the age of the rat, absolute measures are not used in such recordings. Rather, within-experiment procedures are used to make comparisons among animals and groups. The procedure used almost exclusively in chorda tympani nerve recordings is to express each response (for example, NaCl response) relative to a standard response (for example, 0.5*M* NH_4Cl response) recorded from the same preparation in the same stimulation series. Responses were used only when the response to 0.5*M* NH_4Cl deviated less than 10% within a preparation.
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Middle Archaic Period Domestic Architecture from Southern Peru

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Domestic or residential structures ranging in age from 6040 to 6850 years old have discovered at the open air site of Asana in the high sierra of southern Peru. These are the earliest domestic structures known from the high elevation zones of the south central Andes, and they are contemporaneous with sites with structures on the north Chilean littoral. Analysis of site structure and content suggests that during the Middle Archaic the site was a logistical camp within a dry *puna*–high sierra settlement system.

NO DOMESTIC ARCHITECTURE AT open air sites dating to the Archaic Period (10,000 to 4,000 years ago) has been discovered at elevations above 3000 to 4800 m in the south central Andes, nor from models of settlement patterns in the region would the existence of such be expected (*1*). Although some activities were performed at open air sites on the dry *puna* and sierra, caves and rockshelters were thought to be the residential bases. Sites in the open air would, therefore, be expected to be ephemeral, and materials found there would reflect daily food-gathering activities. Artifact density and diversity should be very low, and structures would not be expected (*2*). Furthermore, Santoro and Nuñez (*1*) argued that the high elevation zones of the region were abandoned during the Middle Archaic as a result of climatic deterioration and vulcanism. The discovery of domestic structures at an open air site of Middle Archaic date has not only forced a major revision of current hypotheses on sierra and *puna* land use, but has also necessitated a reexamination of models of the sedentarization process—the causes of the changes in the frequency and scale of residential mobility seen throughout the Archaic in this region (*3*).

The site of Asana is located at 17°06′S, 70°38′W at an elevation of 3450 m. It is situated on the northern side of the Rio Asana, one of the major tributaries of the Rio Osmore. The site is covered with 3 m of blocky colluvium deposited by a landslide that occurred within the past 200 years. Although the total size of the site is not known, it is estimated to be at least 800 to 1000 m^2.

Excavations in 1986 and 1987, exposing a total of 40 m^2, have revealed a stratified archeological deposit that ranges in thickness from 2 to 3 m. More than 75 natural soil strata have been identified and, within these, at least 36 distinct occupations can be distinguished (Fig. 1). Occupation at the site ranges from about 3600 to 9600 years ago.

Domestic structures have been discovered in three levels (XIVB, XVIIA-C, and XVIIA-B), and charcoal obtained from middens, hearths, or other features has been dated to the Middle Archaic. The soil matrix in which the structures are found is a fine sand with a small proportion of silt. When floors are stratigraphically contiguous, as they are for the eastern structure in levels XVIIC to XVIIIB, they are separated by 1 to 3 cm of culturally sterile sands and very fine colluvial gravels. When they are not, they can be separated by as much as 15 cm of homogeneous sands and fine gravels.

The structures, circular or ovoid in form (Fig. 2), have been constructed through the puddling, pooling, and shaping of a locally available white clay on a cleaned, prepared surface. This results in a floor elevated slightly above the substrate upon which it has been placed. In some levels, the clay is mixed with fine alluvial sands. The thickness of the floors varies from 2 to 4 cm. The floors have been placed between large colluvial boulders that served as windbreaks. The margins of the floors are surrounded at irregular intervals by post molds that range in size from 4 to 8 cm in diameter and from 2 to 5 cm in depth. No burned clay or other preserved material that could have served as a daub or wall filler is found in association with either the floors or post molds. This suggests that the walls of these structures were constructed of brush. Small colluvial rocks were placed along the edges of the puddled clay floors and were probably used to support post molds or to anchor the brush walls. None of these rocks show any signs of modification or use. In some of the structures, there is a large post mold (about 10 to 15 cm in diameter and 5 to 8 cm in depth), located near or at the center of the structure, which probably supported a brush roof.

In levels with multiple structures, they are archeologically contemporaneous. Each floor is well delineated, and there is no overlap in features or post-mold alignments indicative of a palimpsest reoccupation of the site. This inference is further supported by noting that those floors presumed to be contemporaneous follow the natural southward slope of this portion of the site. There is no evidence of rebuilding or changing the size or shape of the prepared clay floors. The sizes of the floors vary but remain relatively constant through time (Table 1), and the floor dimensions are similar to those of structures found at short-term camps of ethnographically known arid lands foragers (*4*).

Associated nonarchitectural features in-

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clude large, shallow, midden areas, small deep middens found in crevices between the colluvial boulders, hearths, ash dumps and stains, and rock features (Fig. 2). Shallow sheet middens are found near to and between structures, and are not excavated into the surrounding soil matrix. These middens contain ash, small (<1 cm) bone splinters, and small (<1 cm) and large (>2 cm) lithic materials. They contain little large bone (>5 cm) refuse. In contrast, the middens between the boulders contain high densities of large bone refuse in addition to high densities of bone splinters and large and small lithics.

Two types of hearths are present: small, shallow hearths located within the structures, and larger, excavated hearths found within 1 to 2 m of the nearest structure. The former are simply scooped from the clay floor surface, never lined with rocks, and contain small amounts of ash and no cultural material. The latter have been excavated into the soil, and are often lined with rocks. They are filled with burned soil, large lithic waste, and bone splinters. Ash stains are small, shallow (<1 cm in thickness), and are found within the structures. These stains are generally pushed to the edges of the floors, but are also found near the small hearths. They contain small amounts of small lithics and bone splinters.

Rock features are located within or adjacent to the structures, and consist of small, roughly shaped, colluvial rocks. Large rocks are supported by small ones to provide a level surface. None has grinding surfaces, but many show evidence of having been pounded upon. Although no shaped pounding stones have been found in direct association with these features, some have been found within the middens. These stones are similar to those found at Middle Archaic sites in the central Andes (*5*), and microscopic examination of the examples from Asana show that some have bone residues and splinters crushed into the microtopography of their surfaces. These features are surrounded by high densities of small bone splinters (<1 cm), whereas the surrounding floors have been cleared of all debris. These findings suggest that these features were used to crack bone to remove marrow.

Lithic reduction at the site is limited to the shaping of rough and fine percussion bifaces made of local raw materials. Initial shaping of bifaces as well as final finishing took place elsewhere since by-products of these reduction stages have not been found. Densities of lithic materials per unit of excavated volume are low, ranging from 19.7 g/m^3 to 64.9 g/m^3, suggesting that these activities were not extensively practiced (*6*). Some retooling is indicated since broken projectile points have been discarded, but it is probable that these points were replaced with finished products made at other sites. Other morphological tools found in the assemblages include a single, exhausted, hafted scraper used to process wet hide and a series of retouched tertiary flakes, all of which must have been used in butchery because they show traces of wet bone or cartillage and meat polish (*7*). The lithic reduction and microwear data are consistent with an interpretation of activity as low-intensity gear maintenance, fabrication, and subsistence tasks.

Species present include deer (identified through antlers) and camelids. It is not possible to determine which species of camelid is present because diagnostic parts like

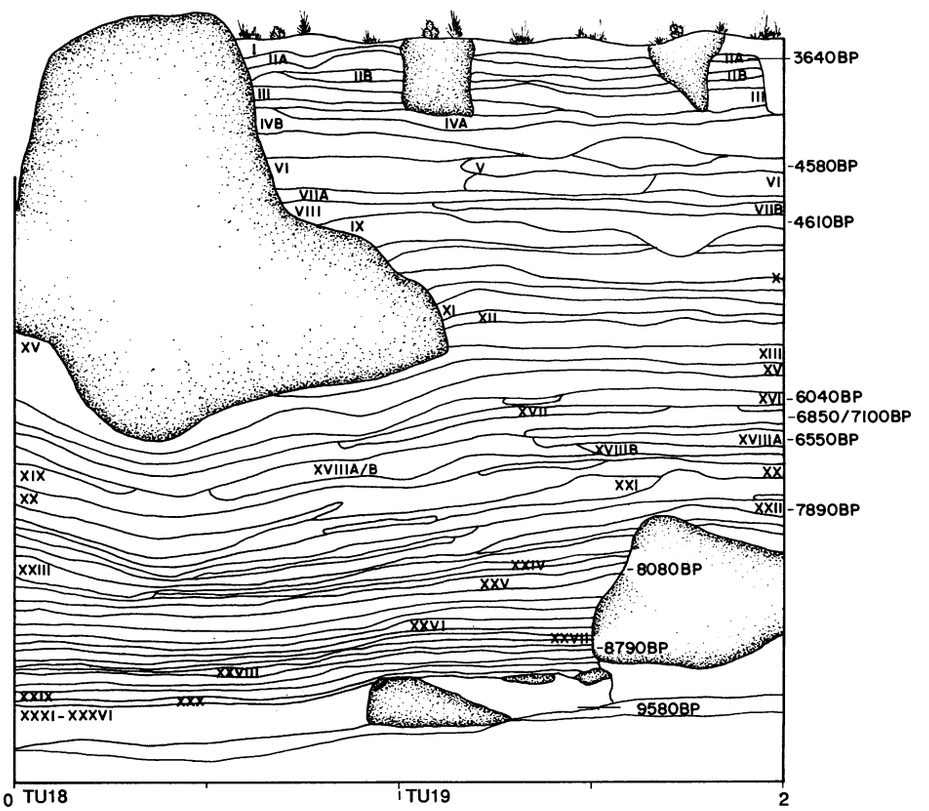

Fig. 1. Stratigraphic profile, north wall, test units 18 and 19 (TU18, TU19), at Asana, southern Peru. BP, years before present.

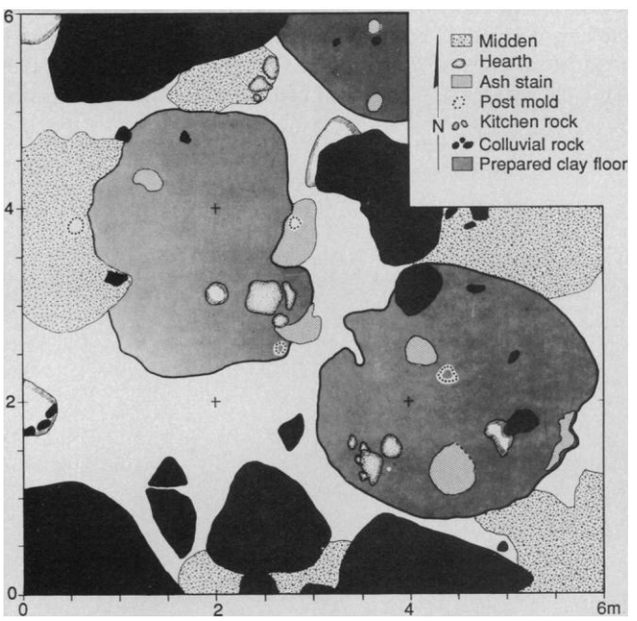

Fig. 2. Prepared clay floors, level XVIIC, at Asana.

Table 1. Descriptive statistics of structures from levels XVI to XVIII at Asana, southern Peru. BP, years before the present.

Level and structure number	Date (BP)	Dimensions (m)	Covered floor area (m^2)	Construction method
XVIB	6,040 ± 90 (Beta-24,634)			
1		N-S, 2.12; E-W, 1.66	3.4	Puddled clay
XVIIA				
1		N-S, 2.36; E-W, 2.60	4.8	Sand, clay mix
XVIIB				
1		N-S, 2.75; E-W, 2.25	6.2	Clay, sand mix
2		E-W, 2.48*		Clay, sand mix
XVIIC	6,850 ± 70 (Beta-25,049)			
1		N-S, 2.62; E-W, 2.90	6.0	Puddled clay
2		N-S, 2.75; E-W, 2.25	6.2	Puddled clay
3		E-W 2.48*		Puddled clay
XVIIIA	6,550 ± 110 (Beta-24,629)			
1		N-S, 2.62; E-W, 2.90	6.0	Puddled clay
XVIIIB				
1		N-S, 2.62; E-W, 2.64	5.4	Puddled clay
2		N-S, 2.50; E-W, 1.76	4.4	Puddled clay
3		E-W 2.48*		Puddled clay

*Estimated.

teeth are too fragmentary to be useful. Small amounts of small mammal bone, and no birds, have been found. Minimum number of individuals (MNI) counts are low, ranging from 1 to 13 per occupation, and the limited demographic data available show that immature animals (6 to 18 months in age) make up 50% of the identifiable animals in level XVIIIA and 31% in level XVIIIB. The assemblage of skeletal parts present, dominated by high proportions of articulating ends of long bones, vertebrae, skull and tooth fragments, and metatarsals, indicate that whole animals were returned to the site for further processing. Most of the large-bone fragments are concentrated in toss zones found in the rocky crevices outside the house floors.

These houses are similar to those constructed at temporary, cold-season sites by modern arid-lands foragers (*4*). The smaller hearths within the structures appear to be sleeping area hearths, and the larger hearths are probably cooking hearths or roasting pits. The placement and composition of middens is consistent with a short occupation span of the site, as is the packing of the houses and their associated activity areas within a relatively small area.

The data from Asana suggest that the site was either a temporary camp that lay within the logistic radius of a residential base on the nearby dry *puna* which, like the high sierra, was not abandoned during the Middle Archaic in this region (*3*), or a temporary habitation site of residentially mobile foragers. Occupation span for these floors cannot be stated with certainty, but given the low density of faunal remains and lithic materials found in the middens, the low MNI counts, and the limited range of activities performed, site use probably lasted no more than a month. Likewise, evidence for the season of occupation is scant, but a wet season (November to April) occupation is probable as judged by ethnographic analogs of site structure, the relatively high proportion of immature animals revealed though MNI counts, and consideration of regional resoure availability (*3*).

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