

BELAKEHAL, A., TABET AOUL, K. and BENNADJI, A. 2001. Sunlight in the traditional dwellings of Algeria. In Ünver, R., Öztürk, L.D. and Yener, A.K. (eds.) *Proceedings of the 2001 International lighting congress, 12-14 September 2001, Istanbul, Turkey*. Istanbul: Turkish National Committee on Illumination (ATMK), volume 1, pages 118-125.

Sunlight in the traditional dwellings of Algeria.

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2001



SUNLIGHT IN THE TRADITIONAL DWELLINGS OF ALGERIA.

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SUMMARY

This paper aims to study the impact of sunlight and daylight on the dwelling's design in Algeria. The approach used for this purpose is the theory of structuration. In this work, the home is considered as the behavioural setting and five case studies are investigated from the coastal area of Algeria to its Sahara desert: traditional houses of Algiers, Kabylie, Constantine, Aures and Ghardaia.

The preliminary outcomes presented in this paper are part of a broader research including people's reactions and attitudes, of an Islamic culture, towards various daylighting and sunlighting strategies in different working and living spaces.

Key Words: Sunlight, Daylight, Structuration, Traditional, Dwellings, Orientation.

1. INTRODUCTION

Out off the physical factors acting upon the built environment, natural light seems to be the only one which the environmental relationship goes beyond energy concern (spiritual, cultural, aesthetic...). A case in point is the presentation of light and space to arouse mystic feelings in the ancient temples. Nowadays, designers try also to make the most of the qualities of natural (and /or artificial) light. This interest supports well the growing amount of research works investigating lighting quality in various types of buildings.

In such a way, this paper aims to study psychological (non-visual) aspects of sunlighting and daylighting with reference to the traditional dwellings in Algeria. This country is characterised by Mediterranean and Saharan regions with clear sunny sky most time of the year. This fact increases the importance of natural light, which become totally dependent of direct sunrays. It must be acknowledged that in such climatic region, solar control and sunlighting indoor spaces present a dilemma problem that each society thought about and resolves in its own way. This study examines, in particular, the relationship between sunlighting and house design through the application of the structuration theory.

2. STRUCTURATION AND SUNLIGHT

Structuration is a social theory of practice stating that social structures are social practices ordered across time and space. It brings out the mutual dependence of human actions and social structure [1]. According to Giddens, structural properties are "both medium and outcome of the practices they recursively organise [2]. It would be hardly an exaggeration to say that the way spatial relations are defined in the environment is a significant indicator of relations in society. Mills's investigation on the informal settlements is a good illustration of the application of the structuration theory at the urban environment level [3]. What we are mainly concerned with here is to examine it at the building level and particularly related to a physical control parameter: sunlight.

Norberg-Schulz attests that physical control parameters possess several structural properties, which could be considered as components and relations [4]. The components are energies (existing and desirable ones), where the relations are filters converting the existing energy to a desirable one.

While sun is the existing outside energy and sunlight (and daylight) is the inside desirable one, the filters (relations) could be of two kinds: spatial and behavioural. The former is concerned with the building layout and other architectural details, whilst the latter is dealing with functional and occupational aspects. Thus, both spatial and behavioural filters structure the building design in order to convert sunrays into a comfortable level of daylight.

Because of its intensity and its distribution creating clear and dark areas within space sunlight have structural properties [5]. In fact, sunlight acts upon the solar orientation of a building and its internal organisation. So, this influence encompasses the functional framework, which presents an acting structure.

3. ALGERIAN TRADITIONAL SOCIETIES AND SUNLIGHT

Geographically, the Algerian country could be divided, from north to south, into four main climatic zones [6]:

- 1) The Coastal Zone which has a typical Mediterranean climate with cool and rainy winters and hot and humid summers.
- 2) The Tell Atlas characterised by cool sunny winters and mild summers with cool nights and peak periods in July and August.
- 3) The High Plains and Saharan Atlas where the climate is continental with very cold sunny winters and hot days with cool nights during summer.
- 4) The Sahara desert is characterised by a hot and arid climate.

Within these various areas and across the different historical periods, several societies succeed one another. Nowadays, Muslim Arab and Berber mainly constitute Algerian society. Like everywhere else, Algerian traditional societies have to deal with orientation. This latter presents a cosmological working-out for explaining to them the universe and its mystery [7]. The sun can be distinguished among the senses of orientation (direction) by its use when planning cities and establishing buildings. The word orientation itself reminds orient which means eastern location related to sunrise.

At the architectural space level, giving a sense to a directional axis (vectorisation) -such as from north to south- implies a spatial structuration and a qualification of the resulting structured spaces. This qualification allows the classification of these spaces, their relations each together, their occupants and their use [7].

The reference to the sun as a direction for the traditional Algerian society could be explained by its powerful daily presence. Although the topographical differences between its various regions, 4/5 of them are all reached by intense solar radiation nearly all the year. In order to study the sunlighting structuration of the dwelling, five types of houses from each region were investigated.

4. THE HOUSE OF THE CASBAH, ALGIERS (COASTAL ZONE)

The site of the Casbah is an east-south-east side, which offers several advantages at both urban spaces and building levels. The Casbah's house is of two storeys with a central opened courtyard. This latter is surrounded by covered arcades. Narrow long rooms essentially occupy the peripheral parts of the house. Each room has a central wide door and two small windows on either side of this door. Windows are generally avoided on external wall [8].

From a spatial point in view, the courtyard is the principal source of sunlighting and daylighting

for the whole of the house. It structures the dwelling by its centre through the catching of sunlight and its diffusion inside the peripheral parts. In these latter, sunlight is going decreasingly from clear into darker and from the room entrance to the central bottom wall niche (K'bou).

The room facing courtyard elevation contains the means of its daylighting. A central wide door with two small windows on its either sides [8]. At the first floor level, a double row gallery can distinguish the south facing room (Figure 1). On the terrace, a room is built with big sized windows facing south with a wide view towards the blue sea.



Figure 1: A view towards the courtyard from the double row gallery south oriented (Source: [8]).

From a behavioural standpoint, the sunlit and shaded courtyard provides a female space favouring a pleasant social life during the most time of the year. Guest's reception takes place at the upper floor south facing room and its double row gallery where the sun is best received when needed (coldest season) and well cut out when it is denied (hottest season). The terrace room (Menzah) is used for domestic activities during the winter season to catch the sunlight which the courtyard can't occur [9].

The room's wide door and small windows are usually opened throughout the day to receive natural light from the courtyard. The clearest areas (such as the K'bou) are used for domestic activities and to converse in privacy while the darkest ones (on both sides of the K'bou) for sleeping.

5. THE HOUSE OF THE KABYLIE (TELL ATLAS)

The villages of Kabylie take up generally a crest or a hillside. The dwellings have rectangular shape of small size and are built in respect of technical (topography and orientation) and social (familial relations) factors. Also, they are established perpendicular to the contour lines. Inside, the house presents a bipartite division in both length and height respectively human zone / animal zone and animal zone / store zone [10].

The entrance door is the principal opening and is often east oriented in the middle axis in length. Because it is the only one source of light, this door is always opened during the hot season like the cold one. When reaching the inside, sunlight structures the home space diagonally in two clear and dark zones (Figure 2). Symbolic and functional aspects increase this division. The clear zone called the wall of light is intended to domestic activities whereas the dark one, the wall of darkness, is mainly for sleeping [11]. The weaving work serves to illustrate the values

of the wall of light because it is a source of prestige and a sign of fecundity and protection.

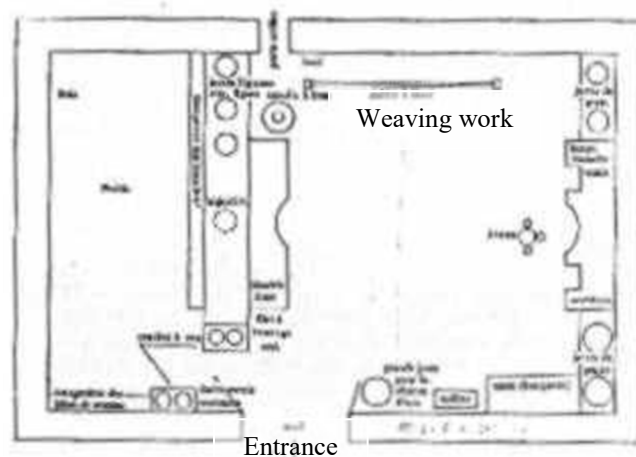


Figure 2: The house of Kabylie: the weaving work place is near the wall of light facing the entrance (Source [11]).

As a general rule, the house of Kabylie is characterised by an opposition between the luminous part which is noble and place of the human and cultural activities (weaving work and cooking) and the darkest one which is intended for natural activities (sleeping, sexual acts and delivery), animal space and store.

6. THE HOUSE OF THE MEDINA OF CONSTANTINE (HIGH PLAINS)

Constantine is located at 450-km south east of Algiers. The site of the Medina (the old city) is a south east oriented high rocky plateau bounded by a ravine and inclined from north to south. The house of the Medina is with an open courtyard and of two to four storeys high. Compared with the Casbah's house, it is often with pitched roof whilst the former one is flat [12].

Peripheral rooms giving on the central courtyard by means of galleries constitute it. The four principal rooms giving on the galleries have a central doorway with two windows on its either side's. Each room is divided in respect to two axis: firstly from the doorway to the central bottom wall niche (k'bou) and secondly between its extreme parts [13]. The external walls have few windows.

The house presents both central and symmetrical spatial structures (Figure 3). Centrality is reflected essentially by the courtyard and symmetry by room's elevation. The room layout also shows a centrality through its entrance space distinguished by particular roofing. The elevation of the rooms is symmetrically organised in accordance with its internal distribution and independently of the external surroundings (the courtyard).

Sunlight enters through the courtyard to be diffused decreasingly towards the peripheral spaces. The spatial structure of the room is also revealed by the luminous ambience. The entrance and the K'bou are more daylit than the extreme parts. Given the situation that the house does not include terraces, the courtyard is the principal outside/inside space providing a successful social interaction. The galleries present also the same functional characteristics but with more privacy because it constitutes an extension for the room.

The use of the house's spaces seems to be completely structured in accordance with the sunlight (and daylight) distribution. The best daylit spaces are used for the principal and noble domestic activities (i.e.: rooms) and the worst ones for the secondary functions (i.e.: store, stairs).

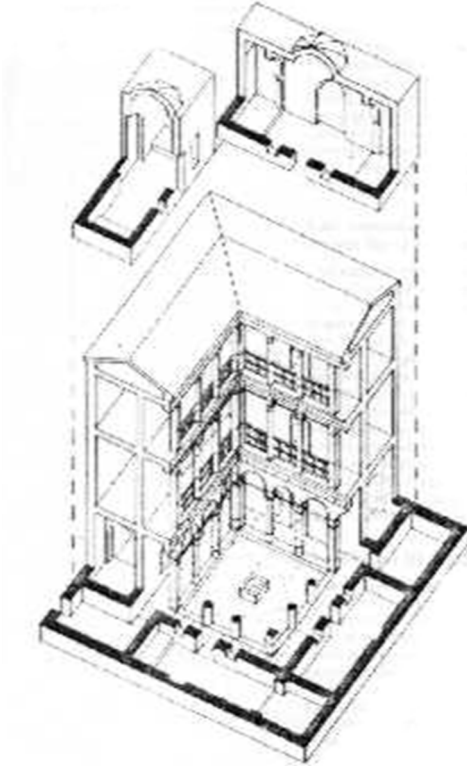


Figure 3: Central position of the courtyard and both central and symmetrical organisation of the rooms in the house of the Medina of Constantine (Source [13]).

The room itself is occupied in respect to the luminous conditions: the clearest zone (entrance and K'bou) is considered as noble and devoted for domestic activities (receiving) whilst the darkest ones (extreme parts) are relegated to a position of secondary importance (sleeping).

7. THE HOUSE OF THE AURES MOUNTAINS

The Aures villages, namely Dechra, offer the sublime image of clustered dwellings hanging on a hillside facing the valley and often south oriented. Houses are of rectangular forms with variable sizes. Their doors are opened to the east or by default to the south [14]. On the south side of the Aures Mountains where the climate is hot and arid, dwellings are generally with open courtyard [15]. This latter allows to daylight the surrounded rooms.

When they exist, windows on external walls are located at the upper floors and used for ventilation. The first floor spaces are widely opened on the courtyard, south oriented and providing fascinating views on the gardens of the valley (Figure 4). Rooms at the ground floor have windows of small sizes and giving on the courtyard. Hence, the doorway is the principal component allowing sunlight and daylight penetration inside them.

Sunlight acts strongly upon the course of domestic activities. Females use the courtyard for their daily work during summer season and to be protected against the intense sunrays, the courtyard could have a covered part.

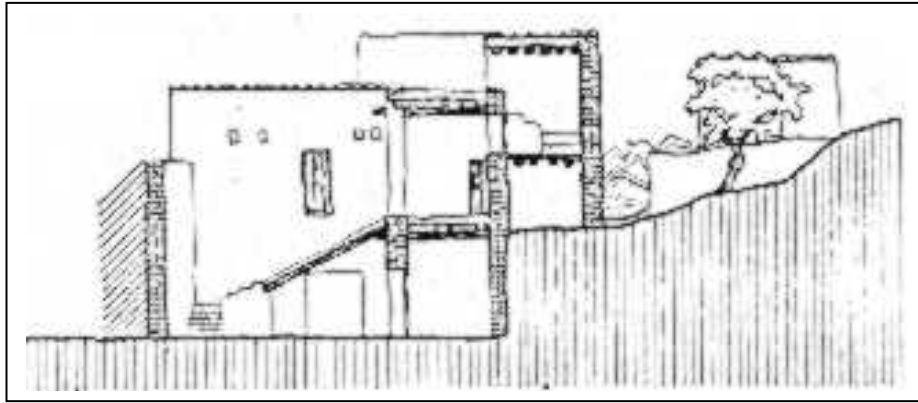


Figure 4: The house of the Aures Mountains is widely opened to the south for a good admission and control of sunlight penetration (Source [15]).

At the room level, the weaving work indicates the importance of sunlight in structuring the space. It is often located at the best daylight place, generally facing the doorway. The other parts of the room are darker and used essentially for storing and sleeping. A bed, constituted by masonry and branches and placed in one dark corner, reflects the sunlight structuration. At the first floor, the wide opened space (Askif) is well sunlit and often used during the coldest season for doing economic domestic activities (i.e.: drying dates).

8. THE HOUSE OF THE M'ZAB VALLEY (SAHARA)

The M'zab valley is situated about 600 Km south of Algiers, in the northern part of the Sahara desert. The cities are generally located on a hill facing south-east.

The house is of two storeys with a central covered courtyard [16]. An opening located at the centre of the courtyard ceiling allows penetrating sunlight inside (Figure 5). The different spaces surrounding the courtyard are indirectly daylight. Thus, the courtyard structures the dwelling in matters of centrality and axiality (vertical and south-east).

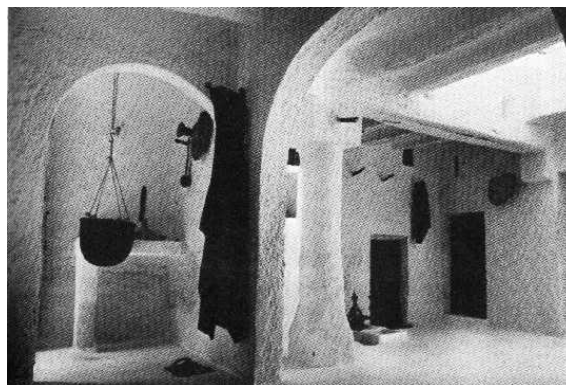


Figure 5: A view inside the house of the M'zab revealing sunlight penetration and diffusion inside the various parts of the house (The courtyard on the right) (Source [16]).

The south or south-east oriented room is widely opened towards the covered courtyard at the ground floor level.

The other places of the dwelling, such as the bent entrance or the various oriented rooms are characterised by a darkest luminous environment. At the first floor, south oriented covered arcades called Ikomar surround an opened courtyard.

The behavioural examination shows that the use of both covered and opened to sky courtyards is structured in respect to the presence of sunray [17]. While the former is used for the hottest season (by covering the aperture during the daytime and opening it at nighttime) the latter is for the coldest one. Inside the best daylight room widely opened towards the courtyard are received female guests or the weaving work are done.

The Ikomar, at the first floor, is very useful throughout the winter season when sunrays are softer than summer's ones.

9. CONCLUSION

Traditional dwellings reveal the importance given to the qualitative aspects of sunlighting. This paper highlights the sunlight's structuration of the dwelling. The studied case studies are traditional houses catching sunlight at their centres through a courtyard spatial configuration. But due to the climatic difference of their locations one is opened whilst the second is covered. Each of them includes several spaces of various levels of both spatial and behavioural structuration of the dwelling spaces.

Rather than the cultural specifics, this sunlighting structuration reveals that space is perceived, in accordance with sunlight penetration and diffusion, both vertical and centralised, as Bachelard asserts [18].

It would be impossible to exaggerate the importance of the courtyard for the related to sunlight spatial and social structuration of the home. Also, it should be stressed that particular places with south or south-east orientation are often structuring from a behavioural point of view.

Finally, the idea of recovering the impact of sunlight on the dwelling structuration could go beyond the objective of exploring daylight appreciation's to either the rehabilitation process of old buildings and the whole design of contemporary dwellings.

7. REFERENCES

1. Harris G. B.; Taylor S. S. 1998, "Organizational Structuration: Interaction and Interrelation", Proceedings of 14th Colloquium, 9-10/07/1998, Maastricht.
2. Giddens A. 1984, *The Constitution of Society: Outline of the Theory of Structuration*, Polity Press, Cambridge.
3. Mills G. 1992, "The Spatial Structuration of Ideology in Informal Settlements. A case Study in Southern Africa", *Building and Environment*, Vol. 27, N° 01, pp.13-21.
4. Norberg-Schulz C. 1979, *Système Logique de l'Architecture*, Ed. Mardaga, Bruxelles.
5. Serra R. 1998, "Daylighting", *Architecture. Comfort and Energy*, Ed. Gallo C., Sala M., Sayigh A.M.M., Elsevier, Oxford.
6. Fardeheb F. 1988, "Country Monograph: Algeria", Proceedings of PLEA'88, Porto.
7. Paul-Levy F.; Segaud M. 1983, *Anthropologie de l'Espace*, Ed. centre Georges Pompidou, C. C. I., Paris.
8. Ravéreau A. 1989, *La Casbah d'Alger, et le Site Créa la Ville*. Ed. Sindbad, Paris.
9. Belakehal A.; Tabet Aoul K.; Bennadji A. 2001, "Sunlight and Inhabitant's Affection Feelings Towards Homes in the Hot Arid Regions", Proceedings of LUXEUROPA 2001,

- 18-20/06/01, Reykjavik.
10. Basagana R. ; Sayad A. 1973, Habitat Traditionnel et Structures Familiales en Kabylie, Mémoires du Centre de Recherches Anthropologiques Préhistoriques et Ethnographiques XXIII, Alger.
 11. Bourdieu P. 1980, Le Sens Pratique, Ed. Minuit, Paris.
 12. Yahiaoui F. 1987, Application of Traditional Climatic Sensitive Building Design Techniques to Modern Housing Programmes in the Constantine Region of Algeria, Master thesis, Mackintosh School of Architecture, University of Glasgow, June.
 13. Noweir S. 1987, "La Maison Constantinoise", Les Cahiers de la Recherche Architecturale, N° 20 / 21, 3ème et 4 ème trimestre, pp.60-61.
 14. Riché R. 1959, "La Maison de l'Aures", Cahiers des Arts et Techniques d'Afrique du Nord, pp.30-36.
 15. Amrane B.; Belakehal A. 1991, Restructuration du Quartier de Blida à M'chounech, Mémoire de Fin d'Etudes, Institut d'Architecture, Centre Universitaire de Biskra.
 16. Ravéreau A. 1981, le M'zab Une Leçon d'Architecture. Ed. Sindbad, Paris.
 17. Bousquet C. 1983, Mutations Urbaines en Algérie. Le Cas de Beni Isguen au M'zab, Thèse de Doctorat 3ème cycle, Université F. Rabelais, Tours.
 18. Bachelard G. 1964, La Poétique de l'Espace, Paris.

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