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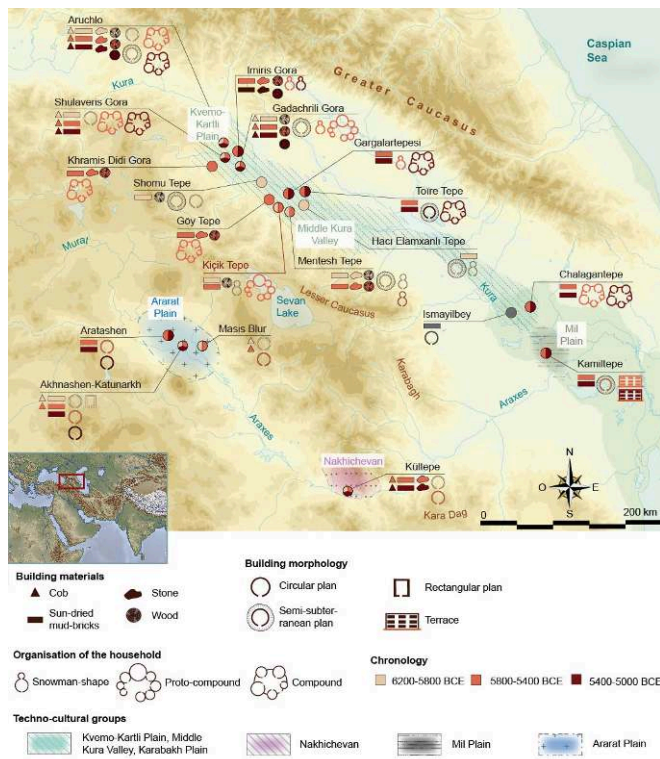
Domed or flat? The case study of Building 21 at Kiçik Tepe (Middle Kura Valley, Azerbaijan) and a reconsideration of the Neolithic roofing architecture in the South Caucasus

Emmanuel Baudouin, Alexia Decaix, Emmanuela Brunacci, Farhad Guliyev and Giulio Palumbi

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- 1 The development of domestic architecture in the South Caucasus reveals the existence of original traditions (Baudouin 2019: 145) since the beginning, around 6000 BCE. Previous studies on the architecture of this region have already shown a complex reality (Baudouin 2019, 2021): while all communities in the South Caucasus share some fundamental elements, namely the circular plan, significant micro-regional variations (e.g., plano-convex mud bricks or semi-subterranean buildings in the Kura Valley or terraced buildings in the Mil Plain) indicate the existence of distinct techno-cultural groups (fig. 1). The present research focuses on an exceptionally well-preserved building from Kiçik Tepe (Azerbaijan). It aims to highlight these diversities, also concerning the roofing of the circular Neolithic architecture typical of the South Caucasus. The question of roofing is still unclear and hotly debated in the Neolithic architecture of the South Caucasus. We hope that the new data collected at Kiçik Tepe will contribute to the current debate on these issues.

Fig. 1 – Map of the South Caucasus with a synthesis of architectural techniques on the main Neolithic sites.



E. Baudouin

- In the context of this paper, we believe it is important to focus our attention on domestic architecture because, as previously pointed out by A. Coudart, the house “est fabriqu ee selon les normes du groupe et pour le groupe”¹ (Coudart 1998: 18) and therefore its study can open new perspectives on the social, cultural and organizational aspects of the Neolithic populations of the South Caucasus. Similarly, recent anthropological and archaeological discussions have shown how architecture can be seen as an important form of symbolic representation, a material expression of concepts, values and social orders (Parker Pearson and Richards 1994; Wengrow 1998). All of this research indicates that how we inhabit and live in the built environment and how we think about that environment are mutually related and deeply rooted in society, as they are both social practices (Kent 1990: 128) that can actively shape group identity. For P. Bourdieu, architecture and particularly domestic space (Bourdieu 1980: 101) is the reification of social and cultural norms (see also Foster 2009: 77), so the built environment can have a strong identity value that we assume is individual and also collective.
- In the context of domestic architecture, we will focus our attention on the roof because, as suggested by A. Rapoport (1969: 34), being the “place” where human activity (in both technical and mental terms) is most present (Deffontaines 1972: 62), the roof is probably the most representative symbol of the house. Indeed, the roof is the nerve centre of the house; it controls the general layout of the building and requires various solutions adapted to environmental and technical factors (Besenval 1984: 168) and also to social aspects. These seem particularly important because historical and social conditions also play a role in the roofing layout, as shown by P. Deffontaines (1972: 84,

1975: 65, 73) in the Catalan Pyrenees, where the terraced roof, probably the result of African or Carthaginian influences, attested before the 16th century, was replaced by a pitched roof originating from the Bigorre region in the French Pyrenees. Within this framework, some ethnographic studies have also shown how the roofing of a house can help mark a social or ethnic identity (Pelmoine and Mayor 2020: 20).

- 4 This article focuses on this particular aspect of construction which is often “invisible” in the archaeological evidence because it is not preserved, based on the evidence from Building 21 at K ıçık Tepe. This will allow us to discuss whether there is a common form of roofing of Neolithic houses in the South Caucasus (as is often assumed, see below) or rather a diversity of roofing forms and techniques. At the same time, we will also attempt to discuss the factors (environmental, cultural, socio-cultural) that may have played a role in the roofing choices.
- 5 This study combines a multidisciplinary approach (stratigraphic, architectural and anthracological data) integrated into a review of ancient published data related to roofing in the ancient and contemporary Near East. It intends to represent a new approach to the study of roofing systems in the Neolithic architecture of the South Caucasus.

The Neolithisation process in the South Caucasus

- 6 The first discoveries of Neolithic communities (6th millennium BCE) in the South Caucasus were made in the middle of the 20th century in the Araxes (Abibullaev 1959) and Kura River valleys (Dzhavakhishvili and Dzhaparidze 1975; Kiguradze 1986; Narimanov 1987). Three main hypotheses have been debated for a long time to explain the origins of the first sedentary communities (Chataigner et al. 2014; Sagona 2018: 85-86):
 1. An independent local evolution (Niebieridze 1978; Amirkhanov 1987);
 2. Cultural interactions between Syro-Mesopotamian communities and those of the South Caucasus (Kiguradze 1986; Kushnareva 1997);
 3. A “colonisation” by the Syro-Mesopotamian Neolithic communities (Abibullaev 1959; Narimanov 1987).
- 7 Nevertheless, archaeological research on the Neolithisation processes of the South Caucasus has significantly intensified in the last decades (Lyonnet et al. 2012; Helwing et al. 2017; Marro et al. 2019; Nishiaki et al. 2019; Nishiaki and Guliyev 2020; Nishiaki et al. 2021; Palumbi et al. 2021; Badalyan et al. 2022a). It has yielded significant insights into the emergence of the first sedentary and food-producing societies around 6000 BCE, commonly labelled 'Aratashen-Shulaveri-Shomutepe' culture (Badalyan et al. 2022b: 257; hereafter ASHSh). Although the dynamics of Neolithisation are still debated (Nishiaki et al. 2018: 1-2; Palumbi et al. 2021: 31), archaeobotanical and zooarchaeological data show that these communities mastered exogenous Near Eastern productive technologies, such as agriculture (Decaix 2016) and animal husbandry (Benecke 2017: 360) from the beginning. In addition, a few North Mesopotamian ceramics discovered at several sites in the Araxes (Harutyunyan 2022: 94-97) and Kura River valleys (Nishiaki et al. 2015: 11) reinforce the hypothesis of relationships between South Caucasian and Near Eastern communities. However, while the mechanisms of this Neolithisation point to an adopted allochthonous socio-economic system, there is

also evidence of indigenous and entirely original developments. For instance, the almost total absence of ceramics at some of the earliest Neolithic sites (Hacı Elamxanlı Tepe, K ıçık Tepe), as well as the similarity between the Neolithic (Hacı Elamxanlı Tepe) and Mesolithic (Damjili Cave) lithic assemblages point towards a possible technological continuity with the local Mesolithic communities (Nishiaki et al. 2019: 9). Finally, the architectural data point to original technical traditions in the South Caucasus compared to Mesopotamia, marked by micro-regional specificities between the Kura and Araxes rivers valleys (Baudouin 2019).

The South Caucasian Neolithic architecture in context

- 8 Following Badalyan et al. (2022b: 257-259), “the sites of the Shulaveri-Shomutepe group [in the Kura Valley] and those of the Aratashen-Aknashen group [in the Araxes Valley] are located in similar landscapes, i.e. low-altitude alluvial valleys with dense watercourse networks”. Environmental data from the lake basins of Georgia and Armenia allow for the reconstruction of the climate and landscape during the Neolithic period, highlighting an increase in humid conditions after the dry 8.2 ka event (Messager et al. 2013: 137; Joannin et al. 2014: 77; Ollivier et al. 2018: 283). From the appearance of the first sedentary villages around 6000 BCE in the South Caucasus, the circular plan became the almost exclusive architectural form² used throughout the Neolithic period by the region's farming communities (fig. 1). Our impression is that the systematic use of the circular plan has strongly influenced archaeologists' perception of AShSh, leading them to view it, well beyond architectural forms, as a homogeneous and widely shared material tradition, albeit with regional variations (Badalyan et al. 2022b: 257). However, this homogeneous image of AShSh has been challenged by recent research on pottery (Marro et al. 2019: 111; Iserlis 2021: 133; Palumbi et al. 2021: 2, 31) and agricultural and livestock practices (Berthon 2014: 14; Nishiaki et al. 2019: 13) by showing both dynamics of regionalization and localized subsistence strategies.
- 9 In fact, archaeological evidence shows that the circular architecture tradition underwent several stages of diachronic change at local (Nishiaki et al. 2020b: 106) and regional scales (Baudouin 2019: 145-146), and that these changes could be signs of technological and social upheavals. It is visible in the materials used to raise the walls, when, for example, cob seems to vanish after one-third into the sixth millennium. Mud-brick was known from the beginning and was used throughout the Neolithic period, albeit with increasingly standardized modules. Simultaneously, while the circular plan developed over almost a millennium, the surface area of the circular buildings tends to decrease over time. These changes go along with developments in the spatial organization of the buildings, from cells functioning in pairs (the so-called snowman-shape; Nishiaki et al. 2015: 5) to cells arranged around a central courtyard and linked by low walls (the so-called compound; Hansen et al. 2013: 393). According to Nishiaki and Guliyev (2021: 227), “the change from snowman-shaped to ring-shaped household plans no doubt reflects the transformation of social organizations during the early phases of Neolithic development”. Moreover, this development of the household also coincides with a shift in the spatial organization of domestic activities in the Kura Valley. Storage structures and culinary hearths or fire-pits located inside the largest dwellings before 5700-5500 BCE are later moved to the compounds' courtyards (Baudouin 2019: 141). It

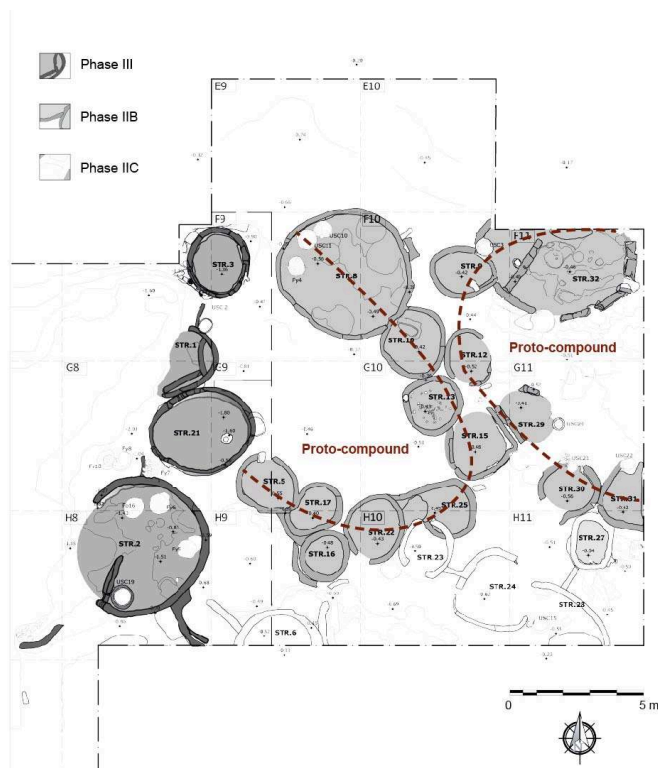
has been suggested that this transformation, whereby daily activities related to food preparation and storage were moved to the open courtyards and outside the circular dwellings (Kadowaki et al. 2015: 423), is possibly related to an enlargement of the family unit during the later Neolithic stage (Flannery 2002: 424; Baudouin 2019: 145).

- 10 As far as architecture is concerned, the wall elevation's state of preservation is often limited and rarely indicates any roof's shape. Thus, the a priori homogeneous circular plan of the AShSh communities, which was often associated with a domed roof based on the first reconstructions made in the seventies (Dzhavakhishvili 1973: 73, 210; Munchaev 1975: fig. 4), does not necessarily reflect the wide range of archaeologically 'invisible' architectural solutions that may have characterized and differentiated these buildings.

The site of K ıçık Tepe

- 11 K ıçık Tepe (40°57'49.85"N; 45°43'49.32"E; 390 m asl) is located in the Tovuz district, near the present-day village of Qovlar, and near the Neolithic settlements of G y Tepe (Nishiaki and Guliyev 2020), Hac  Elamxanlı Tepe (Nishiaki et al. 2015) and Mentesh Tepe (Lyonnet et al. 2012, 2016). It was first identified in 2013 by F. Guliyev and F. Huseynov (Institute of Archaeology and Ethnography of the Azerbaijan Academy of Sciences). Since 2017, a Franco-Azerbaijani team has conducted three excavation campaigns in the frame of the "Mission Boyuk Kesik's"³ activities to understand better the Neolithisation process in the Kura River valley.
- 12 The Neolithic levels (phases 2-3) are dated between 5870 and 5750 BCE (Palumbi et al. 2021: table 3, 15). Phase 3, which is the earliest, has been uncovered so-far only in the far western part of the site and shows evidence of individual buildings. Phase 2 (the latest) has revealed a plan with "proto-compound" houses (fig. 2) where the cells are arranged around a courtyard. In phases 3 and 2, sun-dried mud-bricks, elongated and flat, are always used for the construction of buildings. The composition of mud-bricks is very consistent: they are made of a mixture of water, earth and organic temper. Some mud-bricks have straight edges, which may suggest they were molded. Compared to regional sizes, the mud-bricks of K ıçık Tepe are characteristic of the beginning of the Neolithic in the Middle Kura Valley (Baudouin 2019: 128, fig. 5). As concerns the "finishing" of the walls, interior and exterior faces were coated with a mixture of earth, water and organic temper.

Fig. 2 – General plan of the settlement of K ıık Tepe (Azerbaijan) during the Neolithic period.



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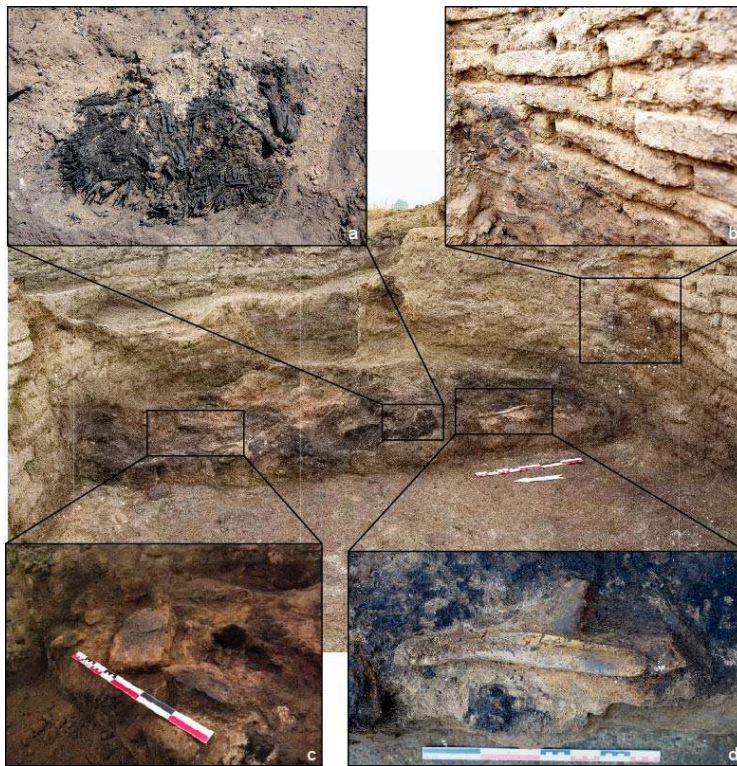
- 13 During the 2018-2019 campaigns (fig. 3a) two buildings (2 and 21) dating to phase 3 were excavated. Building 2 is a large circular mud-brick dwelling (ca. 4.2 m in diameter). Inside, a significant number of features were concentrated along the wall (fig. 3c), among them a clay silo for storage containing charred grain seeds and two fireplaces probably related to cooking activities. In the case of Building 21 (fig. 3b), an abundance of bone tools (awls and spatulas; fig. 4d), perforated animal scapulae with traces of use-wear and a significant concentration of obsidian artifacts counterbalance the absence of internal features. Furthermore, mugwort (*Artemisia* sp.) inflorescences were also abundant (see below). Altogether, this evidence may indicate the practice of different types of activities in Building 21 and, possibly, that it could have been an auxiliary building to adjacent Building 2 (Palumbi et al. 2021: 17).

Fig. 3 – General view of the site (a) and details of buildings 21 (b) and 2 (c).



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Fig. 4 – The collapsed roof level.



a. Remains of charred plant material in situ; b. Brick wall to the South, with rubbed plaster; c. Accidentally burnt mud-bricks against the wall; d. Bone spatula.

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- 14 The preserved height of Building 2 is insufficient to allow its complete three-dimensional reconstruction. However, Building 21's state of preservation, together with much clearer evidence of its structural remains and the dynamics of its collapse, was more favourable and informative for a proposal to restore the elevation and roof.

Material and methods

- 15 The multidisciplinary work presented here combines stratigraphic and archaeobotanical data to reconstruct the elevation of Building 21, its roofing (shape and techniques), and its construction techniques within the framework of the combined use of earth and wood. Our analytical approach, based on O. Aurenche's (1981) research, aims to understand architecture in its three dimensions because, as pointed out by Le Corbusier (1986: 26), "Mass and surface are the elements by which architecture manifests itself". The objective is thus to restore the mass and surface of the buildings by reconstructing circulation, lighting (or ventilation systems) and roofing (Rapoport 1969: 104-105).
- 16 Archaeological layers were recorded as SU (Stratigraphic Units) to reconstruct the relative chronology of actions and events. For the archaeobotanical study, sediment samples from different contexts (floor levels, collapsed roof, structure fill and upper brick collapse) were sieved using a flotation machine (table 1). Organic residues were recovered in a 0.5 mm mesh sieve for seeds, fruits and anthracological analysis. The charcoal fragments were studied later with a reflective microscope in the laboratory,

where taxa were determined with the help of atlases (Schweingruber 1990; Benkova and Schweingruber 2004).

Table 1 – List of the contexts studied in the framework of the anthracological analysis.

Context	Sample number	Stratigraphic Unit (SU)
Bricks collapse	KCT035	G9-139
Filling	KCT044	G9-129
Roof collapse	KCT049	G9-141
	KCT050	
Floors	KCT083	G9-152

A. Decaix.

Building 21 at K ıçık Tepe: archaeological evidence and archaeobotanical data

- 17 Building 21 is oval-shaped and measures 2.6-3 m. The western part has been damaged by modern activities unlike the eastern part which has retained up to 1.4 m in height and 19-21 cm in width for the wall, depending on the thickness of the coating. The mud-bricks used for construction contain straw temper added to the clay and are parallelepipedic in shape. They are regular (39-41×17×9 cm), with straight edges and sharp corners. The wall was erected in a single row of stretchers with a slight batter to the north and an inner batter to the south. This slanting of the wall face is not intentional but is consistent with the damage occurring after the building's abandonment and its collapse on itself in the southwestern part. No doors or windows have been identified. Unfortunately, the eastern part of the wall and its upper filling were damaged and cut out by a later silo.
- 18 Two successive floor levels (SU G9-147 and G9-152) have been identified. The latest hosts a circular arrangement 10 cm in diameter and 5 cm in height located in the eastern part of the building. This arrangement features a flat bottom and is partly covered by a clay flared roll (fig. 5). This was initially interpreted as the base for a roof-post but, owing to its shape, it might also have been the base for a storage container made of perishable material.

Fig. 5 – Detail of the circular arrangement in the last floor level.

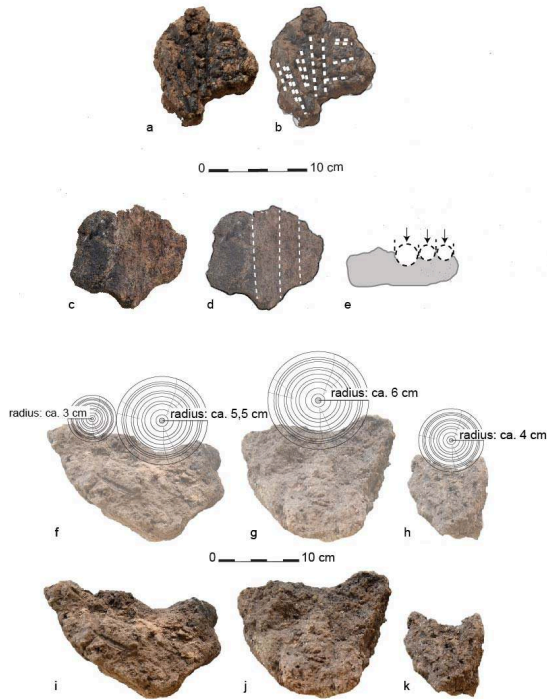


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- 19 In Building 21, the seeds and fruits analysis from the soil samples identified various cereals (wheats, barley) and pulses (lentil). Wild plants are also present in the assemblage, most of which are probably crop weeds (*Heliotropium* sp., Poaceae, *Trigonella* sp.; Palumbi et al. 2021: 10). Mugwort (*Artemisia* sp.) inflorescences are especially well represented (ca. 85% of the wild plants) and could have been used as a fungicide or insecticide (Rivera et al. 2011: 289-296), as previously suggested at G y Tepe and Hacı Elamxanlı Tepe (Akashi et al. 2018: 85-86). The presence of burnt remains of this plant in storage bins at nearby G y Tepe was interpreted as an intentional solution to preserve cereals from insects (Kadowaki et al. 2015: 422). This may suggest that Building 21 was especially used as a storage area for perishable commodities. At the current state of the analysis, mugwort seeds and inflorescences have been exclusively found in the samples from phase 3. Inflorescences are found in samples from the fallen roof (mainly SU G8-136) and in a layer of burnt vegetal remains (SU G9-141). Seeds are found essentially in hearth 6 (SU H8-24) of Building 2.
- 20 Several levels of abandonment covered the floor to a thickness of 20-30 cm, evidence suggesting that the fire affecting the building took place after an initial phase of abandonment. Indeed, a layer of charred vegetation (fig. 4), burnt earth, and accidentally fired bricks (SU G9-141) preserved for more than 30 cm on the sides (fig. 4c) lay directly over the abandonment layers. Given the archaeological data, the fire seems to have affected mainly the roof and the upper part of the walls. However, the fire impact is also visible on the inner coating (fig. 4b). Charred plant remains were found under the bricks and in the centre of the deposit mixed with burnt earth and much gravel. In the centre, the fallen roof's charred elements found in situ illustrate the roof's layout (below; fig. 4a). Additionally, fragments of burnt soil contained twig impressions pointing in two directions (fig. 6a-d), as well as imprints of branches 1.5-2 cm in diameter (fig. 6e-g), and larger pieces of wood 6-12 cm in diameter (fig. 6h-m). A

layer of collapsed mud-bricks over 30-40 cm covered this burnt level (SU G9-136; fig. 7). The backfill (about 2.9 m³) partly corresponds to the collapse of the wall after the fire.

Fig. 6 – Fragments of burnt soil with twig impressions (a-b), imprints of branches (c-e) and imprints of pieces of wood (f-k).



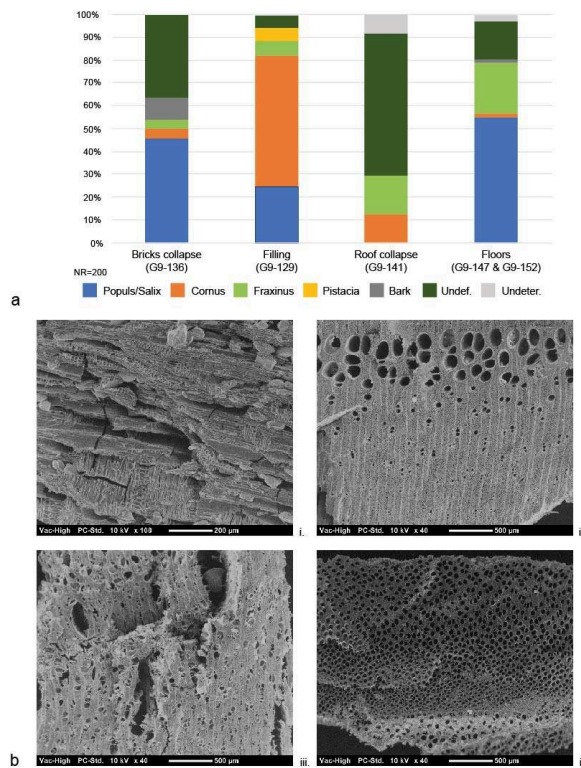
E. Baudouin

Fig. 7 – Upper mud-brick collapse in building 21.



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- 21 The anthracological study involving 200 charcoal fragments (table 1) led to the identification of four taxa (fig. 8a-b): dogwood (*Cornus* sp.), ash (*Fraxinus* sp.), poplar/willow (*Populus/Salix*) and pistachio (*Pistacia* sp.).

Fig. 8 – Anthracological results.

a. Distribution of the identified taxa according to contexts; b. Taxa identified in K ıık Tepe. i. *Cornus* sp., radial; ii. *Fraxinus* sp., transverse; iii. *Pistacia* sp., transverse; iv. *Populus/Salix*, transverse.

A. Decaix

- 22 In the Stratigraphic Units composing the roof (G9-141) and brick collapses (G9-136), numerous twigs were present but could not be specifically identified. In contrast, small twigs of about 1.5-2 cm in diameter were found to be mainly from dogwood.
- 23 Though few anthracological studies have been carried out in the region, the taxa identified at K ıık Tepe are nevertheless regularly documented at other Neolithic sites. Poplar/willow and ash are common trees in the riparian zone and have been identified at Mentesh Tepe (Decaix et al. 2016: 21) or G y Tepe (Decaix unpublished). At the latter sites, dogwood is also identified. These species are also attested at Aruchlo (Neef et al. 2017: 374). Ash is also present at Kamiltepe-MPS 1 in the Mil Plain (Neef et al. 2017: 376). Pistachio is common at K ltepe I (Nakhichevan) in the Araxes Valley (Decaix 2016: 273-274) and is characteristic of open formations still dominant nowadays (Gabrielian and Fragman-Sapir 2008: 20).

An architectural reconstruction of Building 21 at K ıık Tepe

- 24 According to archaeological data, we have to consider 20 courses of Building 21, corresponding to a height of 1.4 m, for a building's size of about 2.6-3 m, and a collapsed layer 0.5 m thick inside the building, i.e. an area of 6.4 m². Based on theoretical research in architecture, we assume that about one-third of the wall collapsed outside the building (Margueron 1987) and that the roof overhang was 30 cm

all around the building to avoid rainwater run-off at the foot of the wall (Houben et al. 2006: 279). Based on this evidence, the overall height of this building was c. 2.9 m (table 2). Given the preserved walls' height, we assume there must have been a doorway located to the south, where the building was damaged. Concerning the existence of windows, which are documented at G y Tepe (Nishiaki et al. 2020a: fig. 3.30, 37), we hypothesize that the doorway was the only entry for the light given the building's small surface area and the fact that its function was probably storage, requiring a limited amount of light for optimal preservation of perishable goods (Aurenche et al. 1997: 97).

Table 2 – Measurements of Building 21 for restitution of elevations

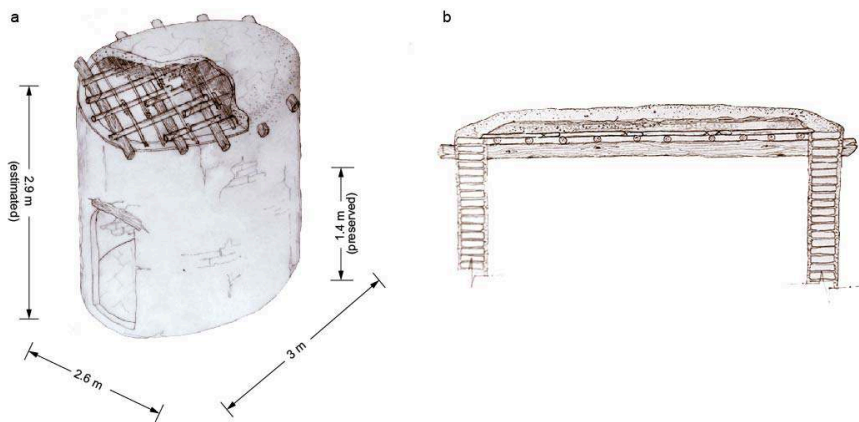
External diameter (in m)	3×3.4
Overall surface area (in m ²)	8.3
Internal diameter (in m)	2.6×3
Usable surface area (in m ²)	6.4
Height of the preserved mud-brick wall (in m)	1.4
Height of the preserved collapse layer (in m)	0.5
Overall volume of the building (in m ³)	11.6
Usable volume of the building (in m ³)	8.9
Volume of the preserved mud-brick wall (in m ³)	2.7
Volume of the collapse layer inside the building (in m ³)	3.2
Presumed overall volume of the collapse layer (in m ³)	4.3
Presumed thickness of the flat roof (in m)	0.3
Presumed volume of the flat roof (in m ³)	3.6
Presumed volume of the collapse (mud-bricks and roof; in m ³)	7.9
Presumed volume of the collapsed mud-brick wall (in m ³)	5.5
Presumed height of missing elevation (in m)	1.2
Presumed height of overall elevation (in m)	2.9

E. Baudouin

- 25 Finally, concerning the roof, results from the macroscopic study of architecture, the position and quantity of the charcoal remains, and the plant imprints on earth fragments, the evidence suggests the use of mixed mud and wood for the roof, which must have been more than 10 cm thick. Only a few elements give a glimpse of the materials used for the covering, due to the severe deterioration of the remains which made them difficult to distinguish systematically from the rest of the collapse during the excavation. The vegetal framework consists of two perpendicular twigs beds – as is visible on the clay fragments (fig. 6a-d) – and two perpendicular branches (dogwood?) beds oriented north/south and east/west. Unfortunately, the fragile collapsed remains and the charcoal remains partly mixed with roof soil do not allow us to propose a plan for the imprints' organization and distribution.

- 26 In light of the data presented here, we can rule out the hypothesis of an earthen domed roof. The wall, preserved to a sufficient height, does not display a batter inside; the charred plant remains, and imprints testify to the use of a timber frame, not only of earthen material. We also rule out the hypothesis of a roof made solely of light materials resting on support posts (conical?) because the building does not seem to have a system of support posts. Furthermore, the orientation of charred plant remains was not set in a radial or polyhedron frame. Finally, concerning the domed roof, mud as filling lends itself rather poorly to this type of reconstruction.
- 27 We propose that Building 21's roof at K ıçık Tepe was flat (fig. 9) and rested on a wooden framework made of poplar/willow and ash selected for their solidity and size. We cannot reconstruct the wooden framework's organisation with certainty, but some fragments indicate a north/south orientation. The model of a rectangular framework intended to reduce roof spans, similar to the one known for the circular Neolithic buildings of Khirokitia in Cyprus (Daune-Le Brun 2001: 68-69) cannot be excluded. However, it is important to bear in mind that a span under 3 m does not represent a technical constraint and that trees of this size were probably available in the area (see above).

Fig. 9 – Proposal for the restitution of Building 2.



a. General view and detail of roof organisation; b. Section of Building 21.

M. Brunacci

The question of the Neolithic buildings' roofing in the South Caucasus

- 28 For a long time, the domed roof was the preferred hypothesis of reconstruction for the circular Neolithic buildings of the South Caucasus, as it was proposed at Gadachrili Gora, where almost complete domes were found (Dzhavakhishvili 1973: 73) and at Shulaveris Gora (Dzhavakhishvili 1973: 20, 210). At this latter site, A. Dzhavakhishvili reconstructed domes based on his observations of buildings preserved up to 2 m in height (table 3). An inward overhang of bricks of 2-3 cm per course forms a constant inner batter from the base onwards, and an interior and exterior coating covers the whole structure for a total thickness of 20-30 cm. This detailed description seems unlikely to us, given the diameter of the cells (2-5.3 m), which implies a slope of the wall between 24 and 45° that is far above the recommendations in traditional corbelled

vaults that are in the order of 10-15° (Houben et al. 2006: 290). According to Azimov (2006: 30), similar interpretations were proposed for Shomu Tepe (Narimanov 1965) based on erroneous archaeological data. Long taken for granted and uncritically reiterated, these interpretations were further suggested for other sites such as at Imiris Gora (Dzhavakhishvili and Dzhaparidze 1975; Kiguradze 1986: 37) or Babadervish (fig. 10-c) where post-holes (Azimov 2006: 31-31) suggest a flat or pitched roof instead. Recently, a dome-shaped roof was proposed to reconstruct Building 1 at Aknashen (Armenia) because “no evidence exists for the presence of a support for a flat covering, such as little ditches or even stone bases” (Badalyan and Harutyunyan 2022: 37). Archaeologists observed a decrease in thickness of the walls from 60 cm at the base up to 25-28 cm. However, the publication did not specify the preservation height, the existence of an inner batter, or the thickness and the composition of the collapse layer. A. Sagona also proposed a similar view recently (2018: 101), underlining the recurrence of the inner batter in the Neolithic architecture and the scarcity of intermediate load-bearing supports pointing to alternative covering.

Table 3 – The roofing proposals in the South Caucasus.

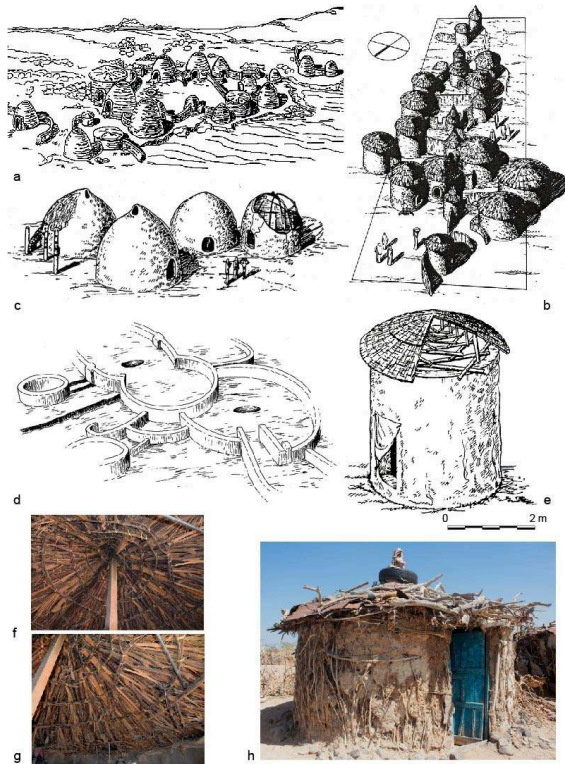
Site	Dating (BCE/ Phase or Level)	Building	Size (in m)	Thickness of walls (in m)	Height preserved (in m)	Span supposed (in m)	Archaeological evidences	Excavators' proposals		Our assessments			
								Material or roofing proposed by excavators	Bibliographical references	Yes (Y), no (N), probable (P) or Indefinite (?)	Arguments	Our proposal	
Aknashen	8830-5750/ Horizon VI	Building 1	Oval-shaped (4.2x5.4)	0.8 (bottom) to 0.25-0.28 (top)	•	4.8-6	Progressive decrease in the thickness of the wall	Dome-shaped	Badalyan and Harutyunyan 2022: 37	?	Insufficient archaeological data: height preserved? Inner batter? thickness of collapse layer?		
Arutsho	8550-5300	General	1.4 to 5.9	0.2 (minimum)	1.2 (complex I); 0.6 (complex X)	2 to 6.5	Narrow width of the walls, wooden posts	Wooden roof (no suggestion of shape)	Hansen and Ulrich 2017: 203; Iseliani 2017: 282	P	Insufficient archaeological data: imprints no in situ (part of the roof or wattle-and-daub?); wooden pole: flat or pitched roof?; for big buildings (more 3m span), a central pole is enough?	Flat or pitched roof?	
	Burned layer						Imprints of reeds and wood (0.16-0.2) cm, until 0.57cm						
	Older Neolithic Settlement	Complex III	4.5	•		5.1	Post-hole with stones						
Baba Dervish	•	Buildings 3 and 7		•			Post-holes: inner batter toward the top	Dome-shaped	Azimov 2008: 31-32	N	Invalid argument: Post-holes suggest a flat or a pitched roof		
Chatskantepe	5550-5260	General	1.6 to 5.6	ca. 0.2-0.3	•	2.2 to 6.2	No post-holes: always straight walls	Flat or pitched roofs	Azimov 2006: 31-28	P	Insufficient archaeological data: no photographic documentation, height preserved? No supporting poles for buildings with a span superior to 3m? But non-verifiable	Flat roof?	
Gadschilli Gora	5970-5300	General		•			Inner batter inside; almost complete dome	Dome-shaped	Azimov 2008: 29 (after Dzhavakhishvili 1973: 73)		(no photographic documentation, no drawings and insufficient data (size, height and thickness of the walls?))	Dome-shaped	
Gargaltapeel	ca. 5800-5600?/ Horizon 2	Building 12	2.3 (interior); 2.8 (exterior)	0.15	2	3.2	Straight wall	Flat roof	Azimov 2008: 31-28		Relatively small size of the building		
	ca. 5000-5830?/ Horizon 1	Structure n°1	3.7 (interior); 4.2 (exterior)	0.25	1.55	4.6	Imprints of burned mats	Roof with light material (no suggestion of shape)	Narimanov 1992: 20		Beams and mats BUT supporting poles for buildings with a span superior to 3m?	Flat roof	
Coy Tepe	ca. 5490?/ Level 4	Building 416	2.3 (interior); 2.7 (exterior)	0.2	ca. 0.3	3.3	Post hole in the center of the building	•		Nishchik et al 2020a: 27, fig. 3.20, 3.27	Y	A central pole to support a flat or pitched roof?	Flat or pitched roof?
	6650-6460?/ Levels 1-14	General	1.6 to 2.6		•	2.4 to 3.4	Post-holes in some buildings, relatively thin walls, especially for buildings of more than 3m	Thatching (pitched-roof?)		Guliyev and Nishchik 2020: 38		Insufficient archaeological data: inner batter? thickness and composition of collapsed layers?	Dome-shaped
				3.1 to 3.5			3.7 to 4.1	buildings without post-holes, especially for buildings of less than 3m	Dome-shaped				

Site	Datation (BCE)/Phase or Level	Building	Size (in m)	Thickness of walls (in m)	Height preserved (in m)	Span supposed (in m)	Archaeological evidences	Excavators' proposals		Our assessments			
								Material or roofing proposed by excavators	Bibliographical references	Yes (Y), no (N), probable (P) or Indefinite (?)	Arguments	Our proposal	
Hacı Elamîni Tepe	ca. 6000-5800/Level 4B	M10-147/150	4.1 (interior); 4.8 (exterior)	0.4	inf. 0.5	5.4	Four post-holes (one in the center of the building)	•	Kadovskii et al. 2021: 16			Postholes to support a roofing system	Flat or pitched roof?
İmirli Göra	ca. 5300?/Horizon VII	Building 8	Oval-shaped (4.25x3.5)	•	0.7	4.2	None	Dome-shaped	Kiguradze 1986: 36		N	Insufficient archaeological data and invalid argument: unlikely that the dome starts at least 70 cm from the ground	
	ca. 5300?/Horizon IV/4	Building 8-10	Oval building (4.8x3.8) + round building (3.2)	0.2	•	Sup. 3.6	Post-holes	Wooden roof (no suggestion of shape)	Kiguradze 1986: 37			Post-holes and size of the building suggest a flat or pitched roof	
Kıramis Didi Göra	ca. 5650-5300	General	2.6 to 3 (exceptionally 4.5)	0.2 to 0.5	•	3.2 to 3.6 (exceptionally 5.1)	Central post-holes	Pitched roof	Kiguradze 1986: 70			Insufficient archaeological data: height preserved? Mats or reeds for the roof? A flat roof is also possible	Flat or pitched roof?
K�ıltepe I	6200-5000	General		•			No stores; no post-holes; straight walls	Flat roof	Azimov 2006: 27		P	Insufficient archaeological data: size? height preserved? Wooden or reeds for the frame? BUT straight walls are enough for a flat roof if the span is less than 3m	
Mentesh Tepe	5800-5600/Level I	293	4.1 (interior); 4.4 (exterior)	0.15	0.3	5	Three post-holes near the wall; a pole imprint in the central part of the building; thin wall	no suggestion of shape	Baudouin 2019: 141			System of supporting posts; curtain wall function for the mud-brick perimeter wall	Pitched roof?
Şhamu Tepe	•	General	2.7 to 3	0.1 to 0.3	•	3.3 to 3.8	straight walls or inner batter	Respectively flat roof or dome-shaped	Narimanov 1992: 13	?		Insufficient archaeological data: archaeological evidences? height preserved? Mats or reeds for the flat roof? Departure of the results?	Flat roof? Dome-shaped? Pitched roof?
							None	Flat roof?	Munchaev 1975: fig.4				
Şhulaveri Göra	5650-5050	General	1.4 to 4.7	0.2-0.3	•	2 to 5.3	Inner batter inside	Dome-shaped	Kiguradze 1986: 13 (after Davavakishvili 1973: 210)	N		Invalid argument: according to Opatovskaya 1975 (pl. II, 1), batter made from the batter supposed an inclination between 24 to 45° which is greater than the recommended 10-15° inclination for mud-bricks domes in traditional architecture (Houbert et al. 2006: 290)	Flat or pitched roof?
							Inner batter inside (2.3m by row for a wall of 20-25cm thick)		Kiguradze 1986: 14 (after Davavakishvili 1973: 20)				
Tolte Tepe	Before 5200?/Horizon III	Structure 1	3 (interior); 3.4 (exterior)	0.2	1.2	4	Straight wall	Flat or pitched roof?	Narimanov 1992: 16		?	Insufficient archaeological data: supporting posts for a building more than 3m span? Composition of collapse layer?	

Circle: no specified ; triangle: not applicable.

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Fig. 10 – Different roofing proposals



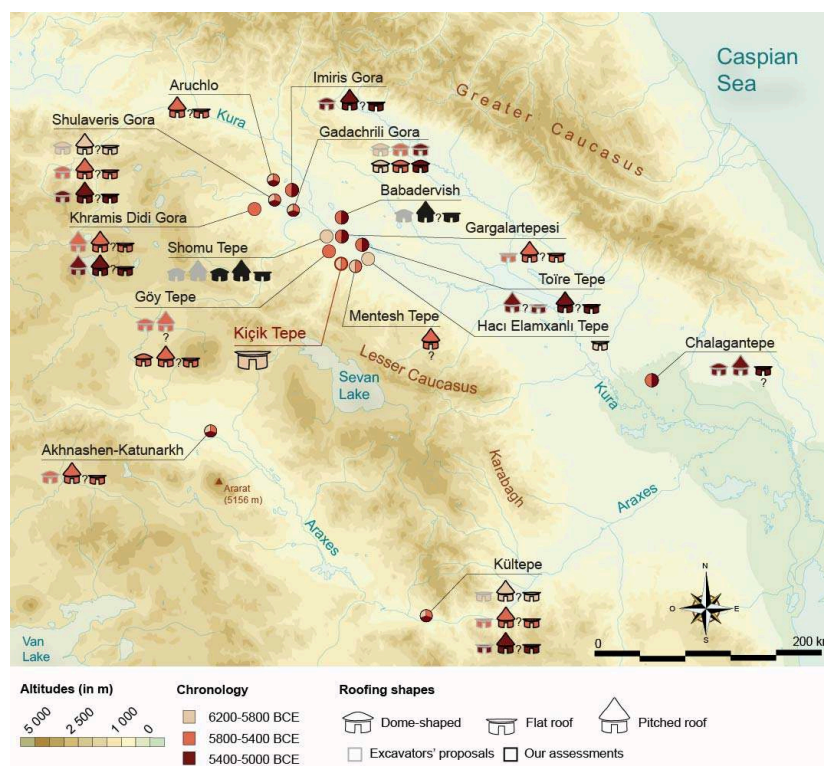
a. Reconstruction of Shomu Tepe (after Munchaev 1975: fig. 4); b. Reconstruction of Shomu Tepe (after Azimov 2006: fig. 37); c. Reconstruction of Baba Dervish (after Azimov 2006: fig. 47); d. Imiris Gora, axonometry of building 8.9-10 (after Kiguradze 1986: fig. 23); e. Restitution of a building at Chalagantepe with the polyhedron-shape roof (after Azimov 2006: fig. 25); f-g. Detail of a conical roof in a wooden frame from a modern dwelling at As-Eyla (Djibouti; E. Baudouin); h. General view of a modern dwelling at As-Eyla (Djibouti; E. Baudouin).

- 29 A variety of roofing solutions, including flat or pitched roofs, was already put forward in previous studies (Dzhavakhishvili and Dzhaparidze 1975: 206; Kiguradze 1986: 70; Narimanov 1992: 32). For example, at Gargalartepesi, the combination of a constant thickness of rectilinear walls (Azimov 2006: 29) without inner batter and preserved over a height of 2 m in Building 12 and the presence of burned mats imprints in Structure 1 (Narimanov 1992: 16, 20), makes it possible to restore a flat roof. Similar proposals were made at Toire Tepe (Narimanov 1992: 16) and for Building 9-10 at Imiris Gora (Kiguradze 1986: 37; fig. 10d), where a central post-hole suggests the existence of a flat or pitched roof. Finally, in some cases, like at Shomutepe, the lack of archaeological data led to reconstructions based solely on ground plans. They proposed flat, domed (fig. 10a; Munchaev 1975: fig. 4) or conical roofs (fig. 10b; Azimov 2006: fig. 37) without archaeological evidence to justify any of the proposed solutions.
- 30 However, F. Guliyev and Y. Nishiaki (2014: 6), S. Hansen and M. Ullrich (2017: 203) recently refuted the dome hypothesis because of the thinness of the walls. Furthermore, the presence of post-holes seems to be frequent, for instance, at Shomu Tepe (Narimanov 1987), Khramis Didi Gora (Kiguradze 1986: 70), G y Tepe (Nishiaki et al. 2020a: 36) and Aruchlo (Hansen and Ullrich 2017: 203) where reconstructions prioritize a wooden or thatched roof with a flat or pitched shape (Munchaev 1982). At Aruchlo, the presence of reeds and wood imprints in a burned layer – unfortunately not associated directly with a construction – could suggest a flat roof (Ioseliani 2017: 282).

Azimov (2006: 31) proposes another solution at Chalagantepe for large buildings (more than 1.5 m in diameter); he suggests a central post with a polyhedron-shape framework for the roof (fig. 10e). Based on a technical point of view, this shape seems to refer to traditional architecture (*tukul*) from East Africa (Ethiopia, Sudan, Djibouti; fig. 10h) where circular buildings are covered with a conical roof in a radiating wooden frame supported by a central post (fig. 10f-g). A variant to these conical roofs was proposed at Mentesh Tepe, where a series of post-holes on the inner perimeter of the building and an imprint left by a central post make it possible to restore a conical roof of perishable materials. In this case, we supposed that the mud-brick perimeter wall functioned as a curtain wall (Baudouin 2019: 141).

- 31 More recently, an increase in archaeological evidence integrated with a literature review allows for a large variety of roofing solutions (fig. 11).

Fig. 11 – Roofing proposals in the South Caucasus in the Neolithic period.



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- 32 How did archaeologists interpret this diversity? To our knowledge, no mention in the literature attempts to link the variability of the roofing solutions with the function of the buildings themselves or to environmental and/or cultural factors. However, according to Azimov (2006: 31) and Nishiaki et al. (2020a: 36), it is possible that these were technical differences generating specific solutions depending on the size of the buildings. According to the authors, while small ones (less than 1.5 m in diameter) may have had a dome-shaped roof “that needed no supporting feature” (Azimov 2006: 31), the larger ones had intermediate posts, suggesting the hypothesis of a conical or flat roof.

Roofing in perspective: archaeological, ethnographic and ethnoarchaeological comparisons

The issue of roofing in circular buildings of the Halaf culture (Mesopotamia, 6th millennium BCE)

- 33 Some authors considered that groups from North Mesopotamia, especially during the Halaf period (6100-5400 BCE), played a role in forming the contemporaneous AShSh (Munchaev 1975: 116-119, 1982: 113). Findings of sporadic imported painted Halaf ceramics suggesting relationships between the AShSh and the North Mesopotamian communities (Harutyunyan 2022: 94-97) justify this hypothesis. The Halaf and AShSh communities were, therefore, contemporary. In this section of the paper, we would like to introduce a comparison with the Halafian circular architecture, as the latter was also at the centre of a debate on roofing forms and techniques similar to the one just discussed in the South Caucasus.
- 34 Based on research carried out in the 1930s at Tell Arpachiyah (Mallowan and Cruikshank 1935: 28), it has long been accepted that the characteristic Halaf circular architecture, the tholos, was covered by a domed roof, by analogy with the ‘beehive’ villages of northern Syria and south-eastern Anatolia (Copeland 1955: 21). Yet, as P. Akkermans explains, “it is doubtful whether this perspective is correct. Not only is there no historical relationship whatsoever between the two forms of architecture, but the archaeological evidence [such as impressions of reeds and wooden poles at Tell Sabi Abyad] itself suggests either a flat or a pitched roof made of timber and reeds rather than a beehive shaped mud brick cover” (Akkermans 2010: 26).
- 35 While some scholars do not question the possibility of a domed roof for the Halaf (Merpert et al. 1976: 45; Tsuneki 1998: 174), others suggest a diversity of roofing forms on the grounds of archaeological evidence (table 4). At Tell Sabi Abyad, archaeologists reconstructed circular buildings with a dome-shaped roof based on an inward curve of the wall in Buildings 8.1, 8.4 and 7.5 (Akkermans et al. 2014: 36, 40, 52). Nevertheless, based on the photographic documentation, one finds it difficult to support this hypothesis (Akkermans et al. 2014: 36, fig. 2.3, 53, fig. 2.17). They also proposed a flat roof in tholos IX on the base of straight walls and wood and reeds imprints discovered (Verhoeven and Kranendonk 1996: 61, 77) and/or a conical roof in Building 7.2 by restoring a central wooden post (Akkermans et al. 2014: 52). The existence of a wedge stone intended to support a central post (Becker and Wickede 2018: 25) has led to the hypothesis of a wooden (conical?) roof at  avi Tarlası also, and, at Fıstıklı H y k, the restoration of a conical roof made of only organic material is also favoured (Bernbeck et al. 2003: 27). However, in both cases, the lack of archaeological data such as the preserved height or thickness of the collapse layer does not allow for a reliable interpretation. As for the hypothetical evolution of the roof shape during the Halaf period, namely the disappearance of the dome in favour of the flat roof (Breniquet 1996: 85), it cannot be demonstrated at the present state of knowledge.

Table 4 – The roofing proposals in the Halaf culture in Mesopotamia.

Site	Datation (BCE)/ Phase or Level	Building	Size (in m)	Thickness of walls (in m)	Height preserved (in m)	Span supposed (in m)	Archaeological evidences	Excavators' proposals		Our assessments		
								Material or roofing proposed by excavators	Bibliographical references	Yes (Y), no (N), probable (P) or Indefinite (?)	Arguments	Our proposal
Toll Arpachyah	8000-5700/ Level T18	Square F d V 2	4.26 (internal)	•	0.85	sup. 4.9	sharp angle of the inner batter	Dome-shaped	Mallowan and Cruikshank 1935: 23		Insufficient archaeological data: no photographic documentation; composition of the collapse layer?	Dome-shaped?
avi Taraisi	Before 5700? / Level 3a	Tholos 13	3.6 (interior)	0.6	•	sup. 4.2	Stone in the center of the building for a post-hole?	Flat roof	Becker and von Wickede 2016: 25	P	Impressive thickness of the wall BUT insufficient archaeological data: height preserved?	Flat roof?
Fiatkiki H�yok	5880-5680	All circular buildings		•			No imprints of reeds and wood; pis� wall no more than 1m height	Pitched roof?	Bernbeck and Pollock 2003: 27		Insufficient archaeological data: Inner batter? thickness and composition of the collapse layer?	
Teil Sabi Abyad	6050-5880/ Level 8B	Building 8.1	3.9 (external); 3.1 (internal)	0.3	1	4.5	Batter inside	Dome-shaped	Akkemans et al. 2014: 36	N	In contradiction with photographs where we observe straight walls (Akkemans et al. 2014: 36, fig. 2.3 and 53, fig. 2.17)	Flat or pitched-roof?
		Building 8.4	3.5 (external); 2.8 (internal)	0.4	•	4.1						
	5890-5780/ Level 7B	Building 7.5	5.3 (external); 4.6 (internal)	0.4	0.4	5.9			Akkemans et al. 2014: 52	?	By analogy with the problem encountered in Buildings 8.1 and 8.4, it is difficult to propose an hypothesis without more archaeological data	
		Building 7.2	3 (external); 2.3 (internal)	0.4	•	3.6	Two stones into the floor in the center of the tholos: foundation for a wooden post?	Flat or pitched roof			P	Insufficient archaeological data: height preserved? Thickness and composition of the collapse layer?
	/	Tholos IX	3.5 (internal)	•	0.5	sup. 4.1	straight wall; imprints of reeds and wood	Flat roof	Verhoeven and Kranendonk 1996: 61	Y		Flat roof
	8000-5730/ Level 4	Tholos in square Q15	3.2	•	0.3-0.7	3.6	No wall curving inwards	Flat roof	Verhoeven and Kranendonk 1996: 77	P	Insufficient archaeological data: imprints? composition of the collapse layer?	Flat roof?
Yarim Tepe II	6th mill. BCE?	Tholos 42	•	0.7	0.4-0.7	•	Batter inside	Dome-shaped	Merpert et al. 1976: 45	?	Insufficient archaeological data: photographic documentation? Size of the building?	Dome-shaped?

Circle: no specified.

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Environment, culture and ethnicity: the contribution of ethnography and ethnoarchaeology

- 36 According to ethnographic and ethnoarchaeological data, the buildings' vault is chosen based on environmental factors – understood as both ecological and economic (Besenval 1984: 168). Architectural studies show that the dome technique is documented in northern Syria and southern Turkey since the eighteenth century (Banse 1911). It is economical in terms of timber, particularly for corbelled domes and sloping bases (Houben et al. 2006), which did not need formwork. The scarcity of wood in the building's close vicinity is often a meaningful environmental constraint encouraging the use of vaulting (Besenval 1984: 168) as in the vernacular architecture in the Khorassan region of north-eastern Iran (Kleiss 2015: 1). In Central Asia vaulting was favoured in the past because it is highly resistant to earthquakes, as in the Turan plateau (Baimatova 2008: 121). Vaulting also lends itself to a warm and dry climate as it provides good thermal insulation in Iran (Bahadori 1978) and good ventilation for cooling the house in Syria (Tsuneki 1998: 174). According to ethnographic studies, these two factors are considered paramount. They clearly predominate over sociocultural factors, such as ethnicity, as documented (see below) in northern Afghanistan (Dupaigne 1968: 60) and the Aleppo region in northern Syria (Copeland 1955: 21; Tsuneki 1998: 174-176).
- 37 There is also mention of economic factors because of the low cost of earthen material and the easy implementation of this type of roofing (Besenval 1984: 168; Tsuneki 1998: 174). Finally, ethnographic data provide details on the organization of the work, the layout techniques, and the lifespan of the vaults. In northern Afghanistan, estimates are that it takes about two hours to cover a 2.5×6 m room with a vault whose estimated life span is 30-40 years (Dupaigne 1968: 60) compared to 70-90 years in North Syria (Sweet 1974: 114). Ethnographic studies of Nubian masons (Houben et al. 1995: 286)

show that lighter, straw-filled bricks are sometimes preferred for such constructions. Ten days of work carried out after the spring rains are required for a 6 m diameter dome made of 4,000 bricks 25×15×5 cm. As a brick weighs about 3 kg, estimations are that the dome weighs about 12,500 kg, or 440kg/m². Furthermore, recent studies reveal that the need for dome repair and the absence of wood to strengthen the structure has led to the current disappearance of this type of construction in favour of the flat roof, deemed more weather-resistant (Tsuneki 1998: 176). The ethnographic documentation shows that flat roofs are the most suitable solution for a warm climate with little rainfall. There are examples of the use of the flat roof in most of the Near East (Kramer 1982: 91; Aurenche et al. 1997: 127). For the construction of a flat roof, preference goes to local wood species: poplar, willow or tamarisk in Anatolia (Aurenche et al. 1997: 129); palm, and sometimes mulberry and apricot in Iran (Rouholamini 1973: 257). The roof spans that need covering are generally short, under 3 m (Houben et al. 2006: 276), for rooms up to 2.6 m wide. For larger rooms, the use of posts is necessary⁴. The construction of the flat roof is quite similar throughout the Near East: successive layers of heterogeneous materials – reeds, branches, packed earth, stones – covering the beams at the top of the wall, for a total estimated weight of 500kg/m² (Ragette 1974: 22). As to other roofing possibilities, the best-known ethnographic examples of vernacular architecture with a sloping roof made of light materials (straw, reeds, thatch) are mainly located in the subtropical plains of Iran and Azerbaijan along the Caspian Sea in the provinces of Gilan and Mazanderan (Kleiss 2015: 3). In these regions, the abundance of wood favours its use in houses built on piles (Morgan 1894: 103; Gabriel and Gabriel 1935: 175; Wulff 1966: 102).

- 38 Dome-shaped, flat roofs or pitched and conical roofs can be related to different practicalities determined by environmental conditions. However, beyond ecological and economic issues we would like to highlight that, as already emphasized by A. Leroi-Gourhan, the house “est   la fois le plus apparent et le plus personnel des traits ethniques” (Leroi-Gourhan 1973)⁵. According to R. Besenval (1984: 168), socio-cultural factors can be decisive in constructing houses and shaping roofs, provided that all other requirements linked to the environment (ecological, economic) are met⁶. In the same vein, recent works highlight the social value placed on roofing in the Mandara Highlands in Cameroon (Ch etima 2019) and the fact that it is possible to correlate roof construction techniques with cultural identities in eastern Senegal (Pelmoine and Mayor 2020). In the latter case, the roof represents a marker of identity, where each ethnic group is identified based on the materials used, the frame’s structure, and the roof’s shape.
- 39 To conclude, ethnographic and ethnoarchaeological studies show that environmental factors (ecological and economic) play a major role in the roof layout. The main elements affecting the roof layout are raw materials’ availability, cost, and suitability to environmental conditions. However, these studies also highlight that the social factor can overlap with the environmental factor. In other words, roofing (shape and technique) can also result from what Deffontaines (1972: 84) calls “historical and social conditioning”, which is a discrete, but pervasive factor in every community. The roof is not only a powerful symbol of the house (Rapoport 1969: 134), but the “house” is a “roof” because its layout is the most significant part of the building activity (Deffontaines 1972: 62).

Discussions

- 40 The multidisciplinary research results allowed us to propose a flat roof reconstruction for Building 21 at K ıçık Tepe. These data and those collected and discussed above demonstrate that flat roofs may have been a common architectural tradition in the South Caucasus. They highlight that a wide variety of roofs may have been characteristic of Neolithic circular buildings, perhaps even among buildings in the same region or even in the same settlement.
- 41 According to archaeological and ethnographic observations, this diversity may be more the result of technical requirements determined by the size of the buildings rather than their functions. However, it cannot be ruled out that size, function and shape of the roof are directly related. We have also underlined the importance of environmental (ecological and economic) factors in determining the roof's materials and shape. It is worth mentioning, however, that in the Neolithic South Caucasus it appears that roofs of different shapes were built in what seems to be a similar environment. These similar environmental conditions make it worth considering R. Besenval's suggestions (1984: 168) that the socio-cultural factor could have played a significant role in the diversity of the roofing and that it could be even privileged over the others in this type of situation.
- 42 Therefore, our hypothesis, which we aim to substantiate with new data from K ıçık Tepe, is that the recurrent diversity of roofs in the Southern Caucasus could mirror "social or cultural" meanings perhaps embedded in different building practices. On these matters, E. Wenger (1998: 3) highlights the dialectic occurring between building practices and learning processes and the fact that both actively participate in the definition of communities of practice, in the construction of senses of membership and, lastly, in the formation and development of social identities. In the same vein, although it remains a working hypothesis at the current state of knowledge, we cannot exclude that house roofing (as a result of different building and learning practices) could have actively contributed to marking some differences between Neolithic families, groups and communities in the South Caucasus.
- 43 The phenomenon of local traditions fuelled by a daily transmission of technical knowledge at inter- and intra-community levels has also been recently demonstrated for pottery traditions (Iserlis 2021: 133). These differences have actively participated in the constitution of the AShSh cultural tradition which, in light of the architectural evidence, appears now to be a much more regionalised tradition than previously assumed. Therefore, the data presented in this work seem to highlight that, rather than displaying "real unity between the sites of the basins of the Araxes and the Kura" (Badalyan et al. 2022b: 260), the Neolithic AShSh was more probably a cultural mosaic expressing both regional and local diversities (Baudouin 2019: 146).

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NOTES

1. Translation: The house "is made according to the norms of the group and for the group" (Coudart 1998: 18).
2. The only exception is a rectangular building identified in Horizon VII (5900-5880 cal. BC) at Aknashen (Badalyan and Harutyunyan 2022: 14, fig. 6; Chataigner et al. 2022: 78).
3. Under the aegis of the Ministry of Europe and Foreign Affairs and in collaboration with the Institute of Archaeology of Baku (Palumbi et al. 2021) and directed by G. Palumbi (CNRS).
4. The value of 3 m spans represented a technical constraint as early as the PPNA-PPNB, as evidenced by the restitution of the roof proposed for building EA53-II/E at Jerf el Ahmar (Syria). The beams used did not exceed 2.5 m in order to avoid a roofing layout that was too complex, according to the authors (Stordeur 2015: 89-90).
5. Translation: "is at once the most apparent and the most typical of the ethnic features"
6. Such differences in roofing within a similar environment are documented in Chad where the main house has a flat earthen roof and women's houses a conical straw roof (Dainville 1948: 67); also in Senegal where the chiefs' rectangular flat-roofed houses stand out among other circular houses with a conical straw roof (Le Blanc 1964 121).

ABSTRACTS

Abstract. The site of K ıçık Tepe (Azerbaijan) is located in the Middle Kura Valley river. The archaeological material and radiocarbon dating attribute the oldest levels to the Neolithic period (5870-5750 BCE), and its circular architecture is characteristic of the *Aratashen-Shulaveri-Shomu* culture. The 2018-2019 excavation campaigns have unearthed Building 21, which was built with mud bricks and preserved over 1.4 m in height. The exceptional state of preservation of the building is due to a fire that led to the collapse of the walls and roof materials. Based on the archaeological results of the excavation and a multidisciplinary research combining a stratigraphic examination, an architectural study and an anthracological analysis, this paper proposes to reconstruct the elevation and the roof of Building 21. In addition, our questions will focus on a possible diversity of forms and roofing techniques in the Neolithic period as perceived in the archaeological literature. We also want to understand what factors (environmental, cultural, socio-cultural) may influence choices regarding roofing and whether they can be identified through archaeological evidence. This paper contributes to the current debate on the technical specificities developed by these communities with new data and thus to a better understanding of architecture in its three dimensions, to define the complexities linking cultural “behaviours”, building materials and architectural solutions among these Neolithic communities.

R esum e. Le site de K ıçık Tepe (Azerba ıdjan) se trouve dans la moyenne vall ee de la Kura. L'ensemble du mobilier arch eologique ainsi que les datations par radiocarbone permettent d'attribuer les niveaux les plus anciens  a la p eriodo n eolithique (5870-5750 BCE). Son architecture de forme circulaire en fait un site typique de la culture *Aratashen-Shulaveri-Shomu*. Les campagnes de fouilles men ees en 2018 et 2019 ont conduit  a la mise au jour du b atiment 21, conserv e sur une hauteur de 1,4 m. Construit en briques crues, l' edifice doit son  etat de conservation exceptionnel  a un incendie qui a entra ın e l'effondrement du mur et de la toiture.  A partir des r esultats arch eologiques apport es par la fouille et d'une  etude pluridisciplinaire combinant examen de la stratigraphie,  etude architecturale et analyse anthracologique, cet article propose de reconstituer l' el evation et la toiture du b atiment 21. Il propose  egalement de s'interroger sur une  eventuelle diversit e des formes de toit (conique, en d ome, plat) au N eolithique telle qu'elle appara ıt dans la litt erature arch eologique. Il s'agit  egalement de comprendre quels peuvent  etre les facteurs (environnementaux, culturels, socio-culturels)  a l'origine de cette diversit e et s'ils sont perceptibles par l'arch eologie. Cet article contribue  a alimenter gr ace  a des donn ees nouvelles la question des sp ecificit es techniques d evelopp ees par ces communaut es et  a mieux d efinir l'architecture dans ses trois dimensions afin d'appr ehender la complexit e liant « comportements » culturels, mat eriaux de construction et solutions architecturales au sein des communaut es n eolithiques.

INDEX

Mots-cl es: architecture, toiture, N eolithique, sud du Caucase, arch eobotanique, reconstruction, Aratashen-Shulaveri-Shomu

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