Zaghloul (eds.), *SHAJ V: Art and Technology Through the Ages.* Amman: Department of Antiquities.

Sherratt, A. 1981. Plough and Pastoralism: Aspects of the Secondary Products Revolution. Pp. 261-305 in I. Hodder, G. Isaac and N. Hammond (eds.), *Pattern of the Past: Studies in Honour of David Clarke.* Cambridge: Cambridge University Press.

Stekelis, M. and Yizraely, T. 1963. Excavations at Nahal Oren: Preliminary Report. *IEJ* 13: 1-12.

Wasse, A. 1997. Preliminary Results of an Analysis of the Sheep and Goat Bones from 'Ain Ghazal, Jordan. Pp. 575-592 in H.G.K. Gebel and G.O. Rollefson (eds.), *The Prehistory of Jordan, II. Perspectives from 1997.* Studies in Early Near Eastern Production, Subsistence, and Environment 4. Berlin: ex oriente.

Weir, S. 1976. *The Bedouin: Aspects of the Material Culture of the Bedouin of Jordan.* London: World of Islam Festival Publishing Company, Ltd.