An Archaeology of Light in Classical Islam. Studying an Immaterial Phenomenon in Medieval Mosques

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ABSTRACT

Light is a universal theme. Scholars have discussed its theosophical points, but it has rarely been addressed archeologically. Can light, though immaterial and evanescent, be understood and thus become an archeological object? Different sources – photometrical, archeological, and textual – point to the possibilities of exploiting light, either directly – through objects that transform or redirect it – or indirectly – through references that mention it, and occasionally exalt its signification. Mosques represent a pertinent subject for an archeology of light because they take light into account in its three dimensions: as a vector of perception, spatial organizer, and significant symbol.

Because it has its source in the sky, natural light is often a symbol that embodies the divine (Masson 1985). Playing on the eye, it can help transform the visit of a place into a religious, ecstatic, and unique experience (Weightman 1996). In religious buildings, the light-work creates a special space that affirms the sanctity of the place, in contrast to profane space, which bathes in natural light, raw and uniformly distributed. Natural light provides an opportunity to redirect, reduce or amplify the space, to cut-off the place itself by clearly separating the public space, to symbolize another intangible space, which maintains a special affinity with the divine and sacred sphere.[2] This is why religious buildings lend themselves well to an archaeology of light.

In Muslim religious architecture, light-work is the subject of special attention, related to the duties of the mosque: indeed, a mosque is not only a place to celebrate God, but also a living and socializing place. Therefore, the architectural light-work aims to provide some visual comfort, as in any secular building. In a mosque, natural light is worked and manipulated, both to magnify the relationship to God, but also for its functional virtues (Bonnéric *in press*). Mosques are thus an object of study particularly relevant to the formation of an archaeology of light, since they are probably the only Islamic buildings to consider light in three dimensions: light as an instrument for perception, for organizing space and as a significant symbol.

The theme of light has been discussed in the past from a theosophical standpoint, as a symbol of the divine, but rarely as an archaeological fact. Nevertheless, thanks to the combination of different sources, light can become a perfectly usable object. It is

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now possible to conduct a global archaeology of light, studying natural and artificial light. This paper aims to examine the main sources – architectural, archaeological and textual – available for such a study.

I. Architecture: natural light and the function of the building

The importance of light in architecture seems obvious since it is difficult for architects to ignore light, a ubiquitous and pervasive phenomenon.[3] Architects have used various means to create atmospheres from light. Stained-glass windows and window panels, arches and domes promote light penetration and transformation. Further elements contribute to modulate or enhance the quality of the atmosphere created from light, such as ponds, mosaics and ceramic tiles. All these elements combine to make light an 'immaterial architecture' (Soulard 2007), which can be superimposed onto the material architecture of buildings.

However, because of its complex nature, natural light is a phenomenon inherently unstable and difficult to quantify. As such, it has long been studied from a subjective point of view, only on the basis of the 'impressions' of observers. Yet, through photometry in particular, it is now possible to objectively measure this phenomenon, quantify certain properties, compare them and predict their influence on visual perception (Fontoynont 1999; Reveyron 1999, 2007, 2010). Photometry has the advantage of providing a quantified measure of the illumination of a building, that is to say the percentage of external light diffused inside the building and perceived by the occupant.[4] We present here an example of photometric analysis, based on two mosques in the city of Buṣrā in Syria.[5]

The mosque of Fāṭima is a small rectangular mosque, measuring 11 m by 21 m (Fig. 1). There were three successive phases of construction, two of which interest us in particular: the construction of a square mosque in the Ayyubid period and the expansion of the mosque to the south in the twentieth century (Meinecke and Aalund

2 For example, light-work has been studied in Pharaonic temples (Zignani 2008; Zignani and Aubourg 2000), in Greek or Roman temples (Heilmeyer and Hoepfner 1990), or in churches (Reveyron 1999, 2006, 2007; Stiegemann 2001).

3 Famous architects frequently testify to this importance of light in architecture (e.g. Le Corbusier 1924; Kahn 1996)

4 Some disadvantages must be mentioned: the mosque and its close environment have been progressively modified over time, modern equipment may have been added, and light diffusion can be obstructed by several objects in the mosque during measurement. For all these reasons, photometric measures need to be carefully analyzed and interpreted. Nevertheless, photometry is one of the most powerful tools to quantify daylight in buildings.

5 These conclusions are preliminary and need to be confirmed by a larger study. This study is being conducted by the author in a PhD dissertation entitled 'Light and Mosque in Medieval Egypt and Syria, from Arabic Conquests to the Mamluk Dynasty: Lighting and Symbolism' (EPHE-Sorbonne University, under the supervision of Pr. Jean-Michel Mouton). Other classical mosques from Bilād al-Šām and Egypt, which did not belong to the modern period, have been studied in this work. The analyses are still in progress.

2005; Dentzer-Feydy *et al. 2007*). The Mosque of ’Umar is the Friday Mosque in the town of Buṣrā (Fig. 2). Its main construction phases are Umayyad, Seljuk, and Ayyubid (Creswell 1969; Meinecke and Aalund 2005; Dentzer-Feydy *et al.* 2007). Measurements were collected and analyzed according to a protocol previously established (Fontoynont 1999). The measurements were quantified using a light meter.[6] The measuring surface is regular (regular intervals), accurate (measuring grid sufficiently dense) and realistic (removing obstructions to light, such as columns). The measurements are in Daylight Factor (DF), which is the ratio between indoor and outdoor illumination and that allows for comparisons with measures independent of time of day, season or even latitude.

This synthesis paper presents the main findings of this study.[7] The Mosques of Fāṭima and ‘Umar are structurally quite different in terms of light. First, it is important to emphasize the differences in terms of luminance sources: the windows are the main sources of luminance at the Mosque of Fāṭima, while the courtyard is the main factor of light at the Mosque of ‘Umar. It is particularly interesting to notice that the most sacred space of the mosque, the *miḥrab* area, is treated differently (Fig. 3): while in the small mosque, the contrast between the *miḥrab* and its surroundings is very pronounced, in the Friday Mosque, however, the *miḥrab* does not differ particularly from the rest of the prayer hall. The architecture of the *qibla* wall is still the same in both cases: the *miḥrab* area is lit by side windows that frame the sacred niche. Since the *miḥrab* is not surmounted by a window, the south span of the mosque is brighter at its ends than at its center, where the *miḥrab* is located. The area in front of it remains the darkest. However, at the Mosque of ‘Umar, the consequences of this development are disrupted by the existence of a central courtyard, which illuminates the prayer room evenly. As we have already pointed out, windows have little influence on the total irradiance of the building.

These differences raise questions about the relationship that the illumination of a building has with its function: the Friday Mosque – the Mosque of Umar – is a congregational mosque, for pronouncing prayers, but is also a public place to study, read or debate. These side functions require high visual comfort and the light is enhanced accordingly. However the small mosque – of Fāṭima – generally does not fulfill special public services, except that of oratory. Although the mosque plays a significant social role, the emphasis is primarily placed on individual faith: the followers go to the Mosque of Fāṭima to pray and commune with God, without interferences from other secondary activities. This closeness to God seems to demand a particular light environment that semi-darkness procures naturally. However, when the prayer is collective, as is the case in the Grand Mosque, meditation no longer dominates and darkness gives way to areas of intermediate illumination.

6 A light meter is an illumination measuring device, equipped with a photocell for converting radiation energy into electrical energy. A filter then presents the values measured on a response curve similar to that of the standard human eye, so that reading is not done from electrical current. Finally, the cell surface is also coated with a diffusing filter, acting as correction of incidence.

7 For a more detailed analysis, see Bonnéric *in press*.

The different approaches to the lighting surrounding the *miḥrab* seem also to represent a notable fact. In the Mosque of ʻUmar, the *miḥrab* seems commonplace since it is not marked by any significant change of illumination (about 1% DF difference between the center of the prayer hall and its ends), while the contrast is particularly marked in the Mosque of Fāṭima (about 3% DF). This again might be associated with the different functions performed by these two mosques. In the Friday Mosque, prayer is collective: the followers pray together, lined up facing the *qibla* wall, and this alignment symbolizes equality. The area of the *miḥrab* is therefore not subjected to any particular light so as not to illuminate some of the followers over others. The illumination of the Mosque of ʻUmar, as a whole, is relatively homogeneous in this respect – except for the courtyard of course.

The photometric sources show that light may help to highlight, within the mosque, separate modules. The illumination of these modules may depend on the relationship to faith (communion among the followers or meditation). Our study comparing Syrian and Egyptian mosques, together with other studies of daylight, could also allow one to draw up different lighting scenarios to prove or refute the existence of constants between mosques, according to their function, dating or doctrine.

II. Archaeology: artificial light and luminaries

Luminaries contribute primarily to overcome the lack of natural light, or act as a substitute when the illumination is too low to allow certain activities that require high visual comfort, but may also serve to highlight some locations. While natural light conveyed by the architecture is distributed freely and is rather difficult to control after construction of the building, light produced by artificial lighting relates more to a deliberate control of the illumination. The diffusion of luminaries, circular and controlled, is distinct from the transverse diffusion of the flow of natural light and therefore promotes the private sphere, intimacy, and contemplation.

The current knowledge of Islamic luminaries is not sufficient for current light archaeology in mosques. The largest gap is that the lights have never been studied in terms of their function, only as dating elements (mainly ceramic lamps),[8] or as works of art (glass or metal luminaries).[9] These typo-chronological and stylistic approaches towards lamps, while necessary, are insufficient and must be taken further by a detailed functional study.

Generally, the luminaries' shape significantly influences their function. They have three main functions: they are used as additional light for a particular activity, they aim to improve the general light quality of the building, or even contribute to increasing the amount of light within the building.

8 See for example: Hadad 2002; Kehrberg 1989; Kubiak 1970 or Day 1942.

9 See for example, concerning glass: Goldstein 2005; Kröger 1995, and metal: Ward 1993; Baer 1983; Allan 1989; Rice 1955.

Candles and lamps with beaks, even placed halfway up on candlesticks or lampstands, are not intended to illuminate an entire room, but to circumscribe a small space. They can provide light for activities that require a certain visual comfort, such as reading. This is probably what candlesticks and stands are used for, to fit the lamp or the candle high enough for a seated man. The beak provides a peripheral flame, thereby lessening the disadvantage of the lamps' shadow. The protrusion of the beak also serves to direct the ray of light more easily and thus concentrate the light on the area of interest.

Contrary to lamps with beaks, lamps without do not have this quality of spot illumination. The wick emerges from the very center of the oil tank, that is to say the center of the lamp: this forces the light to travel a greater distance, resulting in a decrease in the illumination. Lamps without beaks are probably used to further improve qualitatively the overall brightness of a room or to highlight certain areas. Similarly, metal lanterns probably only have a decorative function: their efficiency does indeed seem quite limited since little light escapes the small perforations of their casings.

Chandeliers, however, can increase the amount of light inside a building specifically because they are equipped with multiple glass lamps. Indeed, like in globular glass lamp (so-called mosque lamps) the transparency of the glass cancels shadows and suspension eliminates obstacles to the downward path of light. Destined to be hung from the ceiling, chandeliers and glass lamps provide light on a larger scale – often the entire room.

Finally, it appears that each luminary has its own lighting features, which depend on the type of combustible used and the way the object is conceived, as well as on the shape of the lamp, its basis, and construction. Luminaries allow one to generate a wide range of different lighting atmospheres, promoting contemplation or studying, or emphasizing the sacred during important religious celebrations. These reasons justify a typo-functional study of luminaries.

This kind of study can also be backed by experimental archaeology (Wunderlich 2006), using innovative tools such as photometry as described in the introduction: one can test the effectiveness of luminaries according to many parameters – material, size, shape, wick and oil. The results of such studies could help provide valuable insight into the surface illuminated by a luminary, its efficiency, and into the productivity and type of fuel. Such measurements would more generally help distinguish the efficiency of different types of luminaries.

Since the type of luminary has an impact on the intensity and distribution of light, their location within the building is essential. To address the question of their strategic positioning, one would require a comprehensive and well defined corpus, associated with a rigorously conducted dig. Practical constraints may, however, hamper the realization of this type of study: because of the question addressed and performance issues, archaeological excavations often, and rightfully so, do not concentrate on this kind of analysis. Furthermore, few sites provide undisturbed furnishings. Accurate mapping of the place of discovery of the luminaries would, however, provide crucial information to determine light topographies.

Ultimately, all these elements – shape, material, function, illumination capacity and location – are essential in the way they reveal different management of space and time, especially in religious buildings.

III. Written testimonies: usual management of illumination and symbolic meaning

Written sources provide various data: purely informative on the technical management of illumination, but also sociological on how light and lighting in mosques were seen at the time. To begin with, written testimonies help us complete the illumination pattern of mosques found using photometry and archaeology. The difficulty here lies in the scattering of all this information. Details found in written testimonies can refer to shape, type of combustible, suspension method, location, illumination schedules or even exceptional circumstances for illumination, etc.[10] Written sources also allow us to reflect on how the illumination of buildings was seen and reconsider different choices of illumination. Of course, some photometric or archaeological constants may represent the will of architects to answer cultural imperatives. Only written testimonies however can help prove that the work of light was intentional, and that the occupants of the buildings were aware of the use they were making of light. In this paper, we can only consider some examples.

In his *Riḥla*, Ibn Ǧubayr explains the extraordinary work done in the Great Mosque of Damascus (Ibn Ǧubayr: 268). If the author did not express the exact feelings the beauty of the place inspired in him, it is still interesting to note the visitor's awareness regarding the role light plays: he admires the light-work, and particularly the light colored by the stained glasses of the mosque.

However, light is not only a matter of construction or architecture, light is also significant. A Koranic Verse, the 'Verse of Light' (*aya al-nūr*) assimilates God to Light.[11] This verse summarizes the Koranic message: Allah is light, He appears to the world and mankind as light, and He enlightened Men by sending them the Prophet Muḥammad.[12]

The following two examples show that the symbolism of light, reflecting the presence of the divine, may be reflected in the perception of the visitor. Luminaries and light help establish communion with God. When Al-I'fahānī describes the work done on the *ṣaḥra* in 1187, that is to say taking down Christian elements that had been imposed, he quotes the famous Koranic Verse of Light. When lamps are suspended on the

10 See Bonnéric 2012a, which reports data about oil for lamps.

11 'Allah is the Light of the heavens and the earth. The Parable of His Light is as if there were a Niche and within it a Lamp: the Lamp enclosed in Glass: the glass as it were a brilliant star: Lit from a blessed Tree, an Olive, neither of the east nor of the west, whose oil is well-nigh luminous, though fire scarce touched it: Light upon Light! Allah doth guide whom He will to His Light: Allah doth set forth Parables for men: and Allah doth know all things' (*al-Qur'ān*: 24:35).

12 For an analysis of exegesis regarding the Verse of Light, see Zine 2009; for a short synthesis about this point and the symbolism of light inside mosques, see Bonnéric 2012b.

sacred rock, the chronicler, witness to the actions, affirms that 'the lamps scattered above it (the *ṣaḥra*) light upon light (*nūr 'alā nūr*)' (al-I'fahānī: 65). The *ṣaḥra* – the sacred rock – is understood as a light. This way suspending lights above the *ṣaḥra* is adding a light onto another light. This reference shows the echo the symbolism of the verse has on the Muslim world.

The traveller Ibn Ǧubayr described the celebration of a religious festival in Mecca in 1183. The sacred place is decorated with many luminaries (*šumu'*, *mašā'il* and *maṣābīḥ*). During this description, he notices that in the sanctuary, in addition to the light of the moon, 'the lights [*anwār*] lead towards He who is himself light' (Ibn Ǧubayr: 141).This observation suggests that light can lead to more mystical thoughts, or at least to religious inspirations. As a faithful believer, the famous traveler feels literally transported towards God.

This reference accounts for the impact of the symbolism of this verse on the Muslim world. Written testimonies suggest that a symbolic understanding of the work of light is not unjustified. The symbol of light represents a living symbol in Islam during the Middle Age, not only in intellectual spheres (e.g., exegetes, philosophers, mystics…), but also in the Muslim's daily life.

Several kinds of texts are essential to support an archaeology of light in mosques: not only theosophical texts, but also historical and geographical texts (which provide useful descriptions of lighting devices or religious celebrations with luminaries), medical, botanical or agronomical treaties (which give information about the combustible used) or judicial and literary sources (which provide information about daily use of luminaries). These sources may help us to better understand how luminaries work, when they are used, and how they are distributed within the building.

Conclusion

Finally, Arab-Muslim societies' interest in light arises during the Middle Ages through an abundance of shapes and materials (architecture and luminaries), but also references or symbols (theosophical or literary references). As said previously, in mosques, light not only illuminates and gives order to the mosque, but it also symbolizes hidden meanings or spaces that cannot be perceived by the naked eye. As such, light becomes a structural element of the mosque and the religious Muslim life.

The various sources available to researchers (architectural, photometric, archaeological, textual and iconographic) combine to enable historians and archaeologists to sketch different portraits of illumination atmospheres. Light, although immaterial, can become a useable archaeological fact. The combination of different approaches – archaeological, historical and anthropological – then contributes to the creation of a global archaeology of light. Such an approach should help our understanding of the relationship of Men to light, its environment and the sacred space.

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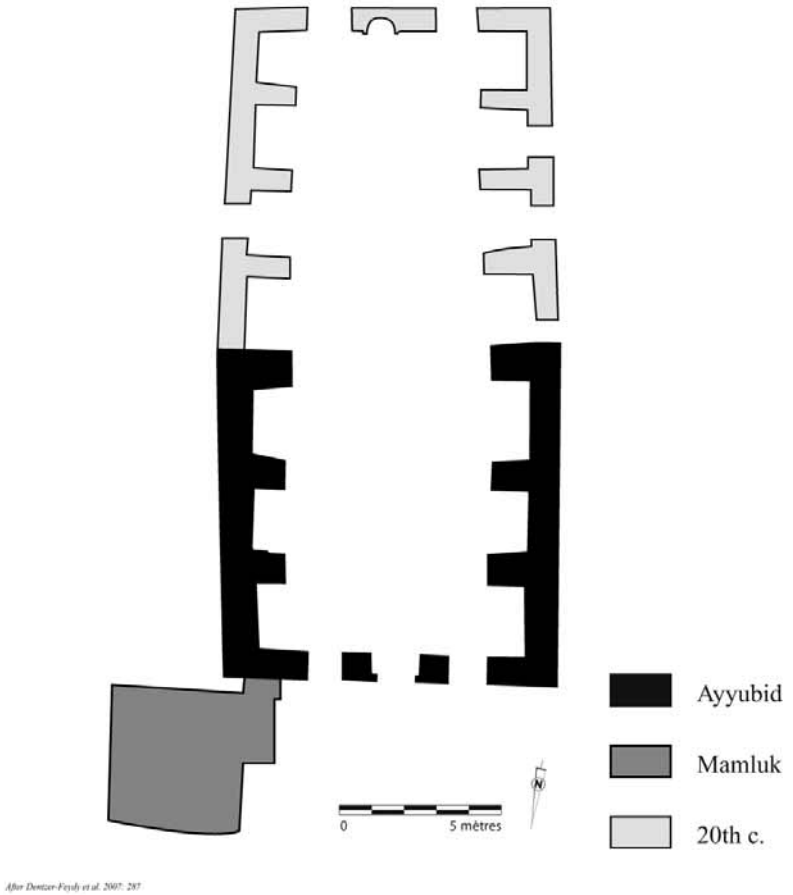

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Fig.1: Construction phases of the Mosque of Fāṭima, Buṣrā.

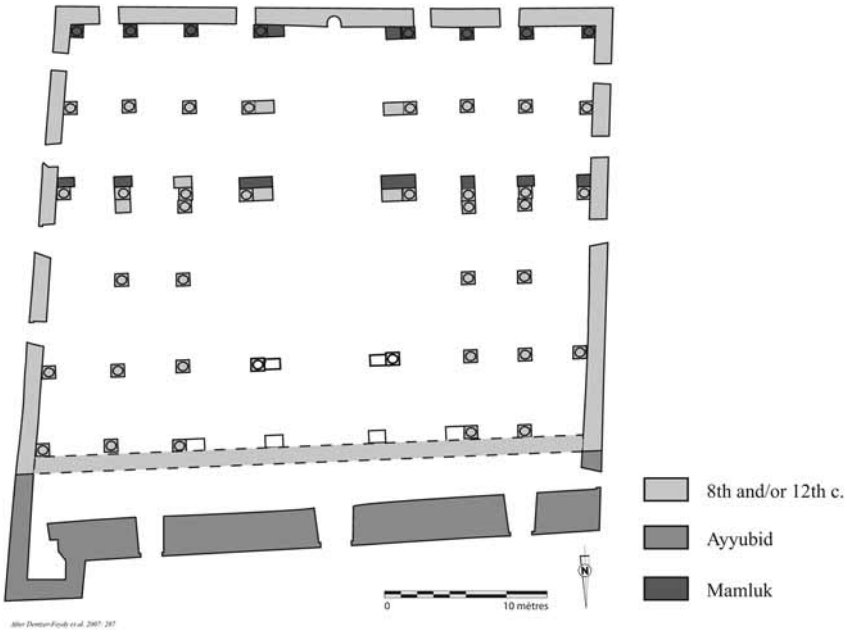

Fig.2: Construction phases of the Mosque of ’Umar, Buṣrā.

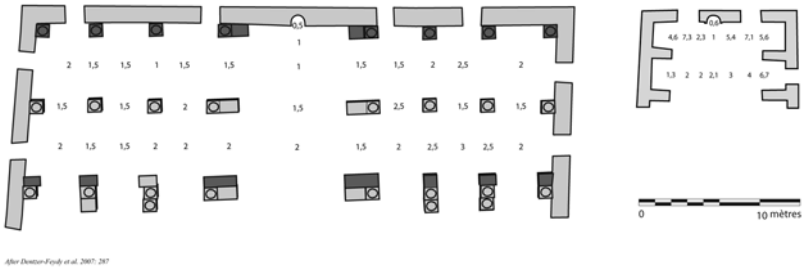

Fig. 3: Daylight factors (%) in the qibla area, Mosques of ’Umar and Fāṭima, Buṣrā.