The architectural morphology of corbelled dome houses

The morphology of the house in towns and villages developed from the material expression of uses, customs, beliefs and the culture of a particular people. The populations of peasants and farmers inhabiting the villages of northern Syria retain a certain heritage of nomadic Bedouin culture, which manifests itself through the use of spaces, through local social relations, and also through the warm hospitality that has always been shown to strangers and desert travellers. Syrian dome dwellings are cell constructions marked by the notable presence of domed roofs that stand out characteristically in the desert landscape. This type of vernacular construction incorporating a corbelled dome is common in the Mediterranean area and is usually built in stone. Far less common is to find them gathering to form groups of dwellings or even whole villages. Even considering the existence of other conflicting examples, the most distinguishing feature of these dome dwellings lies in their character and capacity to be grouped together, along with the use of adobe as a construction material.

The distribution and use of the spaces of a house corresponds rather to the layout of nomadic camps, and the shape of the dome could be seen as symbolically evoking the tent. The earthen dome house originated and evolved over time, stemming from a willingness to apply and develop the most appropriate solutions to meet human needs in relation to the potential and resources of the environmental context. The geometry of the dome itself is not a product of clear intent, but is rather a product in its form and design of the collective intelligence of communities inhabiting the regions of the Middle East. Architecture in such villages does not exactly result from aesthetic research, but from a deep understanding, though often unconscious, of the resources of a place. The owner-builder thus translates into his house certain social and cultural needs, establishing a balance between his village and the forces of nature from which he is seeking to protect himself, living in and integrating into the ecosystem of a particular area.

The character of the cell may at first sight justify the isolation and free-standing nature of most corbelled domes existing in the Mediterranean zone. While in other places the construction of corbelled domes usually answers occasional, sporadic or seasonal needs and depends on the availability of stone, in this case the absence of stone, the absence of mortars like gypsum, lime, etc., and the absence of wood, determines the creation of dwellings, hamlets and villages built exclusively in earth.

The living unit (dar)
The construction model is based on the combination of several cells or blocks, which are arranged around a central courtyard. Built spaces are reduced to a minimum: the daily life of the family, the daily preparation of bread, meals, family reunions and children’s education and play, is spread out. A similar organization is found in the nomadic camp: the tent is a shelter but family life is conducted outside. Several tents are positioned to form a square, creating a sheltered and enclosed space. Unlike nomadic living units, the houses are embellished with certain features.
that meet the needs of the sedentary lifestyle: bread ovens, rooms for fodder storage, chicken coops, stables and wells. These details, complementary to the main dwelling, contribute to a greater sense of the comfortable, practical and stable homestead.

The basic forms of aggregated units, though not easy to categorize, can be distinguished as either ‘closed’ or ‘open’ (Figs. 2-3). In the former, a central space is enclosed by buildings and a fence wall with a small entrance passage. This fence wall is generally low, thus allowing a view of the courtyard while still preventing access by animals or outsiders, though only in rare cases is it secured by lock.

In the latter case, the organization is rather different: the main unit can be surrounded by other complementary buildings but the limits of the units are not defined. Communal and private spaces in this case are somewhat mixed up where areas belonging to a particular house may also be used as common thoroughfares.

There exist endless variations to and forms of the above two types, resulting from the spontaneous growth of housing through the repetition of the basic form, the main dome, with adjacent buildings, which may take on many different shapes and sizes.

Individual domes group together to form dwellings which, in their various forms, depend on certain factors related to the social characteristics of the owner/builder of the house: the state of well-being of the family, the frequency with which the building is used, type of farming adopted (crop-agriculture or pasture), and the number of components in the nucleus (Fig. 4).

**Single-dome unit**

This is the simplest type of housing where the interior space is organized to meet all domestic needs. One part has a floor raised by 20-25 cm and covered with mats or carpets, being the space for living and sleeping with blankets and sheets stored in a corner. Food, drinking water, tools and kitchen utensils are stored in the area nearest the entrance. Here there is no fence to demarcate the area of the property, more often in front of the dome there is a terrace (*mastaba*), acting as a sort of extension of the interior space.
Twin-dome unit
The single cell is most often paired with another to form the household unit. The nucleus can occur in isolation or surrounded by a perimeter fence. Even in cases where there are no perimeter walls or explicit limits surrounding a courtyard, there are always implicit signs (changes in surface or ground level) in order to announce the progressively private domain of the dwelling place.

Multi-dome unit
In the more evolved type of living unit, sets of domes are arranged in line on one or more sides of a quadrilateral. A perimeter wall of earth and stone (sur) can enclose the square, leaving some room for the entrance passage. The complex is managed from the main unit of housing, which can be formed by a single-dome building or two inter-connected blocks. Around this other cells are added over time, each with its own specific role.

With the exception of the small storehouses that appear occasionally in family courtyards and sites, cell domes adopt fixed dimensions for the whole of the village without reflecting any particular hierarchy of use. That is to say, from the exterior, except for other parallel signs (relative position, lime washings, decorations and furniture), a dome used as a dwelling is not distinguishable from one used as a granary or stable. The same architectural typology is, therefore, valid both for the inhabitable and auxiliary spaces. The principle housing cell functionally and spatially organizes the whole of the complex, linking the different functionally complementary service elements. An implicit hierarchy exists in the relative position of the dwelling area with respect to the storage area. Moreover, the dwelling area usually has a raised terrace (mastaba) at the main entrance of the house. In an extended family, the householder and his wife occupy the larger and most important cell, while the married sons and their families inhabit other lesser domes.
The distinction of function for each unit naturally leads people to live largely outside, where most of the daily life takes place. The outdoor area has a distributive function, whilst being at the same time a common space for many important activities (Fig. 6).

This type of dwelling in multiple structures allows the addition of new blocks, in cases where extra space for production is necessary or to make room for new members of the family (Fig. 5).

A tent is sometimes set up next to the living unit. Its location may be temporary, related to the period preceding the final occupation of the house on the return of the family from transhumance. In other cases, the presence of a permanent tent near the dwelling may be used for the housing of livestock, for the storage of straw and firewood, or for the preparation of milk products, such as laban (yogurt), ajebneh khadra (white cheese) and samneh (oriental butter, a speciality of the region).

Organization of space in a housing complex

**Dwelling-house, 'Gurpha'**

The main space of the house is called a *Gurpha*, being the space for housing the family and the reception of guests. It may consist of a single cell, but more often comprises of two domes communicating by an arch (*Qaus* or *Qantara*), equal in size to the dividing wall, that may be separated by a curtain. Usually, there exist no partition walls in the space under the domes. In poorer households animals are also housed in the main room during cold winter nights.

Orientation is frequently north south, with the main opening towards the south in order to take full advantage of solar irradiation, and to protect the house from the easterly and north-easterly winds which are very common to this area of Syria. This space, as with the inside of a tent, has a multifunctional character: by day it serves as an area of residence and shelter from the harsh climate, by night as a sleeping room with mattresses spread around the floor.

Passing through the entrance of the cell we find a small area (*attabeh*) on a level a few centimetres lower (10-20 cm) than the main floor. This space, being the width of the front door and roughly square in shape, is used for storing shoes that are not worn inside the home. Here a container (*Khabia*) containing water for domestic use is often placed, which is sometimes used for washing. A small hole made in the threshold of the door allows the water to pass from inside the dome to the external drain. The interior has no fixed furniture. Blankets and in some cases thin mattresses are placed in a pile in a corner of the room (*frash*), and only at night are arranged on the floor for sleeping.

Objects are placed in niches (*khezana gedaria*), built into the thickness of the masonry. The shapes and dimensions of the niches are variable: there are...
some very small cavities, arranged in sequence, some the size of a window, or niches that rise from the floor to the height of 1–1.50 m. In most homes the niches can be closed by wooden doors to create a wardrobe. The depth, two-thirds the thickness of the masonry, is constant. The main walls in housing can be decorated by relief (raft), always made in raw earth, with floral or geometric patterns, and can form small shelves.

Access
The closed arrangement of this type of architecture responds to climatic, constructional and social factors. Domes usually only have one access for each unit or even one access every two units when inter-connected. The door of a dome dwelling frequently represents the only entrance for the inhabitants and sometimes the only illumination and ventilation point for the internal space. The only wood used in the construction may usually be found around this door, i.e. the lintel and the door itself.

Openings
In addition to the gateway, openings are small and rare. Consisting of small square, rectangular and round (tāqā) holes, they are usually oriented towards the east or west, to capture summer breezes, and allow for night ventilation and the entrance of moderate sunlight. Windows are often found in the most recent housing (nafēza or shubbak), usually on the main elevation.
Bathroom, ‘Marhad’ or ‘Baat Al-mai’

Traditional houses are not always equipped with bathrooms, and when present they tend to consist of a hole in the ground inside a special compartment (dome or flat roof) or in the livestock area, in this case protected by a C-shaped wall, varying in height from 1 to 1.5 m. In wealthier homes a bath (hammam) can be found along with clay containers for pouring water.

Kitchen

The Syrian house has various spaces for the preparation, storage and consumption of food. The tableware and supplies are placed in a specialized unit (matbakh), where today, in addition to traditional earthen shelves, wooden shelves and in rare cases a refrigerator can be seen. Another storage space, used to preserve foodstuffs and fruit for winter, may be located in a separate room (baet al-muna or al-fejhe) or else in a part of the main room separated by a wall where food stocks are placed in small holes (kuara). Traditionally, meals are prepared outside according to the nomadic custom. However, today many families use gas stoves and prefer to cook indoors. Firewood is stored in the same place as the dishes, or in a separate compartment (mustauda hatab).

In each unit there is an oven (maouqed, dfeeh or kanun) for the daily preparation of bread. The traditional oven is a simple circular base in clay, about 60 cm high, with a cavity in the centre for the burning of straw and small branches. The cavity is covered by a convex metal disc, on which a layer of dough of variable thickness is placed. The oven can be outside, consisting in this case of a cylindrical base made of stone and earth, with an upper cavity shape where the dough is cooked and below a space for burning wood. Meals are generally consumed in the main house.

Courtyard, ‘Haush Sahn’

This is the courtyard around which the various functional cells for housing are arranged, surrounded by an earthen fence wall (su) or by the constructions of the dwelling. It is a highly frequented space where one can find small fenced off areas or shelters for animals, small domes used as chicken coops (qunn) and in some cases a fireplace for the preparation of meals. At the centre of the courtyard or in an area adjacent to the house there is often a well (be’er) supplying the family with drinking water. The well can be simply a hole in the ground covered by a flat stone, or it may have an above-ground base built from stone or from mud and stone, dug by hand, from which water is almost always hand drawn by a system of pulleys.

In most villages with an abundance of water, short-stemmed plants are grown in a small orchard-garden (hakura) in the courtyard. In the past it was commonplace for the inhabitants to sleep outside in the courtyard on summer nights on beds consisting of an earthen base supported on a mattress of canvas sacks filled with straw.
Earthen Domes and Habitats

Figs. 15a-i: Examples of grouping of domes in surveyed units.

a. Twin-dome unit in El Raheb
b. Multi-dome closed unit in Oum Aamoud Kebir
c. Multi-dome open unit in Joub Maadi
d. Multi-dome closed unit in Tayara
e. Multi-dome closed in Rasm Al Bugher
f. Multi-dome closed unit in Fajdana
g. Multi-dome closed unit in Rbaiaa
h. Multi-dome closed unit in Rasm Hamd
i. Multi-dome closed unit in Aamoud Seghir
model, i.e. the dome raised by overhanging bricks, is found in a wide variety of types and variations. It is to be noted that the typology of construction adopted is closely linked to the available resources and materials of the site, and the original model is adapted to cater for specific housing needs. From the variety of domes observed, we can identify certain recurring types, which differ from one another in formal aspects and constructional character (Fig. 16a–d). In the description of each type the formal-aesthetic characters and their relation to constructional aspects are highlighted.

Despite the dome’s imposing character on the shape of the building, independent of the architectural variants to be shown in this text, the layout of the cell unit is always square, which aids in grouping units together. The measurements may vary from one village to another, but uniform inside the

Terrace, ‘Mastaba’
The terrace is made of stones and earthen mortar, covered with a layer of earth and straw. It is sheltered from the wind and used for drying fruit and vegetables. On hot summer nights it becomes a sleeping place, when the outside temperature is cooler than the house as it releases the heat collected during the day.

Stables, ‘Hazera’ or ‘Qabu’
In the Bedouin culture livestock has always been a valuable asset, though cattle were more numerous in the past than today. A space was designated for cattle away from the main habitation, in a tent or inside a perimeter wall with a woollen cover. Over the years, with the reduction of herds, animal enclosures have moved into the courtyard of the house. The facilities are very rudimentary, consisting of a simple wall in stone and earth to prevent the sheep escaping. In some cases a specific building, a flat roof or dome, is reserved for the shelter of the livestock. Chickens and hens shelter in small cob domes located in the courtyard, and during the day they are allowed to roam free around the territory of the house.

Stores
Rooms used for storage of objects are numerous and varied, under domes of the same type used for housing, or smaller cob domes (qubbia). Sometimes even flat-roof buildings are used for this purpose. The domes, which are used to store straw (matban), possess a hole (af'a) at the top of the cover. The aperture allows easy access to the straw compartment, and is closed with earthen mortar when the space is filled. The openings in these environments are generally oriented towards west, essential for the ventilation of the enclosure and to reduce infestation by insects.

A classification of corbelled dome houses
The repertoire of dome structures, while based on a single constructional
same urban landscape, at least for the dwelling’s main spaces. Occasionally, there exist some circular modules of reduced dimensions for storage purposes covered by smaller domes. Other factors determine the section profile of the domes, usually common to all buildings of the same village, though this can vary from place to place.

Such factors are, for example, the availability of branches to truncate the dome’s peak with a flat roof, the availability of materials and the degree of exposure to rainwater splash of the facade, surface run-off water, human and animal damage or knocks, etc., which settle the height of the perimeter base or wall.

Variants
The different height of the perimeter wall may help to distinguish more clearly the two type of domes in the vernacular landscape of the domed villages of Syria: the so-called dome of the Sultan or Sultan dome, with a perimeter base that rises up to the height of the lintel of the door to become a real wall of the facade, and the simple dome with a very low base. Between the two, there are other variants according to the height of the perimeter base. In the interior, this difference is shown in the respective dimension and height of the pendentives that allow the transition between the square-shaped layout and the circular dome. The material and constructive differences are minimal, since they are all built with adobe walls and corbelled domes. The profiles of the domes allow us another classification, that would divide them into complete pointed domes and truncated domes, where the availability of wooden branches cuts short the construction of the dome into a flat roof. Normally, these truncated domes have a medium-high perimeter base, approximately two-thirds the height of the entrance.

Simple dome
Description
The dome rests on a stone perimeter base that rises a few centimetres from the ground.

Distribution area
Central Syria, Hama region.

Villages where identified
Cheikh Hilal; Maksa Shamlei; Sourj; Twall Dabaghein.

Geometric and dimensional features
The building has an ogival profile; the dome reaches almost to the ground without interruption. The base is square. The shell of the dome is entirely visible from the intrados or the extrados. The size of the plans of Sultan domes observed varies from 3.0-3.5 m by 3.0-3.5 m. The height is variable from 4.0 to 6.0 m.

Constructional features
Base: the dome is built on a stone perimeter base of between 30 and 60 cm in height.
Earthen Domes and Habitats

Fig. 20: Elevation, plan and section of the simple dome
Fig. 21: Axonometric view of a simple dome
Fig. 22: Simple domes in the abandoned village of Mekhar Shamrei
Coupling between the base and the dome: the dome in earthen bricks rests on the stone perimeter base. The base of the pendentive is built in stone and at a height of between 30 and 60 cm.

Texture walls of the dome: the dome is made of bricks arranged head to head, which begin to corbel from the 4th-5th course.

Aperture: the only opening is the front door, which allows the passage of light and air. Sometimes there are ventilation holes at the bottom of the dome. The door is positioned at the centre of the dome when the cell stands alone, and to one side at an angle in the case of two connected domes. The frames are made of adobe masonry, and in some cases stone. The lintels of the doors can be made of stone or wood.

Connecting arches: the height at the keystone of internal linking arches is limited. The presence of the arch is ascertainable from the outside of the building, from where the extrados of the arch may be perceived.

Variants
Variations to this type basically depend upon the height of the stone perimeter base and the type of stone used, which can lead to diversification from a formal point of view.

Comments
This is the original stock type, which most evokes the idea of the tent. Its diffusion is probably dependent on the difficulty of finding stones in the region to construct the base.

Sultan dome
Description
The building consists of a walled box, under a domed cover with an ogival-paraboloid profile.

Distribution area
Northern Syria, Aleppo region.

Villages where identified
Er Raheb; Feijdane; Mazraat al Rouhiieb; Oum Aamoud Kebir; Oum Aamoud Seghir; Rasm Hamd; Samad; Rbaiaa.

Geometric and dimensional features
The construction is composed of a square walled box, surmounted by a dome cover. From the exterior, the two elements of the box walls and the dome are clearly identifiable, however, from inside the transition from rectangular box to cover occurs seamlessly. The box has a square base on a plan varying in size from 3-4.50 m reaching a height of between 4 and 6 m.

Constructional details
Base: the wall is supported by a stone perimeter base of height between 30 and 80 cm. The availability of stone at the location influences the height of the base.

Walled box: made of adobe, generally with three heads thickness. The height may vary from 1.8 to 3 m, in all cases exceeding the height of the entrance door. While on the outside the wall has a rectilinear geometry, the internal wall begins to curve inwards from the level of the dome.

Coupling between the ring and the dome: the base of the pendentive can be made in brick, wood or stone at a height of between 1 m and 1.50 m. Very often this coincides with the height of the stone perimeter base. In cases
Fig. 25: Elevation, plan and section of the Sultan dome
Fig. 26: Axonometric view of a Sultan dome
Fig. 27: View of a row of Sultan domes in Feijanie
where the pendentive is made of brick, the progressive overhanging of the brick courses is less pronounced.

Texture walls of the dome: starting from the base of the pendentive, the interior of the base wall starts to progress from the square to the circle. When on a circular plan, the bricks are arranged in spirals, initiating the revolutions of the dome.

Openings: windows are sometimes present in addition to the entrance door, supported by a lintel and jambs of wood or stone, depending on the area. Square holes for ventilation of the interior space are often located at the base of the dome. The lintels of the doors are made of wood and brick or stone. Connecting arches: the internal connecting arch is of a considerable height (h = span 1.50-3.50 m) and, in more recent examples, is sometimes replaced by a wooden lintel.

Variants
The profile of the base wall may be straight or shaped. A shaped profile allows the disposal of rainwater from the dome, conveyed down gutters in the concave point of the profile. A straight profile was found in the most recent examples.

The height of the stone perimeter base is variable, depending on the amount of stone available on site.

Comments
This the most widespread type in the region to the southeast of Aleppo. It can be seen as a simple evolution of the dome, since the presence of a high wall allows for greater use of the interiors. The dome in this case is contained and protected in the lower part by the base wall that serves as structural support.

Domes set on low stone perimeter base, or transition dome

Description
The dome is supported by a stone perimeter base.

Distribution area
Region to the south of Aleppo.

Villages where identified
Rbaiaa; Er Raheb; Tayara; Nawara.

Geometric and dimensional features
The stone perimeter base of the building is of variable height, following the outline of the door and architrave, and upon this rests the adobe dome. From a formal point of view, this type is related to the real dome, while the construction and structural design is that of the Sultan dome. The roof dome is not enclosed by a wall, but its shell is visible from both the intrados and extrados.

Sizes of plan and height are restricted from 2.50-4 m.

Constructional features
Base: base wall in stone, height between 50 and 120 cm. The profile of the foundation follows the outline of the door. The stone perimeter base, in some cases, consists of two different materials: the stone exterior and adobe interior.

Coupling between the ring and the dome: the base of the pendentive is usually made of stone. The height of the pendentive corresponds to the height of the top of the stone perimeter base and varies between 50 and 120 cm.

Texture walls of the dome: as with the Sultan dome, this dome is made of
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Fig. 30: Elevation, plan and section of the transition dome
Fig. 31: Axonometric view of a transition dome
Fig. 32: View of transition domes in Rbasaa
Earthen Domes and Habitats

Bricks arranged head to head, starting to overhang from the 4th to 5th course.

Openings: the lintels of the openings can be made with stone or wood. In some cases reused elements can be observed (stones of Byzantine origin) in jambs and architraves.

Connecting arches: the height at the keystone of the internal connecting arch is limited to between 1.30 and 2.00 m.

Variants

The perimeter base is generally made of stone, basalt or limestone depending on the region, but sometimes the base wall can be found in adobe.

Comments

This type is generally found in areas where there is a greater abundance of stone.

Flat-roof domes

Description

The dome is not completed, rather the top is closed by a wooden structure covered with earth.

Distribution area

Region west of the Euphrates River.

Villages where identified

Joub Maadi, Rasm Al Bugher.

Geometric and dimensional features

The structure consists of a truncated cone closed by a flat wooden cover.

Constructional features

Base: stone base and adobe wall, of a height between 50 and 180 cm. Profile of the base follows the profile of the door.

Coupling between the ring and the dome: the base of the pendentive is usually made of stone, with some in brick. Starting height of the pendentive is variable.

Wall texture: as in the Sultan example, the dome is made of bricks arranged head to head, beginning to overhang from the 4th-5th course.

Openings: architraves openings in stone or wood

Connecting arches: internal connecting arches are variable in height depending on the base wall and the height of the dome.

Variants

The base wall may be low (as in the simple dome) or exceed the height of the door (as in the Sultan dome).

Comments

This type of construction has been observed in rare cases in the region south of Aleppo. This is a solution adopted in cases where parabolic or ogival domes have collapsed. In recent years it has been deemed preferable to repair domes with flat covers rather than carry out expensive, labour-intensive re-builds.

In the region east of the Euphrates River, this type is common, the main motive favouring the use of this technique lies in the presence of large quantities of wood in the area. It seems that the technique was imported from the region of Al-Jazirah (Alyundi, 1984) to the north of the country, in order to reduce the horizontal space to be covered, and to reduce the quality and
Fig. 35: Elevation, plan and section of the flat-roof dome
Fig. 36: Axonometric view of the flat-roof dome
Fig. 37: View of a row of flat-roof domes in Joub Maadi
Fig. 38: Elevation, plan and section of smaller domes in cob
Fig. 39: Axonometric view of a smaller dome in cob
quantity of wood used for the cover structure, thus avoiding rebuilding the very fragile upper part of the dome.

**Smaller domes in cob**

**Description**
Small domes in earth shaped by hand and stone.

**Distribution area**
Aleppo and Hama regions.

**Villages where identified**
Rbaiaa; Cheikh Hilal; Mazraat al Rouhi; Maksam Shamlei; Er Raheb; Oum Aamoud Kebir; Oum Aamoud Seghir; Rasm Hamd, Samad; Sourj; Tayara; Nawara; Twall Dabaghin.

**Geometric and dimensional features**
The plan is generally circular and the profile ogival. Height can vary from 0.50 to 2.0 m.

**Constructional features**

**Base**: when present, a small perimeter base is made of stone, never exceeding a height of 50 cm.

**Wall texture**: the structure is made of earth and straw, kneaded and applied by hand.

**Openings**: openings are rare in this type.

**Variants**
The structure of the dome can sometimes be achieved with rows of stone and an abundance of earth mortar.

**Comments**
This type of dome has only service uses (stock, silos and animal shelters).

**Bioclimatic aspects**
The Syrian dome, besides offering a means of habitation that is practical in areas of scarce natural resources, is able to meet the demands of hygrothermal welfare in a semi-arid climate due to cooling abilities achieved by the use of certain materials and the form of the construction.

Earthen material has a naturally elevated thermal inertia, resulting in dampening and a lag of changes in internal temperature compared to those of the outside. The earthen walls also regulate the humidity of the environment through vapour permeability, contributing further to the conditions of hygrothermal and respiratory comfort.

A dome has half its surface irradiated by the sun and the shape of an ogival dome determines that a position of incidence of solar irradiation is very low in the hottest hours of the day, so reducing the heating effects of the sun. The surface area of a dome is greater than that of a flat surface, so when exposed to strong sunlight the curved surface temperature is reduced compared to that of a flat cover. For the same reason, its capacity for heat dispersion at night is greater. The volume covered by a dome, being greater than that of a corresponding flat coverage, allows cooler air to collect at the top, consequently cooling the layers below. Compared to a flat cover, the dome alters the section of the air flow as it rises, therefore increasing speed. This increases the cooling capacity and creates a draw of air, where openings are present, allowing the extraction of natural hot air from inside the rooms. During the day the upper layers of air, further away from the soil, are generally cooler. For this reason there is a cooling of the exterior surface of the building at the dome, which does not occur in the flat coverage.

Since the dome is exposed to the most intense rays of the sun, there is always one shaded part and one in the sun, so producing a temperature difference between the two parts and a corresponding movement of air on the inside. The openings are designed to maintain the internal microclimate: the low ventilation holes allow constant natural ventilation and an exchange of air during the night. The dome shape permits the run off of rainwater and snow, frequent in this region, thus diminishing the risks of degradation in comparison to a flat cover.

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