

**Book Illumination and Architectural decoration:  
The Mausoleum of Uljaytu in Sultaniyya**

by

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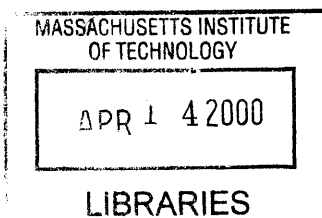
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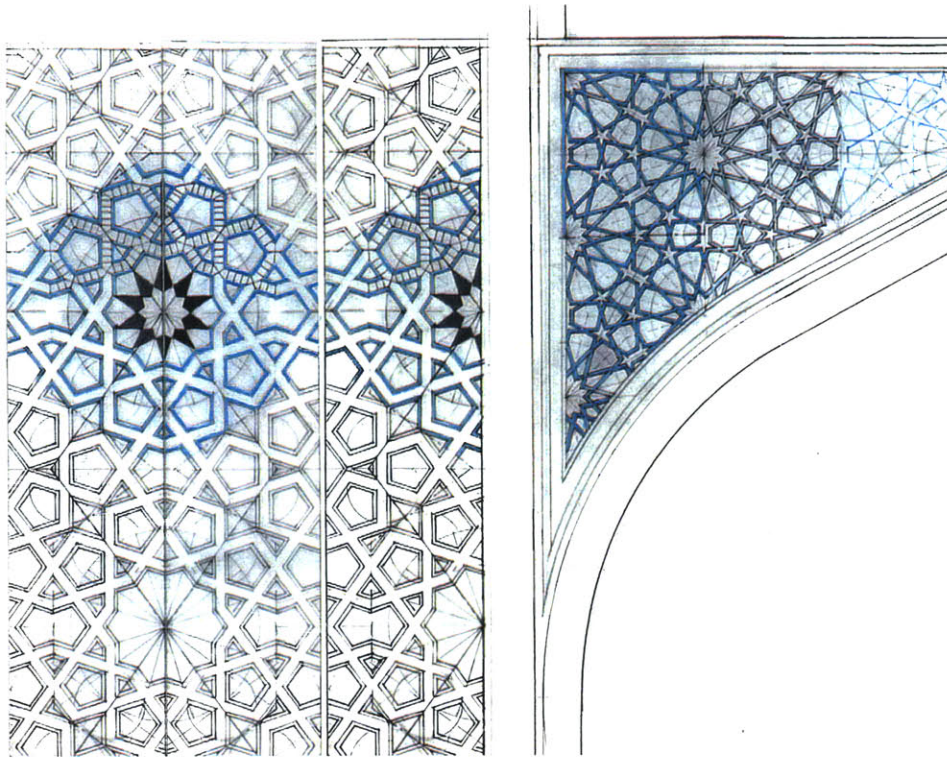




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Architecture

**ABSTRACT**

This thesis examines the conventions of two-dimensional articulation in architecture and its relationship to book illumination in early fourteenth century Iran. By examining the illuminations in a series of imperial Qurans copied in the first quarter of the fourteenth-century and comparing them to the architectural decoration of contemporaneous buildings in Ilkhanid Iran, the thesis proposes that it is the rigor of geometric elaboration in two-dimensional planes that make such a comparison across media plausible. The taste for increasingly complex two-dimensional geometric extrapolations and the creation of layered surfaces, such as those exhibited in the decorative designs of the Mausoleum of Uljaytu in Sultaniyya, Iran, ultimately engender a perception of architecture that alludes visually to an rendition of two dimensional space that is common to both painting and architecture.

Thesis Supervisor: Nasser Rabbat,  
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## 1. Introductory statement:

This thesis examines the conventions of two-dimensional articulation in architecture and its relationship to book illumination in early fourteenth century Iran. The decorative designs in the mausoleum of Sultan Uljaytu built in Sultaniyya between the years 1304 and 1316 and its parallels in contemporaneous book illuminations are the focus of this discussion. The building that has been referred to as, “a compendium of native materials of construction and architectural decoration in Iran,” is an amalgamation of decorative designs culled from various sources and transformed visually by a consistent use of two-dimensional geometry. It is no coincidence that a similar process of image making is deployed in the illuminated pages of Qurans executed by artists trained in Baghdad and working from the metropolitan centers in Iran, Iraq and Egypt in the first quarter of the fourteenth century.<sup>1</sup>

I will in my thesis look at the extent and nature of the visual correspondence between architectural decoration and book illumination that have been observed by various authors in discussing certain aspects of this particular building and also other works of architecture and illuminated manuscripts produced in Iran over the next two hundred years.<sup>2</sup> I shall briefly summarize the observations of the authors writing about the Mausoleum of Uljaytu as they pertain more directly to this discussion.

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<sup>1</sup> Eleanor Sims, “The Internal Decoration of the Mausoleum of Oljeitu Khudabanda: A Preliminary Re-Examination,” *Soltaniye III, Quaderni del Seminario di Iranistica* 9 (1982): 89-123; 93

<sup>2</sup> For a discussion of this subject on the Mausoleum of Oljaytu see, Sheila Blair “The Epigraphic program of the tomb of Uljaytu at Sultaniyya: Meaning in Mongol Architecture”, *Islamic Art* 2, (1987): 43-96; 66. Sims, “The Internal Decoration,” 106. Arthur U. Pope & Phyllis Ackerman (eds). *A Survey of Persian Art*, vol. 3 of 16 (3<sup>rd</sup> ed. Sourush Press: Tehran, 1977. 1<sup>st</sup> ed. London 1938-1939); p.1344. Donald Wilber, *The Architecture of Islamic Iran: The Il Khanid Period*, (Princeton: Princeton University Press, 1955): pls. 82-83.

1. In the *Survey of Persian Art* first published in 1938, Arthur Upham Pope in his discussion of Ornament points to the similarity of the patterns executed in the vaults of the upper galleries at Sultaniyya and the illuminations of the thirty-part Quran executed under the patronage of Uljaytu.<sup>3</sup>
2. This concept is reiterated by Sheila Blair in a far more detailed study of the mausoleum forty years later with a cautious suggestion that perhaps the plaster decoration in the vaults of the upper gallery were actually designed by the illuminators working on the Qurans which were meant to be dedicated to the mausoleum of Sultan Uljaytu.<sup>4</sup> Another account, presented in a symposium on Sultaniyya in Venice by Eleanor G. Sims focuses on the unusual quality of the painted, low relief, ogival forms from the second decorative phase of the mausoleum and speculates on how these forms may have been inspired by the rosettes common to Quranic illumination.<sup>5</sup> I list the interpretations of Blair and Sims together since their study was conducted as a collaboration and though they both address separate issues, a common thread can be discerned in their discussion of the decoration as “inspired” by illumination.

These studies cited above go no further than to point out the appearance of certain motifs such as the medallions (*shamsas*) in architectural decoration as an emulation of the more recognizable imagery of the illuminations within the painted manuscripts. All three

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For discussion on a later manifestations of a similar theme in the architecture in the Yazd see, Renata Holod, *The Monuments of Yazd, 1300-1450: Architecture, Patronage, and Setting*, Ph.D. diss., Harvard University, (1972).

For influence of the architecture at Yazd on the illuminations of manuscripts in the early fifteenth century, see Priscilla Soucek, “The Manuscripts of Iskander Sultan: Structure and Content.” In *Timurid Art and Culture: Iran and Central Asia in the Fifteenth Century*, eds. Lisa Golembek and Maria Subtelny, Supplement to *Muqarnas*, 6.(1992): 116-131; 117.

<sup>3</sup> A.U. Pope, “Architectural Ornament: Some Fourteenth century Ensembles,” *Survey of Persian Art*, vol.3; p.1344.

<sup>4</sup> Blair, “Epigraphic Program,” p.66.

<sup>5</sup> Sims, “Internal Decoration,” p.106.

authors concur that the architectural decoration is either inspired by the illuminations or alternately, that the correspondences between the two media are the outcome of calligraphers actually supervising the design within the Mausoleum of Uljaytu. Both these explanations subscribe to the idea that the arts of the calligraphy and by extension illumination being of prime importance in an Islamic society and that architectural decoration would follow suit. A series of imperial Qurans illuminated in the early fourteenth-century use an angular formal geometry (fig. 7) that may well be influenced by the visual criteria of decoration common to pre-Ikhanid architecture in Iran. My thesis will argue that influence does not necessarily flow in one direction i.e. from the illuminations to the architecture. Rather, the adaptation of geometric stellar patterns with floral articulation is a synchronous development in the painted pages of the Qurans and the architecture in the early part of the fourteenth century. I will argue that this geometric mode of abstraction and the manner in which it is applied two dimensionally allows for the reciprocity of exchange between the mediums of architectural decoration and book illumination.

**Methodological framework:**

The interior surfaces of Sultan Uljaytu's mausoleum, clad in a rich variety of materials-- stucco, brick, terracotta and glazed tile-- described a novel expression of monumentality in funerary architecture from early fourteenth century Iran. Since, the two hundred odd decorative designs are yet to be fully catalogued and recorded, the interpretation offered here limits itself to an analysis of a few of the more easily accessible schemes and traces their appearance in past examples of Iranian architecture and then their successive

transformations in a series of buildings built in Iran during the late thirteenth and early fourteenth centuries.

I will begin my discussion of the building by describing the context in which the building was conceived. The formal analysis of the mausoleum will be woven into a larger social context. By not directly attempting to answer questions of symbolism and meaning posed by the decoration within architecture and illumination, I will concentrate in my analysis of 'style' on the manner in which things are made, described as a field of forces that overlap rather than effectively explain one another.<sup>6</sup> A summary of the political and social currents as regards the spheres of activity of patrons and artisans that may have had a direct impact on this building will be presented both to clarify the boundaries of various disciplines and the processes of commissioning artistic production in Ilkhanid Iran. The copying and borrowings by artisans across media in my hypothesis is mitigated in a fluctuating milieu where the quest for novelty and conformity are dialectically poised.

A detailed description of the structure of the building and arguments presented by various authors on the polarity of "structure" to "decoration" will layout some of the inherent problems of the early modernist readings that have contributed to a distorted perception of decoration in the discourse of Ilkhanid Architecture.<sup>7</sup> I will argue that while the structure is engineered with great ingenuity within the Mausoleum of Uljaytu, the use of decorative shells in layers that often conceal structure represents a manipulation of the

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<sup>6</sup> See, Svetlana Alpers, "Style is What You Make It: The Visual Arts Once Again," *The Concept of Style* ed. Berel Lang, (1979): 137-162. My reading of style follows upon the view presented in this article of the social status of style- one that is synchronized in a particular moment and its "meaning" as reflected in the manner of making within the social context.

<sup>7</sup> Pope, *Survey of Art*, vol.3. Essays written by various authors within this survey analyze decoration using the criteria of aesthetics formulated by a rhetoric that sees 'ornament' in opposition to 'structure'. It is this

visible volume in a way that is often mis-read. The manner in which the structure is masked to create a more concentrated reading of the decoration is fully intended as per my analysis of the aesthetic parameters of a planar mode of design.

My own approach to the question of decoration within the Mausoleum of Uljaytu will be to trace, through the re-iteration of general theories of geometry in Islamic Ornament, their more specific application in Iranian architecture and subsequent reinterpretation in the Ilkhanid context.<sup>8</sup> In this sequence of proceeding from a more general 'theory' to a more specific 'use' of certain decorative themes- both the illuminated Qurans and the mausoleum of Uljaytu will represent a point of departure - a kind of repository of the concepts and techniques that came to dominate the discursive practices of art and architecture of the next century in Iran. While my method shares on the outset a kind of evolutionist dilemma that is an inherent problem of many early studies on Iranian architecture, it is not an attempt to write a comprehensive history of decorative techniques. Rather, the aim in presenting certain formal types as precedents for the imperial mausoleum of Uljaytu is to underscore the idea of novelty within a medieval tradition of inventing that is more concerned with authenticating works by perfecting the art of copying.<sup>9</sup> The shift in architectural decoration of the imperial mausoleum is mitigated not so much by the discovery of new materials (for example

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polemical stance that I refer to as the "modernist" standpoint. I will later expound on the precise parameters of this view and its relevance to the mausoleum of Uljaytu.

<sup>8</sup> For the predilection of geometry in Islamic decoration see, Oleg Grabar, "The Intermediary of Geometry," *The Mediation of Ornament*. Bollingen Series 35, 38. (Princeton: Princeton University Press, 1992): 119-154. For a historical interpretation on the dissemination of geometry in the medieval Islamic world see Gulru Necipoglu, "Part 3, The Geographical, Chronological and Semantic Horizons of the Geometric Mode," *The Topkapi Scroll- Geometry and Ornament in Islamic Architecture*, (Santa Monica: The Getty Center for the History of Art and the Humanities, 1995): 91-126.

<sup>9</sup> I often present the decoration within the mausoleum of Uljaytu as being novel despite being tied in to certain traditions that can be traced back by more than four hundred years. The novelty is really the process of transforming an inherited repertoire by the acquired skills of the individual. See, Richard Shiff,

colored tile) but rather through the conception of designs in another medium- that of illumination.

### **3. The building and illuminations in context:**

The village of Sultaniyya is located three hundred miles south east of Tabriz in the eastern part of modern day Iran. In 1304 Sultan Uljaytu ascended the Ilkhanid throne and issued a decree that designated Sultaniyya to be his new imperial capital. It has been deduced that construction on Uljaytu's mausoleum coincided with this decision and was accordingly initiated in the year 1304. The date 1314 marks the conclusion of a first phase of construction as per the epigraphic dedication on the northern bay in the interior of the building.<sup>10</sup> Soon after this date, the first scheme of decoration in the interior was completely plastered over and a second scheme, more subdued in its use of materials, but just as elaborate as the first one was begun. The interior of the monument in its current condition displays both the revetments from the first and second phases of decoration. The top layer was removed purposely in some areas to expose the decoration underneath, in other areas the plaster has simply fallen away due to disintegration over time.<sup>11</sup>

The monument in question was completed at a moment when the power and prestige of the Ilkhans and that of Sultan Uljaytu was in a very tenuous state. The imperial grandeur of the first decorative scheme with its richly encrusted tile and stucco wall surfaces was

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"Mastercopy." *Iris*, Vol. 2, (1983): 113-147, for an interpretive essay on the notion of originality given the high level of skill acquired by 'master' artists that relies on perfecting the art of copying.

<sup>10</sup> See Blair, "Epigraphic Program." Blair has catalogued most of the inscriptions in the monument and in this paper and offered an account of the chronology of the building that I will adhere to in this thesis.

<sup>11</sup> Sims, "The Iconography of the Internal Decoration in the mausoleum of Uljaytu at Sultaniyya", *Content and Context of Visual Arts in Islamic World: Papers from a Colloquium in Memory of Richard Ettinghausen*, (1980): 139-155; 141.

Sims summarizes the visible layers of Phase 1 and phase 2 decorations.



replaced in the last two years of Uljaytu's life (1314-1316) by a much more subdued but in effect more didactic scheme. This second scheme, comprising of both Quranic quotations and also hadith is interpreted by Sheila Blair as an assertion by Uljaytu, through "religious propaganda" of his political dominance in the Islamic world. In Blair's discussion the meaning of the monument is derived by interpreting the epigraphic program in terms of the historical events during the reign of Uljaytu particularly his desire to vanquish his formidable adversary the Mamluk Sultan. According to Blair, the verses selected from the Quran to embellish Uljaytu's tomb chamber revolve around themes of victory and world conquest and are construed as being part of this struggle for legitimacy on the part of the Ilkhanid Sultan in the Islamic realms.<sup>12</sup>

While I agree with Blair that the rather radical decision to re-decorate the imperial tomb hints at a contentious moment in the history of the Mongol dominance, her explanation fails to resolve why such a different 'style' of decoration was employed in the second phase. The most distinguishing feature of the second scheme is that it abandons the angular geometry common to both the architectural decoration of the first scheme and the illuminations from the imperial Qurans of the Mamluks and the Ilkhanids for the more cursive imagery of painted calligraphy and subtly applied stucco in relief. Thus both the first and second schemes borrow from the vocabulary of the Quran in different ways. It is not so much a question of "the word replacing the image" but rather one kind of image replacing another.<sup>13</sup> Why the second painted scheme, with its use of

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Blair, "Epigraphic Program," 73-76. Blair, provides her own particular interpretation of the meaning of the monument based on this change in the decorative scheme.

<sup>12</sup> Blair, *Ibid.*

<sup>13</sup> Words in quotation marks are from Blair, "Epigraphic Program," 75. For a study of Quranic inscriptions on a series of buildings in the Islamic world see, Erica Cruikshank Dodd and Shereen Khairallah, *The Image and the Word: A Study of Quranic Verses in Islamic Architecture*, 2 vols., (Beirut: American Univ. of Beirut).

cursive calligraphy is deemed more appropriate for the Sultan's tomb is not relevant to this discussion. However, since the two schemes display such different visual criteria, I will in my discussion of the similarity between the illuminations and architectural revetments focus on the earlier decorative phase within the mausoleum.

The extant remains of Uljaytu's tomb consist of the main octagonal tomb chamber covered by a dome and an adjoining rectangular oratory to its south side that can be entered through an opening in the south bay (fig.1 for orientation). At present, these two chambers stand isolated from the surrounding fabric of present day Sultaniyya. At its inception, however, the mausoleum was both physically and programmatically a part of a larger complex of structures that included places of prayer, residence and theological study. The lower surfaces of the exterior brick walls display fragments of structures that once abutted the building - some of which were directly connected to the interior of the main dome chamber. Although visitors presently enter the building from the south western bay, the treatment of the north facade in stucco relief (fig.3 a & fig.3b), and the east (fig.4a & 4b.) and west (fig.5a & fig.5b) facades in ceramic tile suggests that these cardinally oriented planes were the exposed, visible exterior faces of the eight sided building at ground level. While the tomb chamber forms a perfect octagon in the interior, the exterior walls at the lower level appear completely uneven and asymmetrical. In referring to the eight bays on the interior of the building, I will follow the numbering system devised by Sims and Blair (fig.1 and fig.2). Bay 1 is in the northwestern corner and 2, 3, 4 etc. follow in an anti-clockwise direction. Thus the 'main' axis bays, i.e. those that correspond to the 'visible facades' are even numbered; bay 2 is west, bay 4 is south,

bay 6 is east and bay 8 north (fig.1). The vertical planes that constitute a bay are similarly numbered from 1 to 8 as they recede away from the central space (fig 2).

On the exterior, the octagonal shape of the building can be discerned higher up at the level of the drum of the dome where a continuous eight sided gallery wraps around the exterior. (see elevations: fig.3 to fig.5) The dome itself and the eight minarets surrounding it were at the time of its construction sheathed in blue ceramic tile. There appears to be a blue tile frame around the gallery openings and the remains of a two tiered muqarnas cornice running as a kind of canopy above the gallery. The rest of the exteriors, except for the three cardinaly oriented portals appear to have been unadorned.

The octagonally planned building, with its use of brick and tile geometric revetments is often compared to earlier tomb towers and mausoleums in northern Iran.<sup>14</sup> Many elements of design and construction do in fact corroborate this conclusion. The basic scheme of a domed octagonal tomb chamber, the muqarnas cornice, and the use of strap-work on the walls at the Gunbad-i Kabud (1196-97) bears an obvious resemblance to Uljaytu's mausoleum (fig.6). What distinguishes Uljaytu's mausoleum from these earlier prototypes is its monumental scale and siting within an urban environment. This factor of being part of an urban setting points to a very different set of intentions that mitigated its program. The mausoleum of Uljaytu is part of the practice of its own times where the building of an ensemble of religious and charitable buildings around the tomb

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<sup>14</sup> See Pope, *A Survey of Persian Art*, 1339. Also, Donald Wilber, "The Development of Mosaic Faience in Islamic Architecture in Iran." *Ars Islamica* 6,(1939):16-47; 40.

Both authors compare the mausoleum of Uljaytu to other mausoleums in Maragha, and also tomb towers in Kharraqan and Nakhichevan. Wilber's analysis of the tile work will be discussed in some detail later on in my interpretation.

Blair, "Epigraphic program". Writes of the resemblance of Uljaytu's mausoleum to other tombs formally and functionally, "Thus, formally, Uljaytu's enormous octagonal tomb at Sultaniyya is the culmination of an Iranian imperial tradition of polygonal tombs with side galleries, while functionally, it stands in an Islamic tradition of holy sites venerated through circumambulation." p.74.

of a revered leader, in this case the Sultan himself, was commissioned by both the sovereign and the officials of the Ilkhanid bureaucracy. An endowment deed for a similar but no longer extant tomb complex, built by Uljaytu's vizier, Rashid al-Din, in nearby Tabriz includes a description of the activities that were to be supported over a period of time.<sup>15</sup> The deed shows that the patronage did not end with the construction of the architectural ensemble and stipulates along with the details of the upkeep of the buildings- the reading and copying of Qurans, and other precious manuscripts within the institution. So, although the record of an imperial 'workshop' is one that dates to a much later Timurid period the gathering of calligraphers and illuminators to work in teams on manuscripts, allowed for the synthesis of a common design vocabulary informed by a wide variety of stylistic influences.<sup>16</sup>

The book arts gained unprecedented importance under the patronage of the Mongol rulers of Iran- the Ilkhans whose dominions in the middle of the thirteenth century extended over vast tracts of land stretching from Khurasan in the east to Anatolia in the west. The phenomenon of book patronage, particularly the commissioning of decorated Qurans, was second only to the vast amount of energy expended by the ruling class in the building of monumental tombs with attendant pious foundations for themselves and for renowned and powerful religious leaders residing within their domains.<sup>17</sup> The buildings and the books are thus linked in the first instance by the imperial and religious aspirations of the patrons. The political agenda of the seventh

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<sup>15</sup> See Sheila Blair, "Ilkhanid Architecture and Society: An Analysis of the Endowment Deed of the Rab i Rashidi," *Iran*, vol.22, (1984): 67-90.

<sup>16</sup> For a comprehensive analysis of a later imperial workshop tradition in Iran see, Thomas W. Lentz and Glen D. Lowry, "The Kitabkhana and the Dissemination of the Timurid Vision," Chapter 3, *Timur and the Princely vision: Persian art and Culture in the Fifteenth Century*, (Los angeles and Washington, D.C.: Los Angeles County Museum of Art and Arthur M. Sackler Gallery, Smithsonian Institution, 1989): 159-236.

Sultan of the Ilkhans in building this magnificent monument has been discussed in considerable detail by other authors.<sup>18</sup> I have merely summarized the historical dimensions of this project as they pertain to my thesis.

The common ground between the building and the manuscripts commissioned by the sovereigns can be understood through the existence of a common milieu in which the practice of the arts of the books and that of architecture came to crystallize a new visual idiom. The great resources at the disposal of the court elite and the demand for skillful specialization allowed for the production of great books in the Ilkhanid domains and also the execution huge architectural edifices in a relatively short period of time.<sup>19</sup> The records from inscriptions indicate that bookmakers- the calligraphers and illuminators, were often involved in designing and executing certain portions of architectural decorative schemes during this time. The practice of the artisans signing their names and claiming responsibility for certain aspects of the work show the kind of prestige that was accorded to the artisans.<sup>20</sup> Unfortunately, the recorded epigraphy at Uljaytu's tomb, has so far not yielded any evidence of the names of the artisans involved. Through an extrapolation of "common practices" it is reasonable to imagine that calligraphers were involved in the design of some of the more complex epigraphic panels.

It has been suggested that three sets of Qurans commissioned by Sultan Uljaytu and executed in Baghdad, Mosul and Hamadan, around the same time as the start of

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<sup>17</sup> See Sheila Blair, "Patterns of Patronage and Production in Ilkhanid Iran. The Case of Rashid al-Din," *Court of the Ilkhans 1290- 1340*, (1996): 39-62.

<sup>18</sup> See Blair, "Epigraphic Program," 73-76.

<sup>19</sup> See Blair, "Patterns of Patronage".

<sup>20</sup> Donald Wilber, "The Role of the Craftsman," *Architecture of Iran*: 45-47. Wilber lists the names of various artisans that appear in inscriptions in his 1955 catalogue of Ilkhanid architecture and their various roles. For a more recent analysis of the calligraphers involved in architectural inscriptions and also tilework see Sheila Blair, "The People," *The Ilkhanid Shrine Complex at Natanz, Iran*, (Cambridge, MA: Center for

construction of the tomb (the first decade of the fourteenth century) were intended to be a part of the endowment to Uljaytu's funerary complex.<sup>21</sup> The large size paper used to copy these thirty-part Qurans and the elaborate decorative repertoire of illumination make these books monumental, in keeping with the grandeur of the buildings they were meant to enrich. In the Quran made for Uljaytu in Hamadan the use of a bold angular frame generated from a central star shape encloses the more delicate, gold and blue curving vegetal patterns (fig.7). The complementary relationship of the geometric framework and the vegetal insertion exhibited in these illuminations of the Qurans is very similar to the strap-work patterns on the interior surfaces of the mausoleum of Uljaytu executed in tile and stucco (fig.8). This specific interpretation of the reconciliation of a vegetal pattern with an overtly geometric structure reoccurs in the illuminations of several other Qurans illuminated in the fourteenth-century as well as strap-work patterns in other Ilkhanid ensembles.

The use of a bold geometry to order and compose had a long history in the non-mimetic decorative traditions in many parts of the Islamic world. In her discussion on the genesis of a ubiquity of geometric designs in the Islamic world, Gulru Necipoglu traces its appeal to the Abbasid caliphate in tenth-century Baghdad. Rationalist investigations in the arts and sciences patronized by the Abbasid rulers were paralleled by the taste for geometry in architecture. A visual codification of simple shapes in architecture and proportions of calligraphy deduced through geometry had thus occurred in Iran several before the Mongol conquest. The elaboration of geometric patterning by the Ilkhans in

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Middle Eastern Studies, Harvard University, 1986): 5-15. Also, see Sheila Blair, "Notes: A medieval Persian Builder," *JSAH* 14, (December 1986): 389-395.

<sup>21</sup> See Blair, "Patterns of Patronage," 50-51, for issues of patronage of the thirty part Qurans.

the thirteenth and fourteenth-centuries appropriates an aesthetic vocabulary that symbolized the prestige of the central capital of the Islamic world in the past. As recent converts to the Islamic faith, the zeal of the Ilkhanid sovereigns is manifest in their bid to outdo both their predecessors and contemporaries. The projection of a universal mode of visual production in different media was not just a matter of 'inspiration' but would have been a common denominator of comprehension in the fourteenth-century Muslim world.<sup>22</sup>

The Mongols in their reformulation of the 'Islamic orthodoxy' implicit in the geometric mode, add elements of their own cultural tradition. The incorporation of floral and vegetal patterns inserted into the geometric grids is an outcome of the extended contact of Iraq/Iran with China. The circular spiraling ivy backgrounds commonly recognized as the 'Arabesque' were introduced into the vocabulary of illumination by way of these Mongol/Chinese influences in Iran.<sup>23</sup> However, whereas these motifs of chinoiserie are common in a wide range of crafts, the tightly woven patterning in angular frames such as in the strap-work with carved stucco inserts in Uljaytu's mausoleum is an adaptation within Ilkhanid architectural decoration (fig.8, fig.31).

The use of the arabesque along with a cursive calligraphy more in keeping with the fluidity of brushwork or ink on paper is employed more sparingly in architecture. The

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For illustrations of Quran illuminations see David James, *Qurans of the Mamluks*, (New York: Thames and Hudson, 1988) and Martin Lings, *The Quranic Art of Calligraphy and Illumination*, (London: World of Islam Festival Trust, 1976). See in particular, James' commentary on the Baghdad Quran of Uljaytu p. 93.

<sup>22</sup> See Necipoglu, "Chapter 6. Geometric Patterning Before the Mongols," *The Topkapi Scroll*, 91-109. Yasser Tabbaa, "The transformation of Arabic Writing: Part1, Quranic Calligraphy," *Ars Orientalis*, Vol.24 (1991): 119- 148. ----- "The transformation of Arabic Writing: Part 2, The Public Text", *Ars Orientalis*, Vol. 21 (1991), p.141. Both authors interpret the use of geometry in the tenth- eleventh architecture as having a co-relation to the transformation and of the Quranic script by the Abbasids.

<sup>23</sup> Jessica Rawson, *Chinese Ornament. The Lotus and the Dragon*, (London: The British Museum, 1984). Rawson expands upon the infiltration of Chinese motifs and techniques in a wide range of Persian Art. The impact of these influences in architecture has not to my knowledge been studied any great depth.

stucco *Mihrab* of Uljaytu at the Masjid-i Jami (1310) at Isfahan shows the dexterity with which such a layered carving of script on a vegetal background with large scrolls would have to be executed simultaneously by the sculptor working back and forth between the background and foreground (fig.24). The medium of the plaster would have to be worked in a semi- wet condition and through a quick method of drawing onto, inscribing, and finally carving. The rigor of expert draftsmanship, with its reliance on the line is directly translated onto the surface of the stucco *Mihrab*. This work is signed by Haydar, a calligrapher of considerable renown mentioned by Qadi Ahmad in his sixteenth century account of painters and calligraphers as one of the six students trained by Yaqut al-Mustasimi in Baghdad.<sup>24</sup>

The campaigns of the Ilkhans into Anatolia and Iraq in the mid-thirteenth century brought a lot of the craftsmen and artisans directly into the employ of the Ilkhans. The ravages of war and the active employment of artisans in building the new centers of Tabriz and Cairo caused the migration of artisans from the fallen Caliphal capital of Baghdad. Thus, with the Mongol sack of Baghdad in 1258, the “symbiotic relationship between a center possessing legitimacy but lacking power and a periphery lacking legitimacy but wielding real power” had come to a close.<sup>25</sup> In the absence of this symbolic center of the Islamic world a new order was forged by the Mongols and

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<sup>24</sup> Qadi Ahmad b. Mir- Munshi al Husayni, Trans. By V. Minorsky, *Calligraphers and Painters: A Treatise by Qadi Ahmad, Son of Mir- Munshi, c. A.H. 1015/A.D.1606*, (Washington: Freer Gallery of Art, 1959). The six students of Yaqut al-Mustasimi are discussed as such by Qadi Ahmad in his biographical account of calligraphers. There is some ambiguity who these alleged ‘six’ actually were, but in the ensuing discussion of the illumination of Qurans a lot of the calligraphers/ illuminators (sometimes the same person but not necessarily) in the employ of the Mamluks and Ilkhanids in the early part of the fourteenth century were trained in Baghdad and possibly came into contact with Yaqut al Mutasimi who was the most influential calligrapher in the employ of the last Caliph of Baghdad. With the execution of the last Caliph, he came to be employed by the Ilkhanids- still working from Baghdad. On the subject of the migration of calligraphers and illuminators see James, *Qurans of the Mamluks*.

<sup>25</sup> Tabbaa, “The transformation of Arabic Writing: part 2,” p.140.



Mamluks alike. The commissioning of Imperial Qurans executed by scribes and illuminators trained in the Baghdad courts seemed to be an appropriate expression of imperial ambitions of the two contenders in the Islamic world. Hence, in the first generation of artistic patronage, the Qurans decorated in Cairo appear to share a common aesthetic premise with the contemporary Qurans made in Tabriz or Hamadan. However, the literal translation of architectural elements into the illumination of these Qurans and then the siphoning back of the more elaborate schemes back to architecture, seems to be a specifically Ilkhanid feature.

#### **4. Structure of the building:**

The tomb chamber has a regular octagonal profile on the interior and is surrounded by eight bays that recess through the depth of the seven-meter thick masonry piers all the way towards the outside (Fig.1). Each bay is framed by a pointed arch (fig.2, surface 3) approximately two and a half meters deep, that, in essence transfers the weight of the drum and the dome to the corners of the octagon. Each of the eight bays is reminiscent of an iwan or portal bordered by an inscription in a slightly concave rectilinear frame, arranged side by side with a double beaded edge in brick. Beyond these tall masonry arcades the eight bays recess further towards the outer wall (fig.2, surface 7 & surface 8), to create two vaulted spaces-- one on the lower floor, raised a few feet above the main octagonal hall, and another one on the second floor, that faces inwards as eight balconies overlooking the central space. Barrel vaults span the lower zones, whereas pointed barrel vaults and alternate with muqarnas vaults in the balconies. The

upper galleries can be accessed by spiral stairs and are connected to one another by a continuous passageway.

The transition from the octagonal base shaft to circular plan profile of the dome is constructed without pendentives and the shallow plaster shell squinches are used to mask the condition of the dome sitting on a wide brick octagonal ledge. The thrust of the immense dome is further transferred to the eight corners of the octagon by pointed brick arches that are concealed behind the squinch transition (fig.9). Facing the exterior, forming a third accessible level that corresponds in level to the interior drum in elevation, is another upper, exterior, gallery constructed as eight split arch barrel vaults that are covered to form a three cross vaults, per bay, in plaster.

The dome, as illustrated in the axonometric drawing by Marcella Giutini (fig.9), is constructed as a series of linked arches that act like ribs to stiffen the horizontally coursed brick rings that are filled in between the arches. A second shell dome that spans the arched brick ribs and creates a smooth surface which receives the finished tile surface. The weight of the entire structure is thus very carefully transferred to the eight corners, which perform like wedge shaped buttresses.

To simplify this account, the rudimentary structure consists of: a) the dome on a brick ledge, that bears down upon eight arches in the transition dome that direct the outward thrust of the dome to the eight corners which act as wedge buttresses; b) the arched bays further reinforce the squinch arches and transfer the downward thrust and outward load once more to the wedge piers; c) The deeply recessed interior of the eight bays are insertions of eight three storied units into the space between the piers. In this simple breakdown of the mausoleum of Uljaytu the element, a) is the canopy, b) is the

load bearing 'structure' and c) is a kind of in-fill. There are very few openings to the outside even though there are ample possibilities of puncturing the shell given the elaborate set of arches that transfer the load. Most of the openings appear in odd places and their uneven profiles suggest that they were probable inserted retrospectively.

Arthur Upham Pope comments on this apparent lack of interest in structure and by extension spatial articulation on the part of the 'Persian Architect' for in his words "openings where structure would have permitted it are in Persia, closed by tympana and curtain walls."<sup>26</sup> Pope is not referring to any specific building but rather to the structure of the iwan. The mausoleum of Uljaytu, in its proliferation of the iwan type in all eight bays, creates such an impression of being sealed but it is difficult understand why such a closure to the outside would present, "space as solid, not space as infinite."<sup>27</sup> Before trying to solve this somewhat vague notion of space, let me fortify it with another more specific observation by the same author on structure in Ilkhanid Architecture.

Pope observes a shift in interest in the fourteenth century ensembles by comparing them to those from the preceding Seljuk period. According to Pope the shift in the Ilkhanid architecture is from *structure* to *decoration*. This is not to imply that Seljuk architecture was lacking in decoration but rather that the decoration of this earlier period is more 'tectonic' at first and then becomes in successive stages more and more divorced from structure. For example, the ribs and armatures of the vaulting from the Seljuk period at the Masjid-i Jami at Isfahan always display the underlying structural principle whereas those from the fourteenth-century onwards are seen by him as being almost wholly

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<sup>26</sup> Pope, *Survey of Persian Art*, p.1045.

<sup>27</sup> Ibid. Continuation of quote from same discussion as noted above.

decorative.<sup>28</sup> This polarization of structure to space on the one hand and to decoration on the other is deeply embedded in the twentieth century discourse of Ilkhanid Architecture.

Perhaps in an attempt to revise the earlier reading offered by Pope, in her book on the Ilkhanid Complex at Natanz, Sheila Blair begins the discussion on a chapter entitled 'Vaulting and Decoration' by locating a conceptual break in the fourteenth-century building tradition:

"By the Ilkhanid period architects' interest had shifted from *structure* to *space*, and more attention was directed to methods of covering space, especially rectangular areas. A continuous tunnel or barrel vault is, of course, the easiest way to cover a rectangle, but its inherent problem is that its long unbroken walls create monotonous and dark interior spaces, yet its sides cannot be pierced above the springing without endangering its stability."<sup>29</sup>

Blair uses the word "space" to describe a more expanded volume as implied by her discussion that follows this initial statement on the transverse vaulting in the tomb chamber of Abd al-Samad at Natanz. Infact, the construction of the full muqarnas stucco dome such as the one in Natanz is the only surviving example of this occurrence in Ilkhanid architecture from this time. As argued by Blair herself, the choice of this special Baghdad import was motivated more by a desire to emulate a well-established religious model rather than create a more volumetric space.<sup>30</sup> Her initial assertion of the Ilkhanid's

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<sup>28</sup> Pope, *Survey of Persian Art*, p.1286.

<sup>29</sup> Blair, "Vaulting and Decoration," *Ilkhanid Shrine*, p.31.

<sup>30</sup> For the connotations of the Muqarnas and its associations with Baghdad, see Yasser Tabba, "The Muqarnas Dome: Its Origin and Meaning," *Muqarnas: An annual on Islamic Art and Architecture*, Vol. 3, (Leiden: E.J. Brill, 1985): 61-74. Also, consult footnote 16 for a theorization of certain visual types used as a means of representing political affiliations.

interest in space obfuscates the issue of the choices being made. The muqarnas domes have certain semantic associations and thus cannot be analyzed as a “spatial” component.

There is however, an interesting visual transformation of this particular symbolic architectural unit in the mausoleum of Uljaytu that begins to suggest an alternate reading of the use of the muqarnas in Ilkhanid architecture. While the sharply receding full muqarnas dome is not too popular, the half muqarnas constructions were often used in the iwans in Ilkhanid architecture. They appear in the mausoleum -in the odd bays one, three, five and seven (fig.11) in a very flattened, rudimentary manner. The construction of these in terracotta and tile as opposed to plaster (like the ones at Abd al-Samad’s tomb chamber in Natanz) means that these were constructed on site, in tiers, one row after another and not as pre-cast units assembled on site.<sup>31</sup> This technique of constructing the muqarnas would imply that the shell units are tied to the wall rather than suspended from the underside of the upper barrel vault. This vault gradually peels off the back wall not so much creating a cavernous ‘space’ but rather just twisting its arched units to create a visually fractured surface. The two toned contrast of the terracotta and blue glazed tile heightens this effect both in the individually framed units and in the alternating plain and colored muqarnas wedges. Similarly the applied plaster squinch in the transition drum zone is used to create an undulating defined surface not to expand the ‘space’.

The discussion of the dichotomy of ‘structure’ and ‘space’ in a sense has no place in heavy masonry construction, where the larger the enclosed volume the more generous the proportions of the structural elements – the piers, walls etc. The architecture of the

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<sup>31</sup> Ulrich Harb, *Ilkhanidische Stalaktitengewölbe: Beiträge zu Entwurf und Bautechnik*, (Berlin: D. Reimer, 1978). By looking at a broken down muqarnas plaster vault at the site of Abaqa Khan’s Palace at Takht i Suleyman, Harb was able to deduce how each ‘stalactite’ was constructed as a unit and then suspended with rope from the underside of the structural shell. However the construction in heavier terra

fourteenth-century described the surfaces through the medium of geometry, rather than the expansion of space through the potential lightness of the structure.

The awareness of certain graphic systems that would imply a third dimension was known in the practice of architecture. The discovery of a plaster tablet (fig. 10), found at the site of a ruined Ilkhanid summer palace, the Takht-I Suleyman (1265-82) of Abaqa Khan, incised with one-quarter of the muqarnas plan demonstrates how the builder used a practical projective geometry to resolve the proportions of intricate angular units that locked together to describe a curve. The tablet attests to the knowledge of the builder, of the compression of spatial depth onto a two dimensional surface.<sup>32</sup> The flat tablet is a practical means of calibrating a complex architectural problem through simple geometry. The use of similar graphic conventions in the illumination of books is an aesthetic transformation of a practical theme. The application of this flattened muqarnas half dome at Sultaniyya suggests a different kind of 'space' - one that is implied visually rather than defined physically through the folded and divided terracotta units.

## **6. The Geometric Surface**

Fundamental to most of the compositions in the mausoleum of Uljaytu and the full-page illuminations of the Qurans are the networks of underlying geometric grids that are a means of articulating the surfaces through a novel use of certain pre established modules. The idea of dissolving the surface into a monotonous pattern is effectively contrasted with the delineation of more discernable and solidified angular shapes. Words,

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cotta and tile would entail an entirely different support system such as that of ledges projected from the back wall.

particularly as epithets or titles are inserted in a very precise way and incorporated into the inscribed geometry, framed with multiple borders and highlighted to a greater prominence. The following analysis traces the continued use of certain prototypical shapes-mainly stars and polygons and how these are re- invigorated by being extracted from a more layered set of two dimensional geometry as practiced by the illuminators and builders. If in tenth century Baghdad, the use of geometry is applied as a means of abstracting a more figural decoration, in the fourteenth century Qurans the application of geometry is further expanded to imply depth and surface continuity.

#### **a. Star and cross**

The surviving examples of glazed tile in Iran from the thirteenth century, demonstrate that basic tile shapes were formed so as to be laid in interlocking compositions such as the star and cross laid out along relatively simple horizontal grids. The idea of the ‘interlock’ as a two dimensional compositional device finds an application through a variety of media in Islamic art and is an idea that has also been discussed in the more general studies on decoration such E.H. Gombrich’s “*Sense of Order*” as a sort of device that defines an order rather than the sculpted object itself.<sup>33</sup> The contours of two adjoining units neatly lock into one another to create a rigid seam that bends consistently to create a continuous undulation.

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<sup>32</sup>For an analysis of the projection of a diagram such as the one inscribed unto the plaster tablet into three dimensional muqarnas domes see Mohammad al-Asad, “The Muqarnas: A Geometric Analysis by Mohammad al-Asad,” *The Topkapi Scroll*, 349-359.

<sup>33</sup> E.H. Gombrich, “Chapter Five: Towards an Analysis of Effects,” *The Sense of Order: A Study in the Psychology of Decorative Arts*, (Ithaca, NY: Cornell Univ. Press, 1979), 117-148. Eva Baer, *Islamic Ornament*, (New York:New York University Press, 1998), 80. Baer sees the geometric interlockings as “another way of overcoming empty space” recalling the notion of “horror vacui” proposed by Richard Ettinghausen, “The Taming of the Horror Vacui in Islamic Art”, *Proceedings of the American Philosophical Society* 123, (1979): 15- 28.

In architectural decoration, the method of composing an indented form and its reverse is a particularly effective way of creating a continuous visual field along larger wall surfaces. Whereas the use of square or rectangular tiles would emphasize the precise lines of the underlying grid, those of the interpenetrating star cross composition imply both a horizontal and diagonal grid along the angled contours of the eight pointed star (fig.12 & fig.13). The ensuing visual order that stops and starts is optically stimulating without disintegrating into chaos.

In Iran, star and polygonal medallions appear in the decorative stucco work at least as far back as the tenth century. Eight pointed stars, lined up in a border, appear on the decorated stucco mihrab wall at the tenth-century Masjid-i Jami at Nain. In tracing the presence of the eight pointed star shape to this tenth-century application, it appears that it is not exclusively linked to the notion of the interlock but rather became more commonly interpreted as such retrospectively in the thirteenth century. For example, an interlocking star and cross tile panel put together from tiles found in the aforementioned ruined Ilkhanid summer palace-- the Takht-I Suleyman-- at a site between Sultaniyya and Tabriz (fig.12) enhances the continuity of the surface as opposed to a border panel such as at the Nain Friday Mosque. This panel is fabricated, using two kinds star tiles one painted with a dragon and the other with the paradise bird (the *simurgh*) and two kinds of cross tiles in contrasting dark tile with a light floral spray and light tile with a dark floral spray. The placement of these four varieties of tile in an alternate sequence of dark and light, *simurgh* and dragon, creates even in the simple structure of the rectilinear grid, a multiplicity of cross connections that fragments the plane of the wall even as it extends in both X and Y coordinates. There are numerous occurrences of the star and cross tiles in



Ilkhanid architectural interiors. They appear in several other buildings from the time, often as a dado such as in the interior of the shrines at Natanz and Qumm and in the masjid-I jami at Damaghan. A plainer version of the same concept, in ceramic tile is used more extensively on walls panels, in niches and the intrados of the iwan arches at Pir-i Bakran (1310), near Isfahan, with two colors of glazed dark and light blue tile in (fig.13). The persistence of this star/cross tile interlocked model in the early part of the fourteenth-century is mirrored in the illumination of contemporary imperial Qurans produced for the Ilkhanids and also those produced at the same time in Egypt under Mamluk patronage.

The double frontispiece from the Quran of Baybars al-Jashankir (fig.14), produced in Cairo (1304-6), and the Quran of Rashid al-Din (fig.15) produced in Tabriz (1315) both demonstrate the popularity of the eight pointed star theme. In all the above mentioned architectural applications, the eight pointed star, with its ninety degree corners, was always aligned to the frame of the wall panel. Similarly, in the division of a page from the Tabriz Quran, the eight pointed star units are aligned along ninety and hundred and eighty degree coordinates of the square grid (fig.15). The alternate gold and blue checkered page is close to the idea of a continuous grid of an architectural repeat unit tile or masonry bond and is more commonly used to create tables or charts within manuscripts. Here however, the text title information is contained in blocks of dark blue in the top and bottom of the page.

The frontispiece of the Cairene Quran (fig.14), in contrast, uses an enlarged central star to inscribe the title in clear white against a dark blue floral background. Four L-shapes in gold mediate between the profile of the star and the squared frame that holds the composition. While the motif of the star is not new in the arts of this region the star of

the Cairo Quran is more medallion like a point of focus placed squarely in the center of the page. Later Mamluk Qurans would tend to use a similar but much more elaborate stellar geometry to illuminate their Qurans. I would suggest that at this early stage however, the simple interlock of the illustrated page (fig.14), with the interlocking 'L' shaped corners is analogous to the 'tiled' concept of the architecture of Iran, Iraq and Anatolia. There appears thus a kind of deliberate reciprocity between the tile work and the illuminations that is perhaps part of the legacy of a prior Iraqi model. However, The novel designs of the frontispieces purposely adopt elements that are more easily a part of the decorative idiom in the fourteenth-century 'Persian' sphere.<sup>34</sup>

Another elaboration of the eight-pointed star design from the right-hand frontispiece of "The Anonymous Baghdad Quran" (1302-8) (fig.16) resembles very closely two fragments of the Phase 1 terra-cotta, ceramic and stucco decoration in the mausoleum of Uljaytu (fig.17a & 17b). The composition within the center panel of the frontispiece has been achieved by stretching the grid of the underlying star and cross composition and inserting polygons. The crosses are fragmented in the process and four pieces of the broken cross shape appear radially aligned in the intermediate zone between the stars and polygons.<sup>35</sup> In the interior of the mausoleum, the two fragments appear in similar locations at ground level, to the right of the bays 3 and 8 and the strip composition akin to the exploded star and cross composition, breaks into a square Kufic tile inscription towards the edge of the bay. The inscriptions in both bays 3 and 8 have been

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<sup>34</sup> James, "The Relationship between Mamluk and Ilkhanid Qurans, 1301-16," *Qurans of the Mamluks*: 103-110. The idea of the dispersal of calligraphers from Baghdad courts to Cairo is one that has been seen to be the main cause of a dissemination of a common technique of decoration in early Mamluk and Ilkhanid imperial Qurans.

<sup>35</sup> James, "The Imperial Qurans of Iraq," *Qurans of the Mamluks*, 104. James finds this to be an unusual motif that appears only in one other quran with a polygon in the center instead of the star- in the Babayar's Quran.

deciphered as citations from the Quran: the one in bay 8 is the beginning of the throne verse, and although the one in bay 3 is not sufficiently uncovered to warrant a clear reading, its first phrase confirms it as a Quranic verse.<sup>36</sup> The skillful extension of the angled letters of the Kufic towards the geometric schema involves a harmonizing of the script with the stretched star and cross composition. David James comments on the unusual appearance of this composition in two contemporary Qurans.<sup>37</sup> The fact that this unusual design is part of an epigraphic panel in Sultaniyya makes a strong case for the involvement of illuminators in the designing of the tile-work.

Another instance of combining the polygonal geometry with epigraphy occurs in the Kufic inscription in Bay 6, in the intrados of the outer structural arch, executed in unglazed terra-cotta against a ceramic cut tile back ground (fig.18). This inscription starts on the right side at the spring line of the arch, runs up along the inner edge of the arch down to the left side, turns two corners at the spring line and then bends back to run along the outer edge of the arch. The stems of the letters from the inner and outer sides of the arch extend vertically towards a continuous central spine in the arch to twist into a linear composition of linked oblong hexagons. In each of these oblong hexagons are inserted a regular hexagon and two diamond-shaped polygons. The writing is adjusted to the gradation of the grid generated by this inner geometric spine.

In her analysis of this epigraphic panel Blair compares it to a knotted Kufic inscription on the minaret at Natanz (fig.19) which also reads in two directions.<sup>38</sup> Whereas the inscription at Natanz has the familiar 'knots' of the knotted Kufic linking the lower (upright) and upper (upside down) bands of writing, at Sultaniyya in the arch

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<sup>36</sup> Blair, "Cat.33 and Cat.44", "Epigraphic Program," p.53-54, p.56.

<sup>37</sup> James, *Qurans of the Mamluks*, p.43.

configuration, the two writings are linked by the somewhat odd geometric chain link spine. In referring to the style of this inscription, Blair has described it as a later “debased knotted Kufic” and pointed out that the Arabic has many mistakes-- a factor common to most of the other inscriptions from the first phase at Sultaniyya.<sup>39</sup> Errors in the text notwithstanding, the use of star and cross tiling in illumination and the unusual fusion of geometric patterns with writing are indicative of the exchange across the two visual disciplines that of calligraphy and architectural decoration in this instance.

#### **b) Three pronged arrow or Y**

In the star and cross tiling the emphasis is on the polygonal shapes, in another interlocking design, one that I call the “three pronged arrow,” the interlocking elements are more linear and accentuate the lines of the grid. A series of Y shapes, sometimes terminating in arrows, are locked into one another. The pattern appears in the space between the outermost rim of the pointed arch and the rectilinear outer frame above the entrance portal at the Gunbad-i Surkh in Maragha (1192) (fig.20). The triangulated, interlocking strips of blue tile set in a mortar bed are aligned in striations at ninety, sixty, and thirty degrees to the horizontal lines of the brick coursing. The pattern responds to both the triangular frame of the pointed arch and to the rectangular one that frames the entire portal. Like the star and cross tiling, it is drawn from a simple underlying grid that is mirrored and symmetrical.

This pattern is not repeated too often in the Ilkhanid ensembles, but an inscribed design of interlocking Y’s, minus the arrowheads are applied as a kind of background in a

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<sup>38</sup> Blair, *Ilkhanid Shrine*, p.43.

<sup>39</sup> Blair, “Epigraphic Program,” p.56.

similar position in the portal of the khanaqah at Natanz (1304) (fig.21).<sup>40</sup> Juxtaposed on this bed of terra cotta Y's with small blue triangular inserts, are two round *shamsa*-like medallions in the left and right corners of the frame and a teardrop ogival medallion at the center. The three medallions are clearly executed in a plane that lies on top of the terra-cotta bed and the dark tile on the light sand colored background makes this reading even clearer.

Gulru Necipoglu traces the genesis of the interlocking shapes in geometric patterning to early Samarran plaster designs. In her assessment a process of abstracting the relationships between forms transformed the more figural imagery of earlier, pre-Abbasid architectural designs. Such an abstraction dissolved the distinguishing contours of objects and rendered them indistinguishable from the background they were juxtaposed upon.

“As in Samarra entire surfaces continued to be covered in tile like fashion with infinitely extendable repeat units whose ingeniously interpenetrating abstract shapes, which seemed capable of continual metamorphosis into one another, once again blurred figure ground relations.”<sup>41</sup>

The clasped Y's can be seen as the vestige of this form of abstracting visible in early Samarran plasterwork, but in the khanaqah portal, the background, constructed of the clasped Y's has been reasserted to display the sign-- of the illuminated roundel-- derived in part from the Quranic lexicon. Just as the writing and certain illuminated

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<sup>40</sup> Ibid. Blair posits that a lot of the workmen involved in the decorative program at Natanz moved to work at Sultaniyya. This seems very likely given the proximity in time and place of the two structures. The Natanz portal was completed in the year 1304 and the construction on the mausoleum of Uljaytu was begun in 1305. Given this condition of the same people being employed in both projects, what is remarkable is that although both projects have similar sorts of designs- no single scheme is precisely repeated at Sultaniyya. Thus, both projects represent a synthesis of aesthetic principles but in the actual execution of the specific designs there is a great propensity for experimentation.

markers in the Qurans are rendered entirely clear, so too in the architecture, the legibility of certain recognizable signs was enhanced by being juxtaposed on an interlocking geometric background.

In an illuminated finispiece from another Cairene quran(fig.22) an eight lobed roundel in gold and blue is painted against a background of Y's, drawn in fine red lines. As opposed to the earlier appearance of this pattern in the triangular architectural frame at the Gunbad-i Surkh at Maragha, here in the illuminated page the orientation of the pattern is at odds with the superimposed forty five-degree corner pieces. The four gilded corners and the eight-lobed roundel would sit more evenly within the geometry of a forty-five and ninety degree angles of the grid. Instead, the triangulation of the background along a thirty-degree incline to the horizontal have been rendered as a 'field' in which the corners set the limits of the frame. The use of the geometric interlock as a background is an unusual occurrence in the illumination of the Quran and James<sup>42</sup> attributes this to the peculiar style of Muhammad b. Mubadi, an illuminator in Cairo, who trained in Baghdad. On another folio attributed to the same artist, in the Quran illuminated for Baybars al-Jashankir, the text encased in the white cloud fringe is juxtaposed onto a background of inverted red-lined Y's (fig. 23).

Within the Qurans (typically) the text is presented on a less overtly geometricized floral background. In particular, the title block is conventionally drawn out in a white or gold Kufic or cursive script upon a dark blue circular scrolling background. This application is absorbed and conventionalized in later epigraphic panels executed in fine mosaic tile but in the early part of the fourteenth century this technique is paralleled in

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<sup>41</sup> Necipoglu, *The Topkapi Scroll*, p.93.

<sup>42</sup> James, "Qurans in Cairo, 1304-30", *Quran of the Mamluks*, p.51.

carved stucco such as that described earlier in the mihrab of Sultan Uljaytu at the Masjid-i Jami at Isfahan (fig.24). In the first phase of decoration at the mausoleum of Uljaytu, very elaborately carved stucco is conspicuously missing. Most of the stucco work is restricted to the tile-like modular units of low relief stucco that are inserted in the reflected repetitions strap-work.

### **c. N-fold symmetries and the module:**

Both the star and cross-tiled formations and the interlocking Y's, share a "cellular" structure that expands symmetrically along square and isometric grids respectively. The pattern in each case can proliferate exponentially through a mirroring along a 'fold' line. In a study derived from mathematical analysis, the two patterns that have been discussed so far, were shown to be based on eight-fold and the three/six-fold repetitions respectively around a point (fig.25a, 25b).<sup>43</sup>

In first of these two diagrams (fig.25a) the two segments of line that form one eighth of the total star are seen as the most rudimentary graphic information required to generate the pattern. These two lines reflected eight times around the center would create a module of the star (hence the eight-fold symmetry). Conversely, the cross shape can also be generated as a unit from the same line segments using a different set of symmetrical reflections, around a central point. In the iwan fronting the main domed sanctuary at the Masjid-i Jami of Varamin (1322), along the side wall surfaces, a variable of the star cross composition in terracotta is constructed by laying molded rectangles with

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<sup>43</sup> Salman, A.S. & Syed Jan Abas. *Symmetries of Islamic Geometric Patterns*, (Singapore: World Scientific Publishing co., 1995). The particular diagrams illustrated here have been selected from this book but there are other studies of Islamic patterns by proponents of applied mathematics that are similarly interested in the idea of a code as the generator of pattern. I have presented this study merely to advance the notion of all

chamfered ends in plaster at the interstices of a square grid (fig.26). With a reveal that recesses back to the plaster under-surface, the eight pointed stars are formed by a veneer of staggered terra-cotta pieces, faked to resemble brick coursing. This mosque was built in the reign of Uljaytu's successor, Abu Said, approximately a decade after the mausoleum and uses little ceramic tile but the design schemes are an elaboration of similar geometric principles. The break down of a 'standard' design into its component parts in this fashion betrays the sophistication with which some of the concepts inherent in prototypical designs continue to be manipulated in Ilkhanid architecture.

The second diagram (fig.25b) presents the curious Y pattern where the three line segments in an isosceles triangle, rotated in three positions around the apex, would create a unit cell that would be in the shape of an equilateral triangle. By reflecting this triangular unit along any one of its three edges the grid that runs under can be seen as one composed of parallelograms such as that in the diagram, or alternately six of the triangular units reflected about a single point, would yield a hexagon. There is more than one way to interpret this particular composition and the symmetries suggested by such a seemingly simple pattern are many as are the grids defined by it. The projections and axis of symmetry within such a composition actually cannot be deduced through any one procedure of mathematical derivation.

Looking again at the finispiece of the Cairo Quran, attributed to Muhammad ibn Mubadir (fig.22), there are two details that need to be considered in light of this discussion. The first is the two triangular indentations in the center of the upper and lower horizontal edges of the frame that at first appear not aligned to the grid generated by the

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the different ways in which the designs can be broken down and that the different applications of the patterns in Ilkhanid architecture shows an awareness of these complex possibilities.



background, nor are they angled to the corner pieces or the eight-lobed center roundel. However, the equilateral triangle is one that defines the “unit cell” of the y interlock. Further, between these two indents and the central roundel there is a hint of two hexagons created by the six dark blue in-filled centers of the triangles. In drawing the background, the illuminator of the finispiece is inadvertently aware of the folds along which the pattern repeats itself; in these two details he chooses to assert the connection of the foreground with the background. It is in the details that the principle of triangulation of the Y is confirmed.

The spandrel zone between the top of any pointed arch and the rectangular frame surrounding it lends itself to triangulations with six-fold symmetries. In the mausoleum of Uljaytu, on the exterior of the east portal leading into bay 6 (fig. 27), the spandrel displays strips of relief terra-cotta on a blue ceramic tile background, three inverted isosceles triangles that announce the *Shahada* in Kufic across the top edge. At the apex of these downward pointing isosceles triangles, is a small dark-centered six-pointed star from which equilateral triangles formed in Kufic script radiate. There are exactly six such triangles fitted into each half of the spandrel and the epigraphic content of each of them is the same. Three “Muhammads” are aligned along the three equal sides of the triangle and the center is composed three “Alis” forming a sort of hexagon in the center. Technically, the use of colored tile, contrasted against a terracotta or stucco background in alternating strips to form blocks of text is common in other monuments of this time but the triangular composition and the neat division and interlock of script to be framed into the spandrel is extremely unusual.

On a corresponding spandrel on the interior across the lower arch of bay six, a twelve-pointed stellar network is composed in light blue cut tile embedded in a plaster background (fig.28). These two compositions (figs.27 & 28) placed back to back employ the same diagonal sixty, thirty, ninety degree grid to achieve two completely different patterns. Since both the spandrels under examination frame the same arch on the inside and outside, the centers of the twelve-pointed star formations correspond precisely the small dark centers of the stars in the exterior spandrel.

With the twelve-pointed star composition, the possible fold lines have multiplied twice over and in any given direction the extended lines radiate to enclose two kinds of polygons, five-pointed stars, and elongated six-pointed stars. The precision with which this composition meets the frame is dictated by the position of the centers of the stars—they demarcate along the top, the sides, and the bottom of the panel. This particular composition in the spandrel became a conventional solution in later Timurid architecture although it is not repeated with such regularity in this period. In the mausoleum itself, a variety of other star configurations are applied, often combining two or more numerical systems, for example in bay 3, where nine pointed stars are interspersed with twelve pointed ones. The oppositions set up by the disparate angles of two different numerical systems are harmonized ingeniously, using the same very spare vocabulary of star and polygonal shapes. As compared to this combination of different geometric orders, the stellar compositions of the full-page illuminations of the contemporary Hamadan Quran of Uljaytu (fig.9) are far simpler in their use of geometry. The twelve-pointed star is framed in a perfect square and the pattern does not negotiate with the oddities of the frame in the manner of the spandrel designs. The entire composition can be read at a

glance since the main figure of the star, dominates the page. The large central star rendered in an intricate golden interlace is set in the dead center of the frame and the subsidiary figures are clearly radiated from this center.

The dexterity of geometric manipulations in decorative design is the outcome of the practical applications of geometry in architecture; there are some indications that such compositions were recorded in various manuals of practical geometry but to what extent the artisans were aware of these remains unclear.<sup>44</sup> There are particular pages (fig.29) from the anonymous treatise *Fi tadakhul al-ashkal al-mutashabiha aw al-mutawafiq* (“On interlocking similar or congruent figures”) that illustrate the resolution of the interlock between two dissonant n-fold constellations. The most efficient way of generating the requisite geometry is the method proposed in the anonymous treatise-- by framing in a rectangle a quarter of the twelve-pointed star with a quarter of the ten-pointed star diagonally across. The divergent angles of these two networks are compensated by an ingenious working out of proportions of the radii generated from the two centers. In the combination of the twelve and nine stars in bay 3 discussed above, an understanding of the proportional distances such as that illustrated in the anonymous treatise would have to be pre-figured. The treatise, datable to the eleventh-century through the thirteenth-century, demonstrates the schematic analysis of a practical problem pertinent to architectural decoration. The resolution of the zone in between is achieved by describing a division through the extension and bending of the linear elements so as to enclose the familiar shapes- regular polygons and smaller five-pointed stars.

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<sup>44</sup> Necipoglu, “Chapter 8. Theory and Praxis: Uses Of Practical Geometry,” *The Topkapi Scroll*, p.131-166.

Tiles produced at kilns, on or near construction sites at the beginning of the thirteenth-century in Iran, were basically in the shape of rectangles, pentagons, octagons, eight-pointed stars or crosses. Even as the architectural possibilities of tile were greatly expanded, the shapes and types of glazed and luster tiles essentially remained the same. This is not due to the monopoly of tile manufacturing since no standardization of sizes or even types would be effective in the multitude of applications in wide range of architectural projects. The art of tile-making was highly specialized, and given the expense entailed, the number and types of tiles had to be ordered in advance of the installation process.<sup>45</sup> The practice of making molds allowed a fair amount of flexibility in the making of various shapes but the repertoire of the geometric schemes determined the precise shapes. While simple geometric shapes are consistent with the rigidity of the baked glazed tile material, the transference of the same forms to stucco tiles, a more malleable material, speaks rather of a conceptual consistency in the figuring out of design schemes using a module and applying it consistently.

## **7. Conclusions:**

The process of drawing the twelve pointed repeat composition in the spandrel of bay 6 (fig.28), involved a kind of working back to an initial module. First, by constructing a reference grid of fitted equilateral triangles which determined the relative distance between the centers, and second, by isolating the basic repeatable square (fig.28), similar to the construction in the *Fi tadakhul al-ashkal al-mutashabiha aw al-mutawafiq*

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<sup>45</sup> Blair, *Ilkhanid Shrine Complex*, p.14-15. Blair explains how the tile and luster ware must have been ordered in advance, produced in kilns in nearby Kashan and then installed in the tomb chamber of Abd al-Samad. Thus each batch of tiles is specially made for a particular job and needs to be designed and specified in advance.

(fig.30). The centers of stars lie on the corners of the frame and the scheme is laid out beginning from the seams inwards. In the final execution of the geometric composition the seam is rendered invisible by the network of intermediate lines and forms that describe the surface more than the frame. Thus, the stellar design in the spandrel of bay 6 as analyzed through drawings at various scales in the end appears to be divorced from the initial module that generated it. It is this polar relationship of the frame to the plane-- of containment and expansion-- that characterizes the decorative designs in the mausoleum.

The similarity between the mausoleum of Uljaytu and a group of funerary monuments in the Azarbaijan region from the eleventh and twelfth centuries was mentioned earlier in this essay. Several authors view the interest in the use of colored faience in the late thirteenth century as a “revival” or a “picking up” where they left off two centuries later. By way of explanation Wilber suggests:

“The situation is as if during a laboratory experiment an organism had been instantly frozen and then kept for a considerable length of time in that state. Then when it finally was allowed to thaw out its renewed activity began, without any apparent break, at exactly the point where it had broken off.”<sup>46</sup>

In decorating the mausoleum of Uljaytu, the multitude of craftsmen employed were not limited to looking at regional examples for building prototypes. In my account I have tried to widen the scope of this discussion by emphasizing the change in the conception of pattern-making that corresponds to a shift in aesthetic preferences under Ilkhanid patronage. The two authors that have most recently researched into this subject

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<sup>46</sup> Wilber, “The Development of Mosaic Faience”, p.40.

have casually cited many plausible sources as precursors to this monument.<sup>47</sup> I have in my analysis of specific designs tried to assert that given a certain facility with the complex idiom of geometric analysis, it is entirely possible to see the decorative program of the mausoleum forged from a known repertoire of formal elements.

**a. Geometry and the layered surface:**

It is interesting that this known repertoire of formal elements is encompassed to a great extent by specific themes in the exterior brick and tile interlacing designs of the monuments at Maragha. The translation and transformation of the three-pronged arrow from the spandrel of the Gunbad-i Surkh has already been examined in a great deal of detail. The strap polygons in the tympanum (fig.20) also have a direct co-relation to the schemes of strapwork used in later Ilkhanid architectural decoration. At the Gunbad-i Surkh at Maragha the strands of the similar sized glazed and terra-cotta strips are embedded in the background of hard plaster that is subtly indented to create floral relief. Three different layers can be discerned in the polygonal strap compositions by virtue of the degree to which they are raised from the surface of the plaster background. First, almost flush with the background, are the doubled terracotta hexagons; second, in greater relief, but intertwined with the above-mentioned hexagons, are the smaller blue glazed nine-sided polygons; and finally, the overlay of the large twelve-sided polygons in unglazed terracotta.

This sort of physical layering of elements is replaced in the later fourteenth century architecture and low relief is used instead to imply depth. In Ilkhanid decoration, as exemplified by the interior designs at the mausoleum of Uljaytu, the interest had

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<sup>47</sup> Sims, "Internal Decoration," p.89-123. Blair, "Epigraphic Program," p.43-96.

shifted to the emphasize the “implied” layering of elements and a resolution of the invisible structure through a solidification of the trapped tile shapes. In contrast, the tympanum from the eleventh-century portal uses twelve, six, and nine-sided polygons, applied more simply as rings that are laid over one another, arranged around a center.

In many discussions about Ilkhanid architecture, the emphasis on technical innovation as a generator of form often overwhelms the deciphering of choices made both by the patrons and the artisans. The analysis made by Donald Wilber in 1939, tracing the history of a technique of using ceramic tile in Iranian architecture has been particularly influential in the study of decoration. In Wilber’s account, the integration of ceramic cladding in architectural structures dates back to the Seljuk era where blue tile bits were first inset into decorative brick masonry bonds to highlight certain aspects of an otherwise monochromatic architectural surface. He sees the development of faience in Iranian architecture, as a gradual progression from this earlier phase of a limited use of color to an increasingly polychromatic usage in later Timurid architecture. The loss of three-dimensionality in applied stucco appears in this account at the same time as the rise in popularity of ceramic decoration. The implication is that somehow the discovery of glazed, colored tile displaces the art of stucco and by extension the use of “sculptural texture” in architecture. In this linear progression the ultimate goal is seen to be that of “complete mosaic faience” and his account of the history of tile ends at the mausoleum of Uljaytu where mosaic appears for the first time in the borders and on the colonettes flanking each bay.<sup>48</sup>

The complicity between illuminations and architecture presents a very different picture of the manipulation of the material - be it tile, stucco or paint on paper- to achieve

consistent effects. I would even go further and suggest that what makes the exchange between the art of illumination and architectural building possible is the conception that the medium can flex to accommodate the idea. Thus, there is a conscious choice to represent the angularities of the geometric interlock more “natural” to architectural masonry or carpentry in the medium of painting. Conversely, the construction of floral sprays and more fluid curving forms in mosaic tile in the architecture from Yazd and Isfahan towards the end of the century is the flip side of the same coin where the more malleable line of the painters art is emulated by the tile cutter.

By looking at the nuances within the decorative scheme at the mausoleum a much more complex picture of references emerges. The building appears to be something of an experiment where designs from different sources are metamorphosed by working at them two-dimensionally. The earlier prototypes were presented not so much to trace certain designs back to a source but rather show how familiar patterns were reinterpreted by a much more facile application of geometry. The conventions of representing three-dimensional space two-dimensionally comes to painting from architecture by way of geometric layering. Just as the diagram inscribed on the tablet from the Takht-i Suleyman (fig.10) would allow a builder to produce a three dimensional muqarnas vault by a process of extrusion, the geometric overlays of the illuminated page allow the viewer to perceive depth by a process of visual extrusion.

#### **b. The view of the interior**

In the paintings from the manuscript known as the “Demotte Shahnama” (dated to around 1330), the interiors of buildings are represented as if it were constructed out of planes that

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<sup>48</sup> Wilber, “The Development of Mosaic Faience,” p.46.



have been hinged out so as to present all the walls and the floor simultaneously to the viewer.<sup>49</sup> Frames meticulously separate these wall planes from one another and the figures are juxtaposed somewhat symmetrically in alignment with the architectural components. I propose that the manner in which this view is rendered, corresponds to the way in which architecture and its decoration is conceived in the mausoleum of Uljaytu.

The ingenuity of the structural system of Uljaytu's tomb chamber, lies in the way in which it makes the expanse open up, accordion-like, to the viewer. The analysis of "space" presented by the aforementioned arguments, is a deterrent in this discussion where the idea of visibility takes precedence over a more holistic grasp of occupy-able volume in architecture. There is no dialectical relationship between the underlying structure and the decorative skin-- the structure enhances the principle of legibility of the decorative scheme. The breakdown of the building into constituent bays and galleries allows for a multiplicity of viewing as the observer occupies different zones and sees different planes embellished with the compressed geometric schemes.

In conclusion, I would like to present a "view" of bay 4 in the mausoleum of Uljaytu (fig.31), collaged together from photographs taken recently on site. The bay is witnessed, through the lens of the camera, scanning first, the vertical length of the imposing outer arch, and then moving horizontally in, towards the outer back wall of the niche.

Bay 4 connects the main tomb chamber to the rectangular mortuary chamber on its south side. The photographic fragment to the extreme left, and that to the extreme

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<sup>49</sup> For illustrations of paintings see Sheila Blair and Oleg Grabar, *Epic Images and Contemporary History: The Illustrations of the Great Mongol Shahnama*, (Chicago and London: The University of Chicago Press, 1980). For example, "Shah Zav, Son of Tahmasp, Enthroned," pl. 14.

right, show the inner corner between surfaces 3 and 4 (see fig.2 for orientation). Surface 7, at the center, is presented in its relationship to surfaces 3 and 4, in a different plane separated by a two-part border frame. The composition on this inner wall is a curious combination of the radial twelve-pointed star and the “three pronged arrow” reconfigured radially (for detail see fig.8). It forms a rather large wheel, centered on the wall in the likeness of a frontispiece. The difference between this enframed wheel and the adjacent spidery strapwork pattern is striking though technically they are both spun off of radial grids. The stellar geometry is thus manipulated to create a large radial panel in the inner niche and, a wide frame constituted to surfaces 3- 4 by the more repetitious rhythm of the terracotta strapwork design.

Versions of the spidery strapwork of surfaces 3 and 4 appear in all the other even numbered bays of the mausoleum, in exactly the same location whereas the same surfaces in the odd bays are decorated with a squared Kufic blue tiled pattern inserted in plain brick coursing. The bent strapwork in bay 4, generated from ten-pointed stars, smoothly wraps from surface 3 to surface 4 by centering a star and polygonal column exactly on the concave wall corner. Viewed head-on this causes the corner to disappear creating an illusion of flattened, planar continuum. In an interpretive drawing (fig.32) of the same surfaces (3-4) in bay 6, the two surfaces are flipped open to demonstrate the continuity of the design across the corner. The bent in the strapwork is used to the advantage of this scheme by the designer such that surface 3 is twice the width of surface 4 and the jointed bended seam causes the corner to disappear. In the convex corner, between surfaces 1 and 3, on the other hand, the strap-work stops an inch and a half short of the edge and is

curtailed by a brick border that is flush with the decorated surface. The corner itself is recessed and a typical colonette is inserted into this vertical void.

In the double-paged illuminations within Qurans, similar conventions are formulated. The inner and outer edges of the pages are defined so as to reinforce the continuation of the surface across adjacent pages, and in contrast, the outer edge is framed by a heavy border (fig.14 & fig.15). This format is standardized and appears with consistency in later book illuminations in Iran.

The mausoleum of Uljaytu was built and decorated over a relatively short period of time. The decoration was divided into discrete parts to expedite the process and to create an interior that is extremely varied. In the first phase each of the eight bays was decorated as a separate niche, perhaps by different groups of craftsmen. The interior, where none of the walls are alike, is presented in a page like manner-- each plane isolated by a series of frames. Pious epithets appear-- plaque like-- in various visible locations within the dense matrix of the repeated polygonal and star shaped units all along the wall surfaces. The viewer is thus drawn into this complex network of pattern, actively scanning the surface for recognizable signs. The decoration within the mausoleum, with its specification of continuities and discontinuities, is akin to the rulings and marks within the Qurans, to guide, enhance and display.

The octagonal tomb tower with the pyramidal roof-- the Gunbad-i Kabud at Maragha (fig.6)-- can be seen as an inside out diagram of the eight-part interior bay scheme of Uljaytu's mausoleum. The division of the arched wall panel into an upper and lower zone is an abbreviated version of the more volumetric recessing and spatial division of each bay in the monumental interior of Uljaytu's mausoleum. The two

colonettes flanking the arch, the brick strapwork pattern of the wall panels, the inscription in blue Kufic tile in the shallow intrados, the flattened muqarnas in the tympanum and the twelve-pointed star composition in the spandrel, are elements common to both the tombs. However, whereas the Gunbad-i Kabud presents itself to the viewer as a solid object unified by repeating the same scheme in each façade, the interior of Uljaytu's mausoleum displays different scenarios as the viewer circumambulates the building at different levels. The depth of its interior surfaces is less tangible and engages the audience in an illusionistic play by compression, flattening and containing.

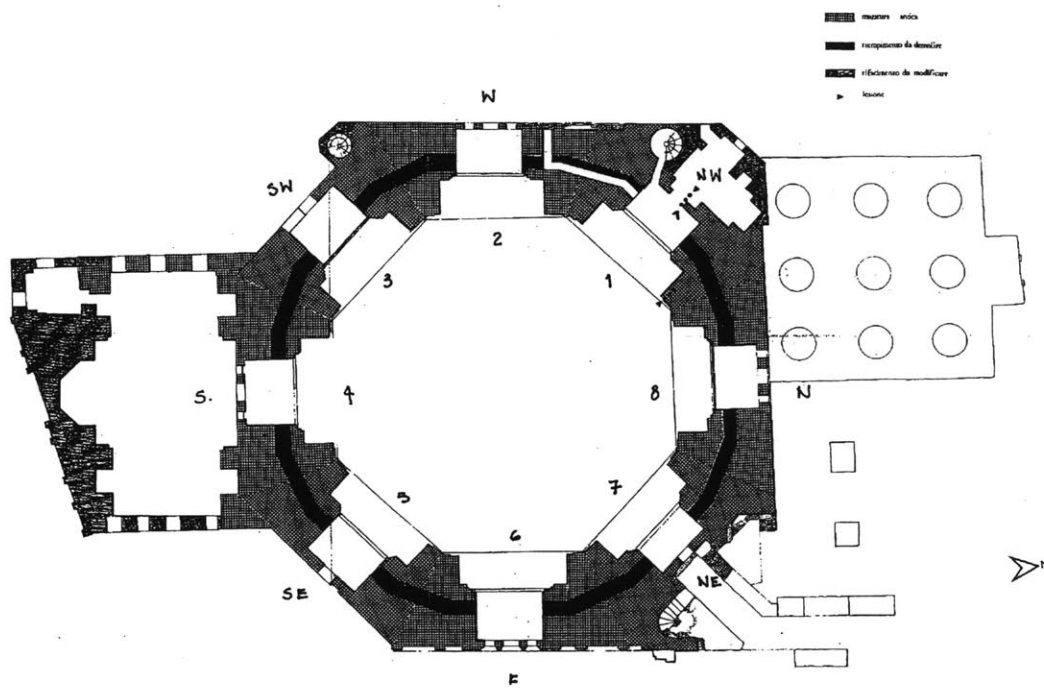


Fig. 1. Plan showing orientation and numbering of bays:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

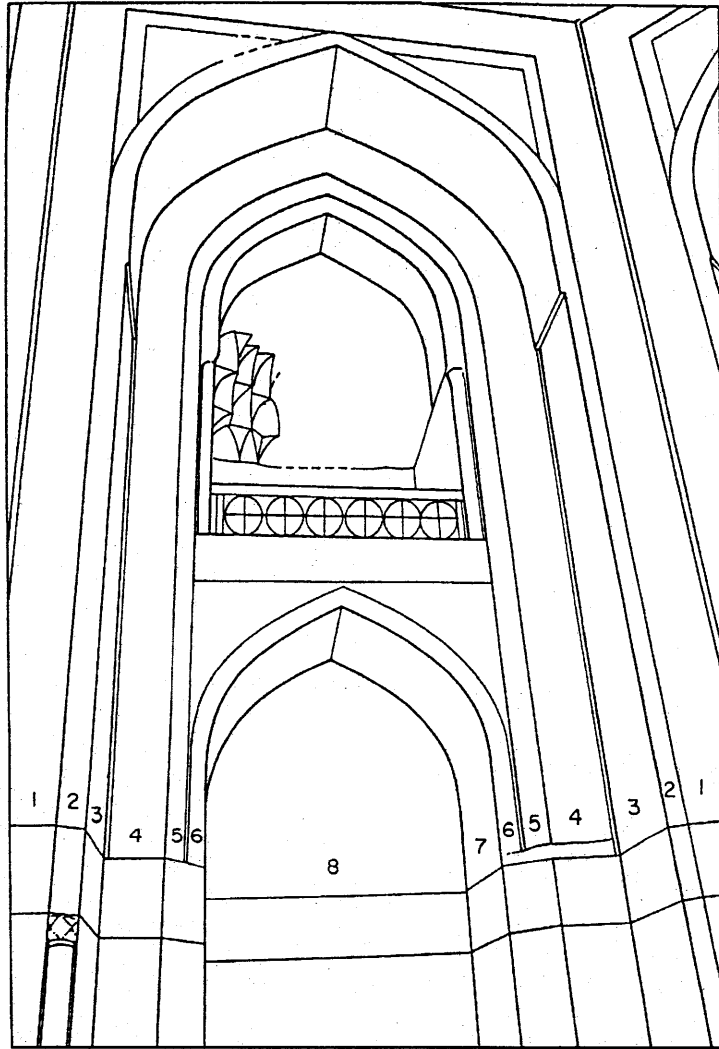


Fig.2. Sketch of typical bay, numbering of surfaces:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

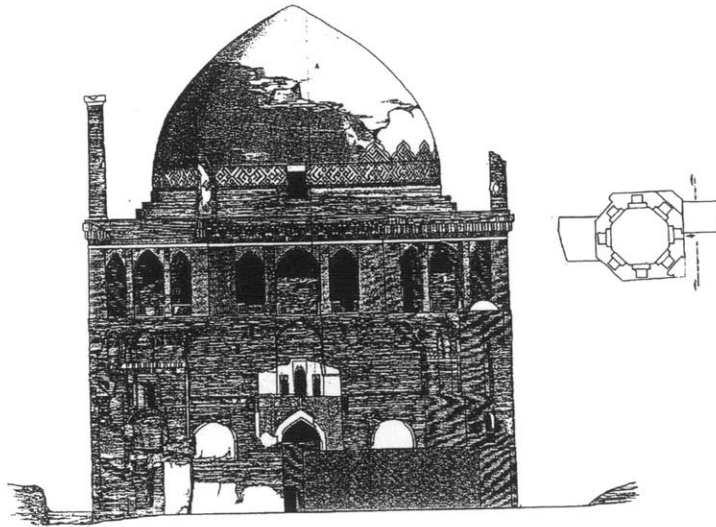


Fig.3a. North Elevation: Mausoleum of Uljaytu, Sultaniyya Iran, (1304-1316).

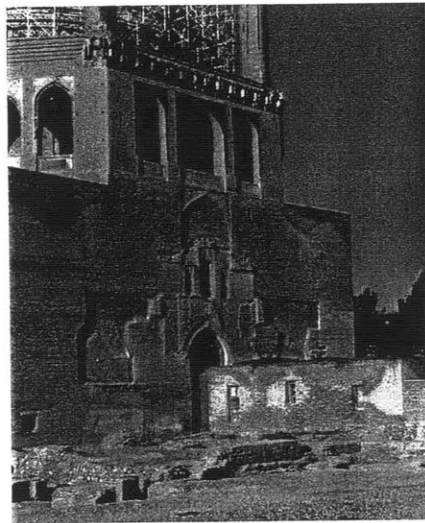


Fig. 3b. North view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

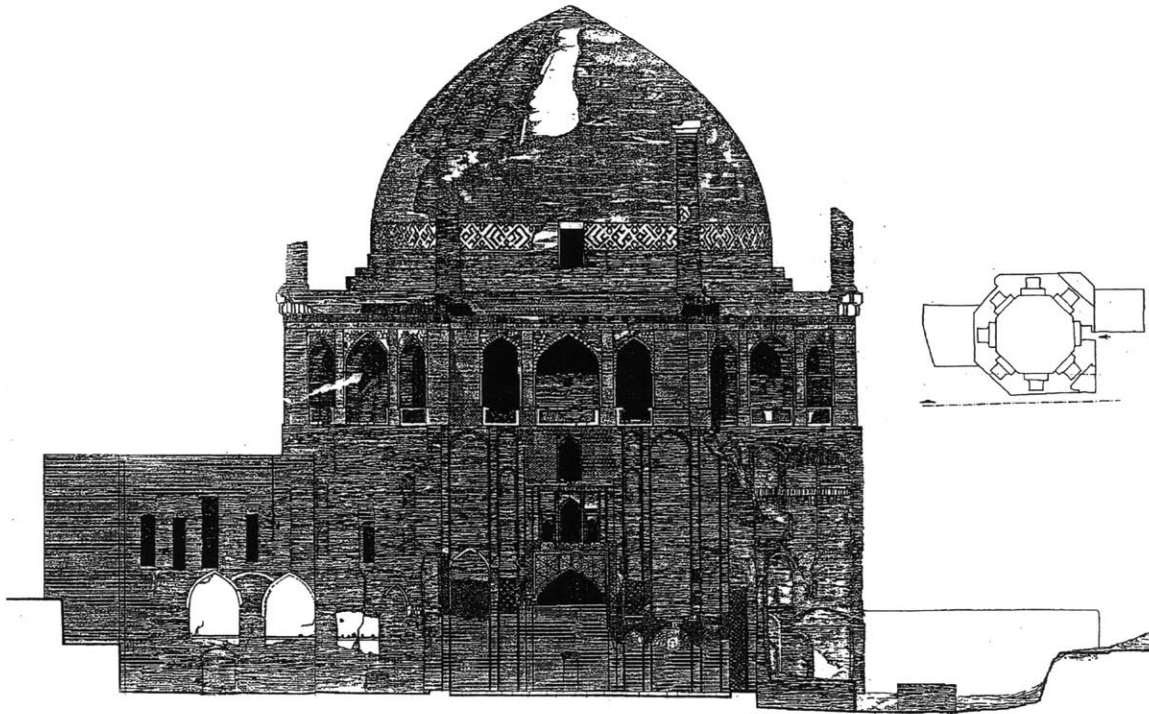


Fig. 4a. East Elevation: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).



Fig. 4b. East view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).



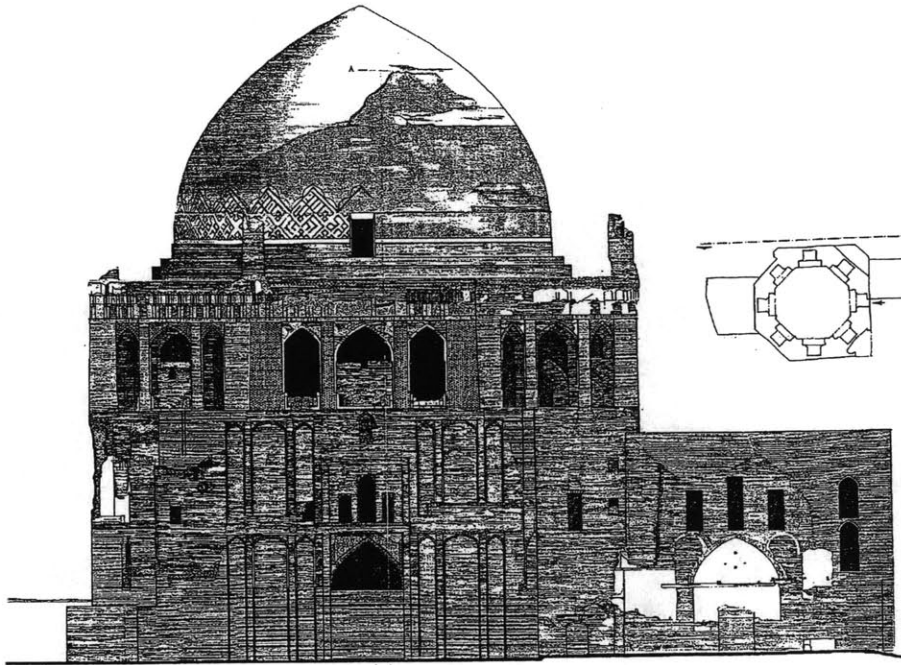


Fig. 5a. West Elevation: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

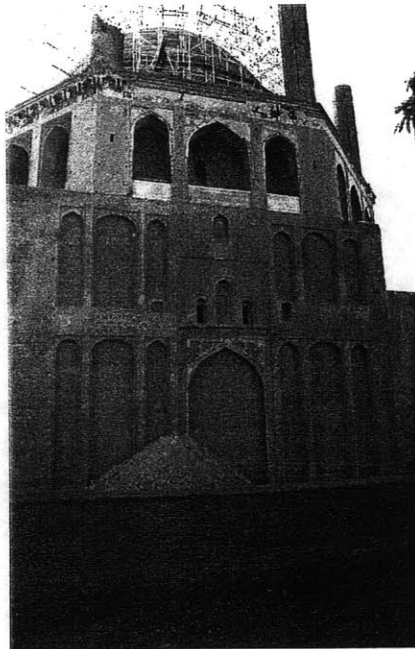


Fig. 5b. West View: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

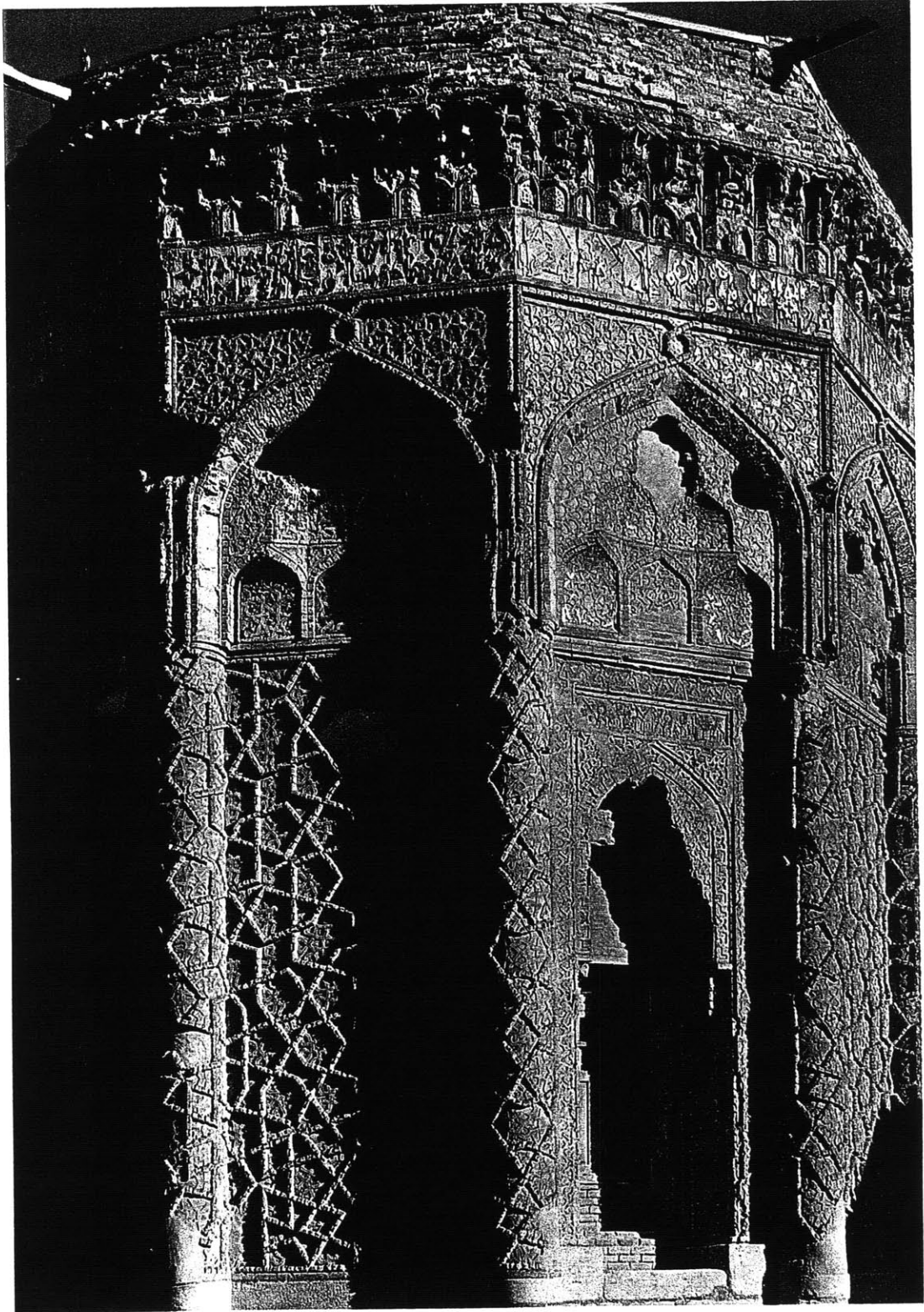


Fig. 6. View: Gunbad-i Kabud, Maragha, Iran, (1196-97)

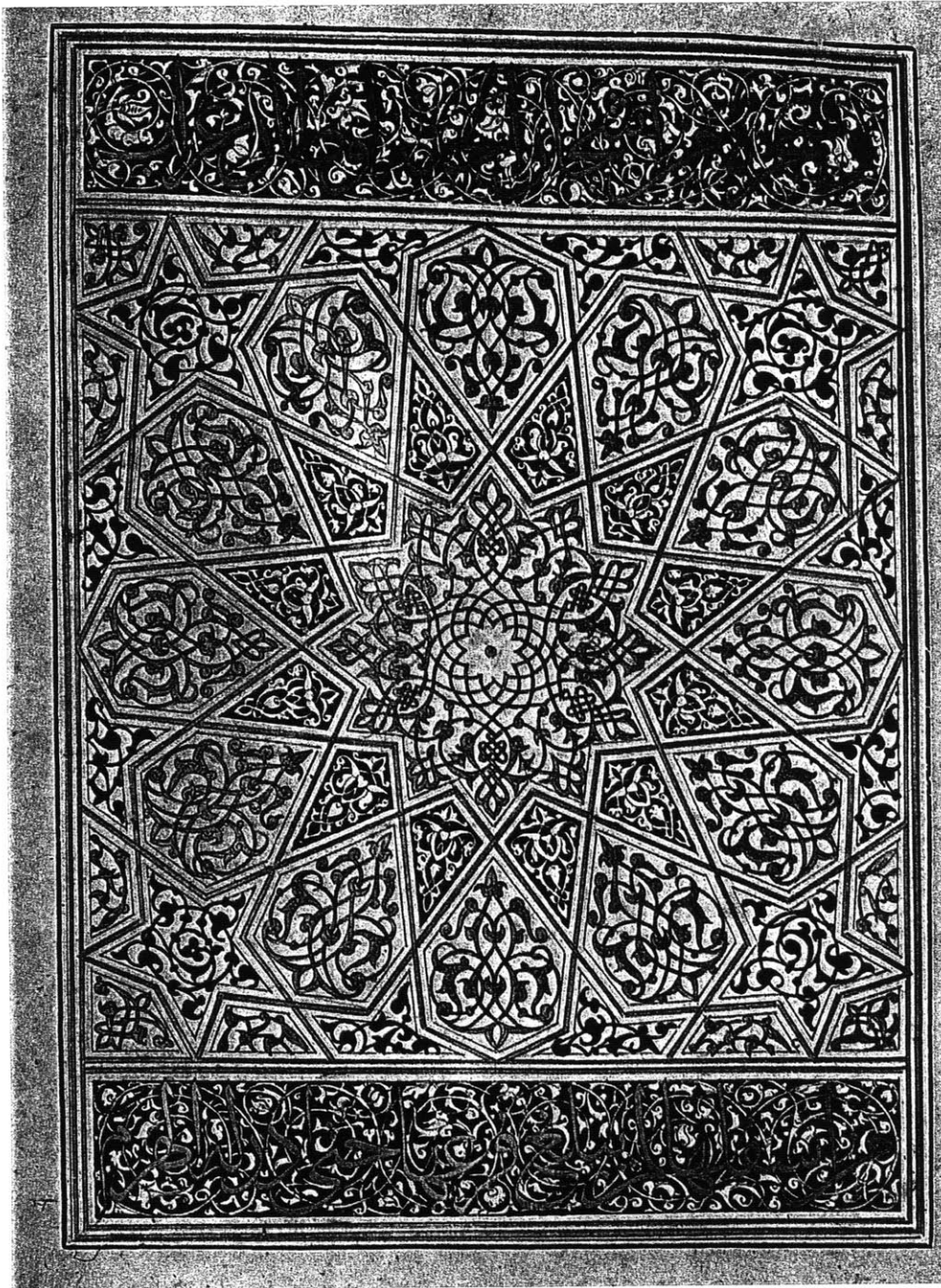


Fig.7. Page (original page: 56.5x 41cm) from the frontispiece to part 22 of a Quran in 30 volumes written and illuminated in Hamadan. Colophon credits Abd Allah Muhammad al-Hamadani, 713/1313 as illuminator and calligrapher.

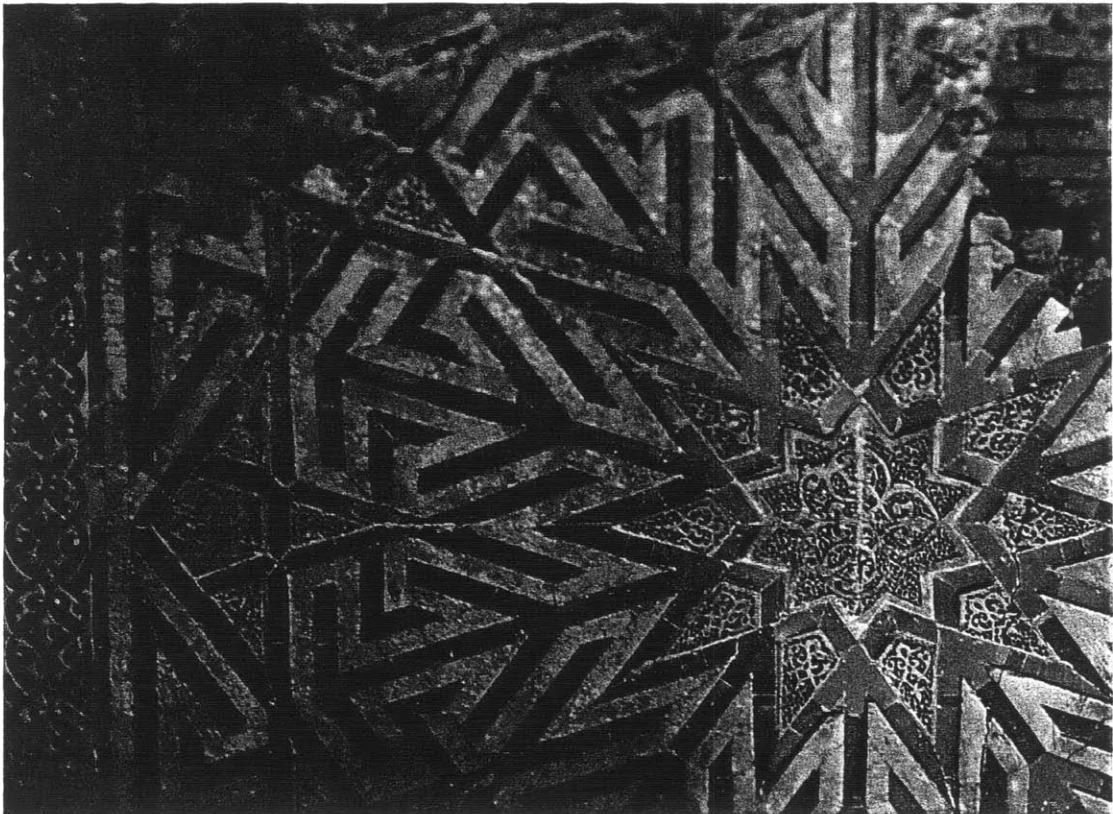


Fig.8. Partial view of surface 7, bay 4, interior:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

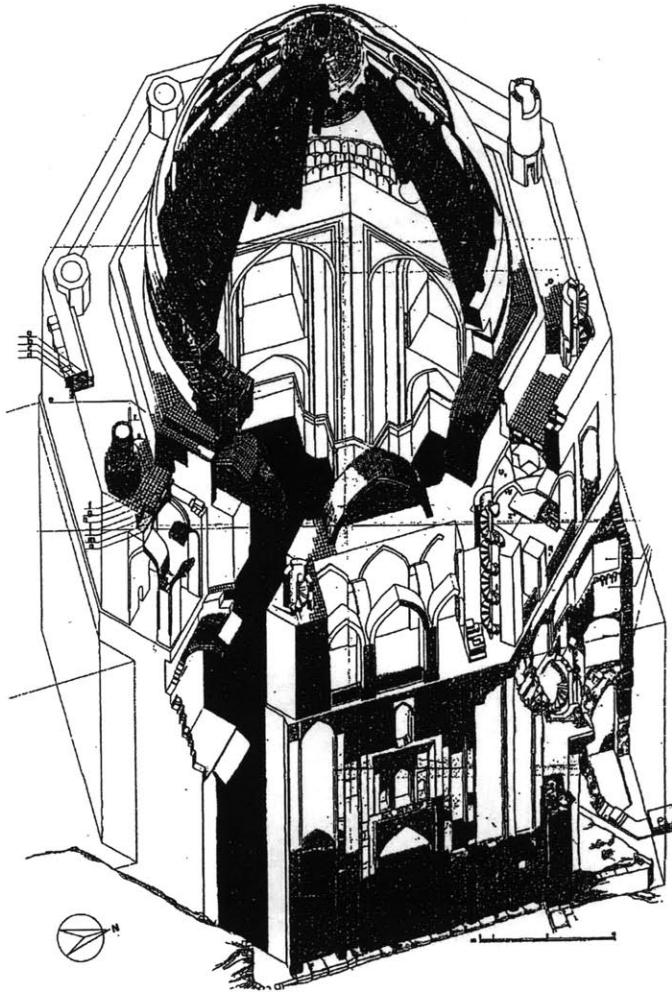


Fig.9. Isometric view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).





Fig.10. Plaster tablet incised with quarter plan of muqarnas vault: Takht-i Suleyman, Iran, (1270).

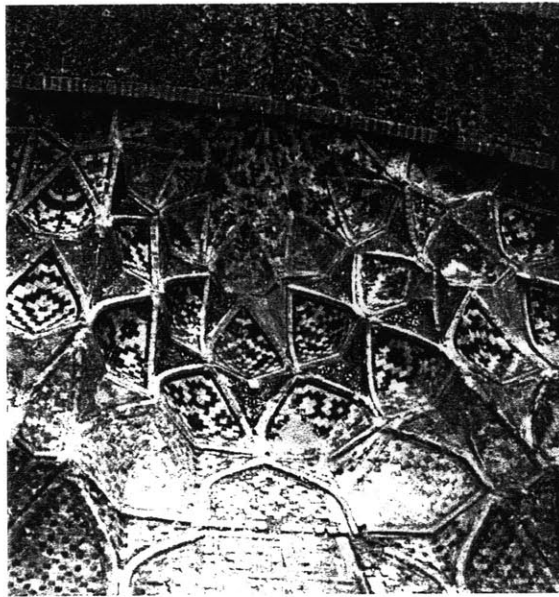


Fig.11. Muqarnas vault, bay three, interior gallery: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

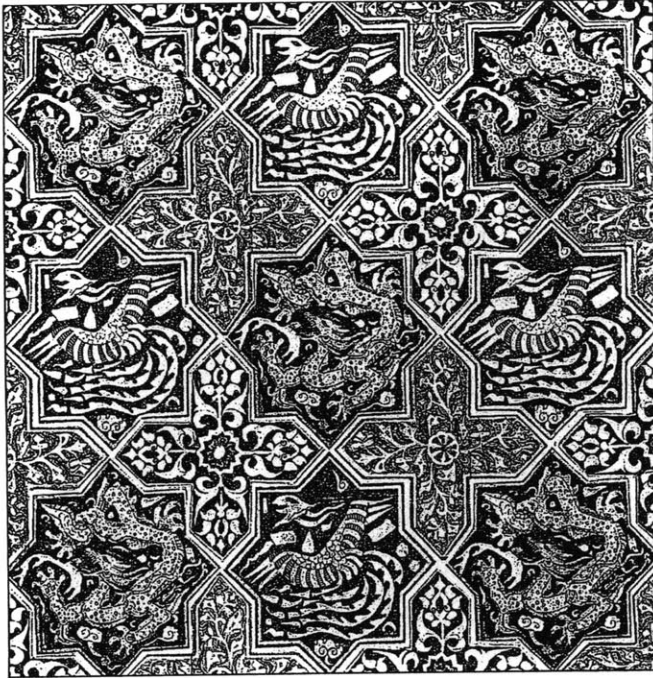


Fig.12. Star and cross lustre tile panel: Palace of Abaqa Khan Takht-i Suleyman, Iran, (1265-1282).

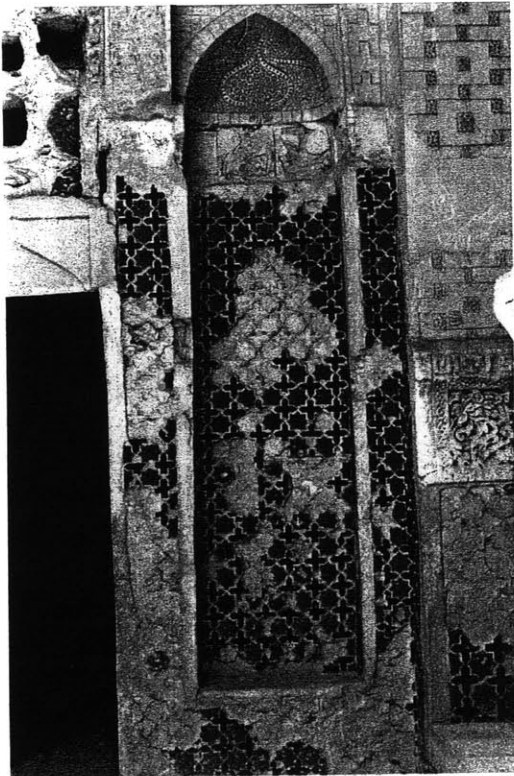


Fig.13. Tiled niche in northern Iwan: Pir-i Bakran, Iran, (1310).

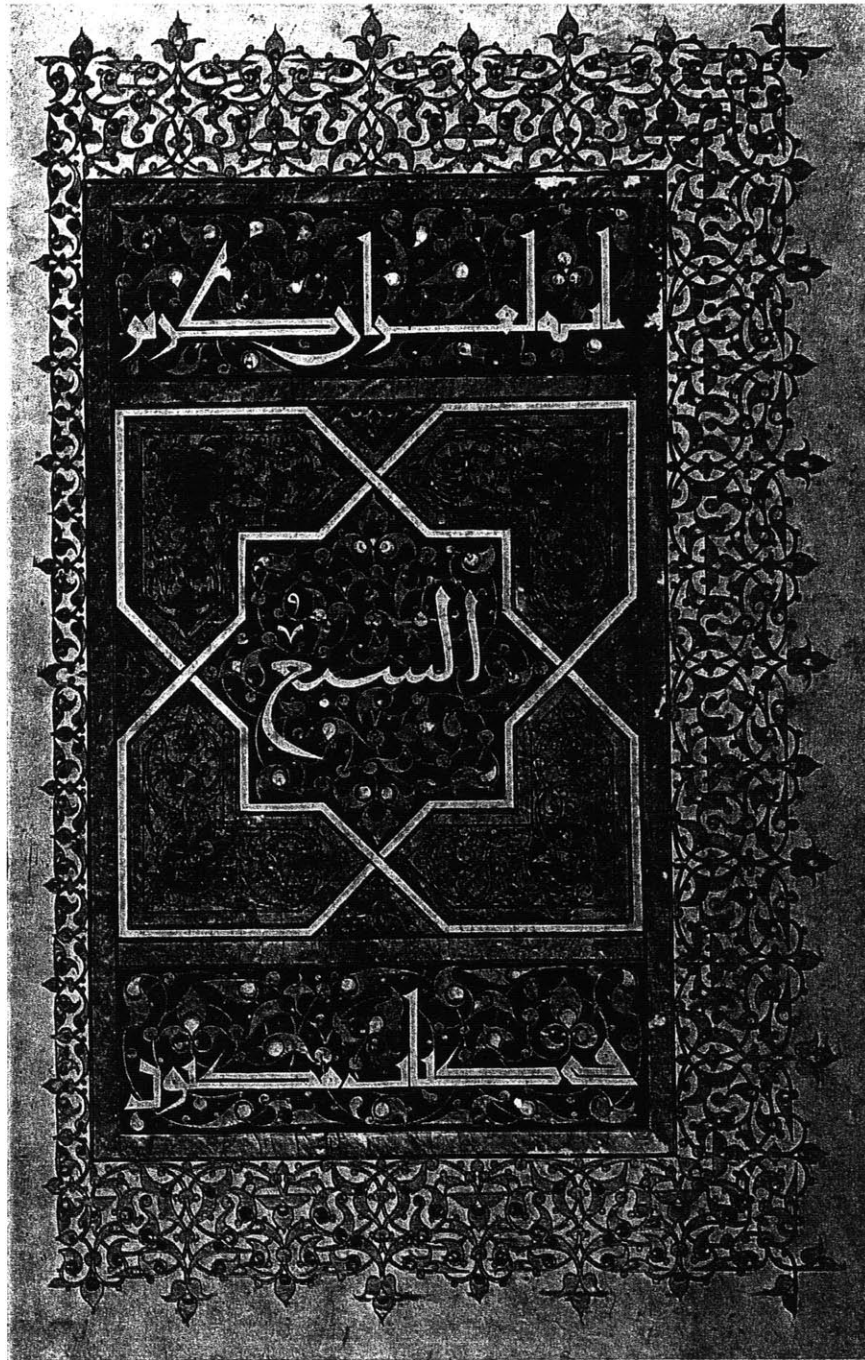


Fig.14. Frontispiece (original page: 47.5x 32cm) from vol. 1 of a 7 vols. Quran written and illuminated in Cairo, for the Rukn ad-Din Baybars al-Jashankir. Colophon credits: Muhammad ibn Mubadir and Aydughi ibn Abdallah al-Badri as illuminators, and Muhammad ibn al-Wahid as scribe, (704/1304).



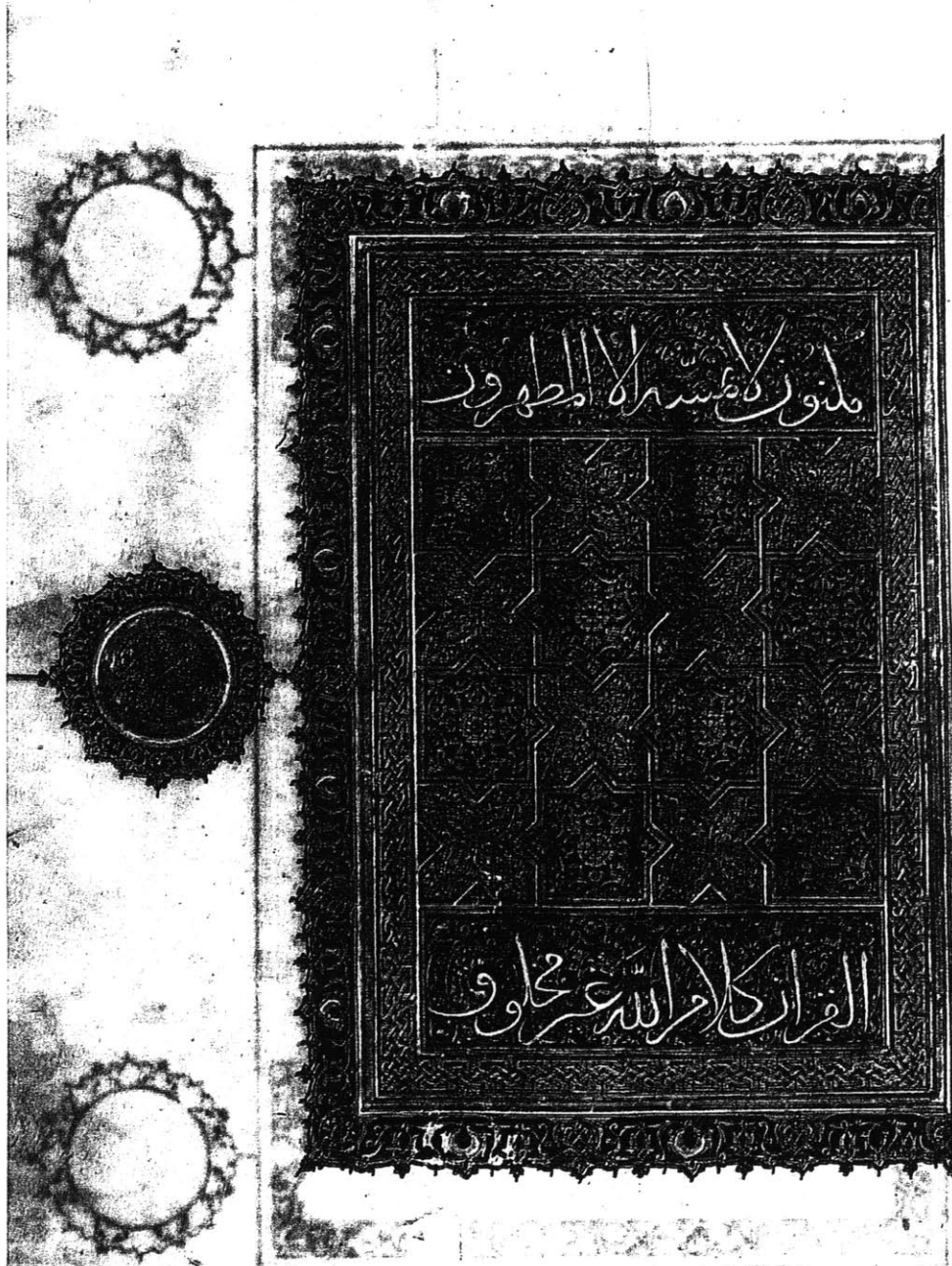


Fig.15. Left hand frontispiece (original page: 57 x 37cm.) from part twenty-six of thirty- part Quran written and illuminated in Tabriz , for the Ilkhanid vizier Rasid al-Din Fadlallah.

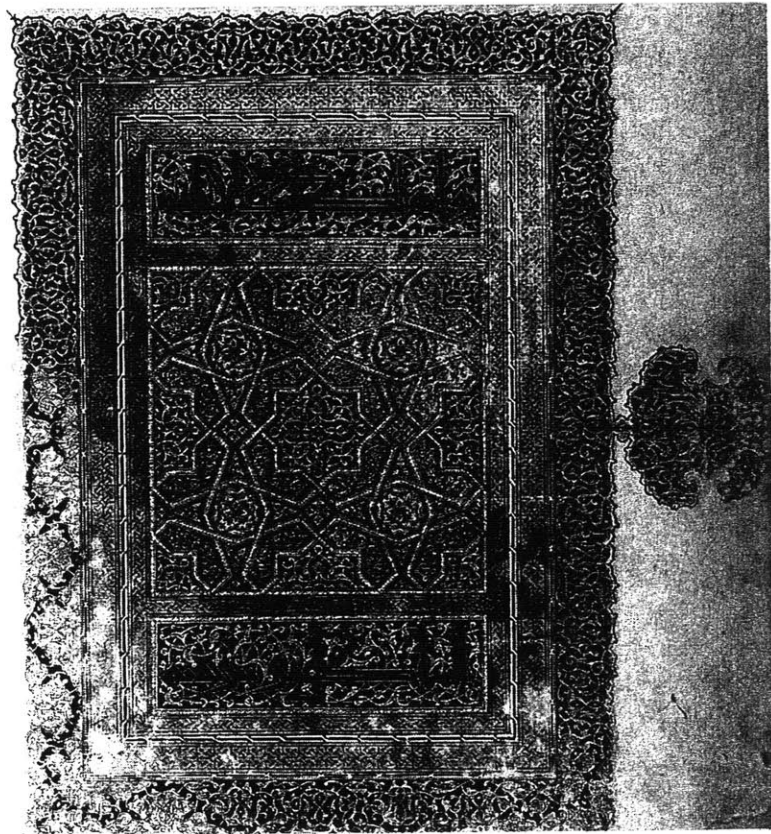


Fig. 16. Right hand frontispiece (original page: 50 x 35cm.) from part two of a thirty- part "Anonymous Baghdad Quran," perhaps begun for the Ilkhanid Sultan Ghazan Khan.

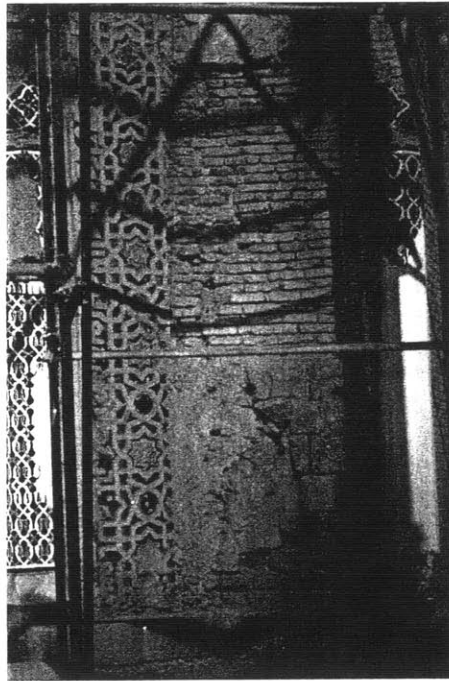


Fig. 17a. Partial fragment of epigraphic panel, Kufic with star and polygonal extension, surface 1, bay 8: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

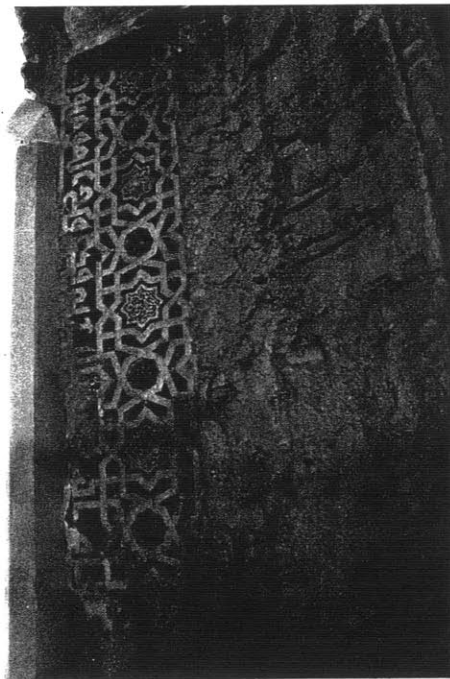


Fig. 17b. Partial fragment of epigraphic panel, Kufic with star and polygonal extension, surface 1, bay 3: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

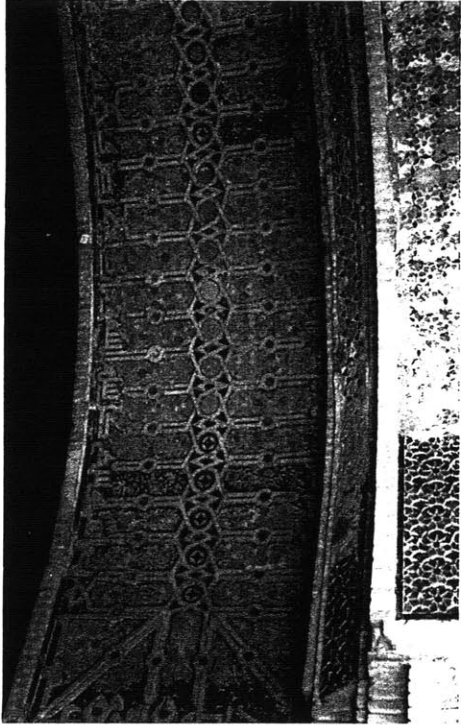


Fig.18. Detail of Intrados of arch, surface 3, bay 6: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

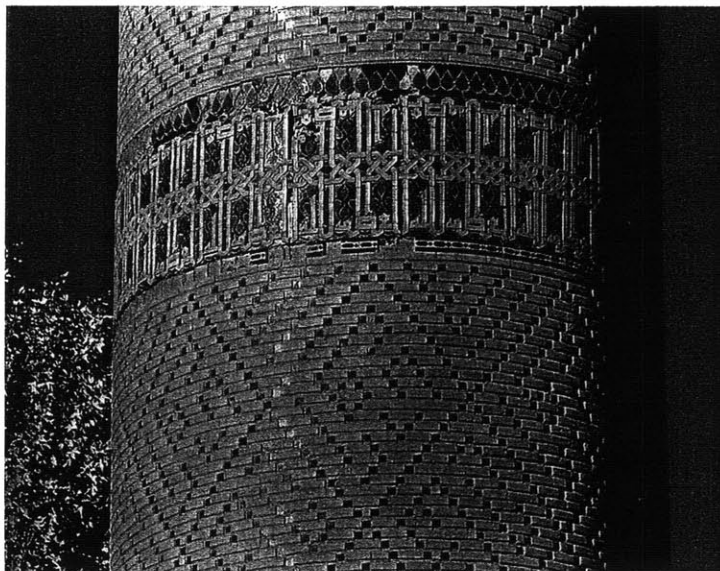


Fig.19. Band of knotted Kufic writing on minaret: Shrine complex of Abd al-Samad, Natanz (1304).

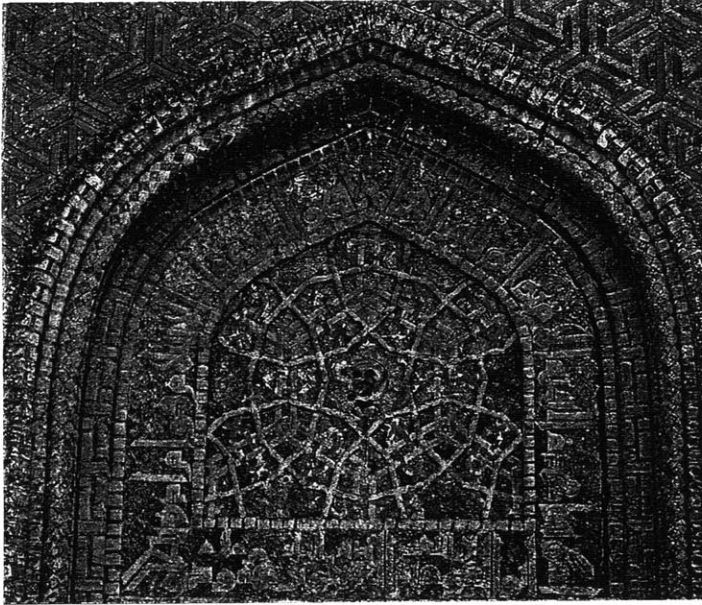


Fig.20 Detail of portal:  
Gunbad-i Surkh, Maragha,(1147-48)



Fig.20 Detail of portal:  
khanaqah at Shrine of Abd al-Samad (1304)



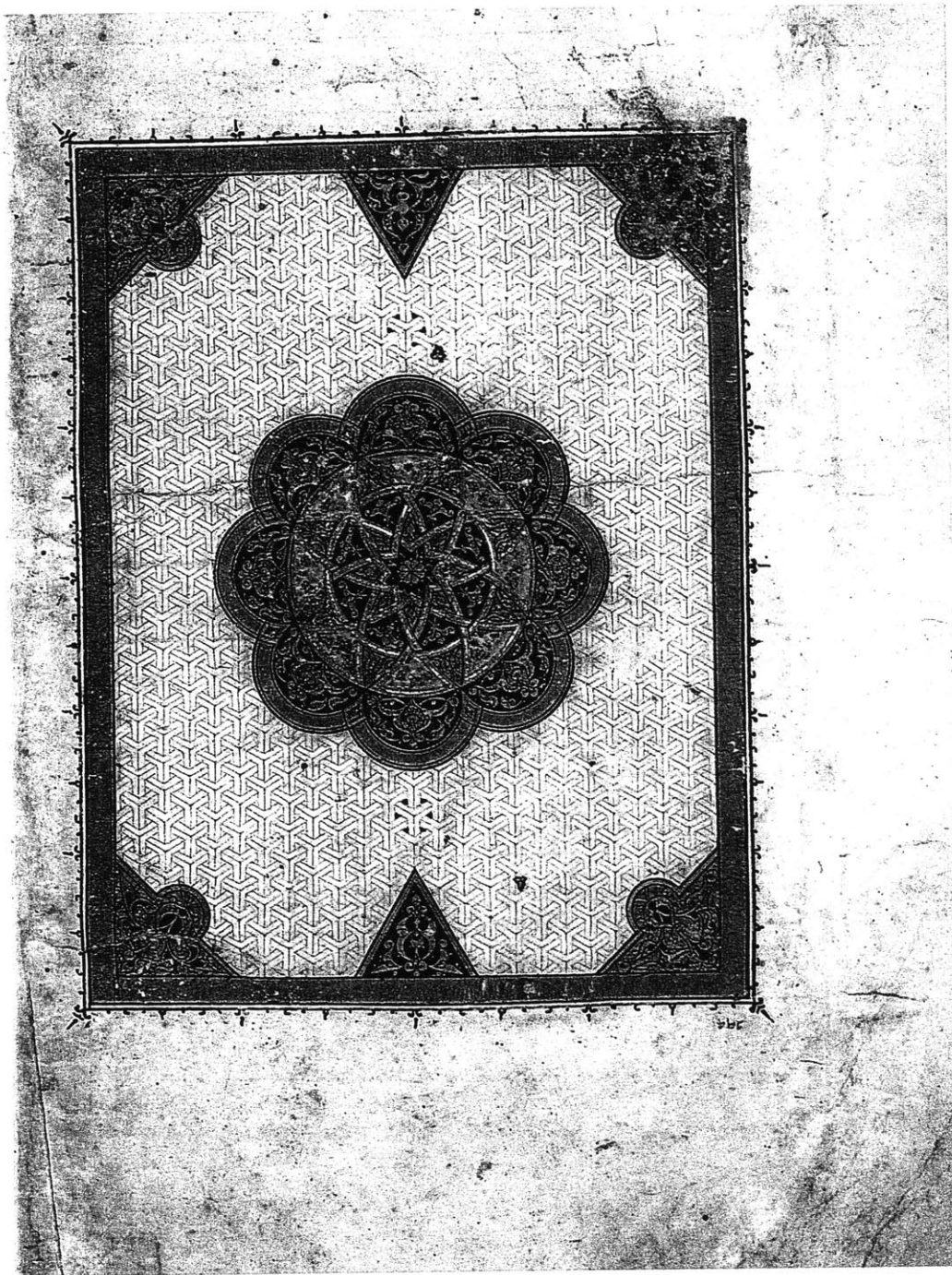


Fig. 22. Finispiece (original page: 35 x 25cm) from Quran written and illuminated in Cairo, for an unknown patron. Colophon credits: Muhammad ibn Mubadir as illuminator, and Muhammad ibn Abdallah ibn Ahmad al-Ansari al-Khazraji as scribe, (1306-15).



Fig.23. Opening page of text (original page: 47.5x 32cm) from vol. four of a seven volumes. Quran written and illuminated in Cairo, for Rukn ad-Din Baybars al-Jashankir. Colophon credits: Muhammad ibn Mubadir and Aydughi ibn Abdallah al-Badri as illuminators, and Muhammad ibn al-Wahid as scribe, (704/1304).

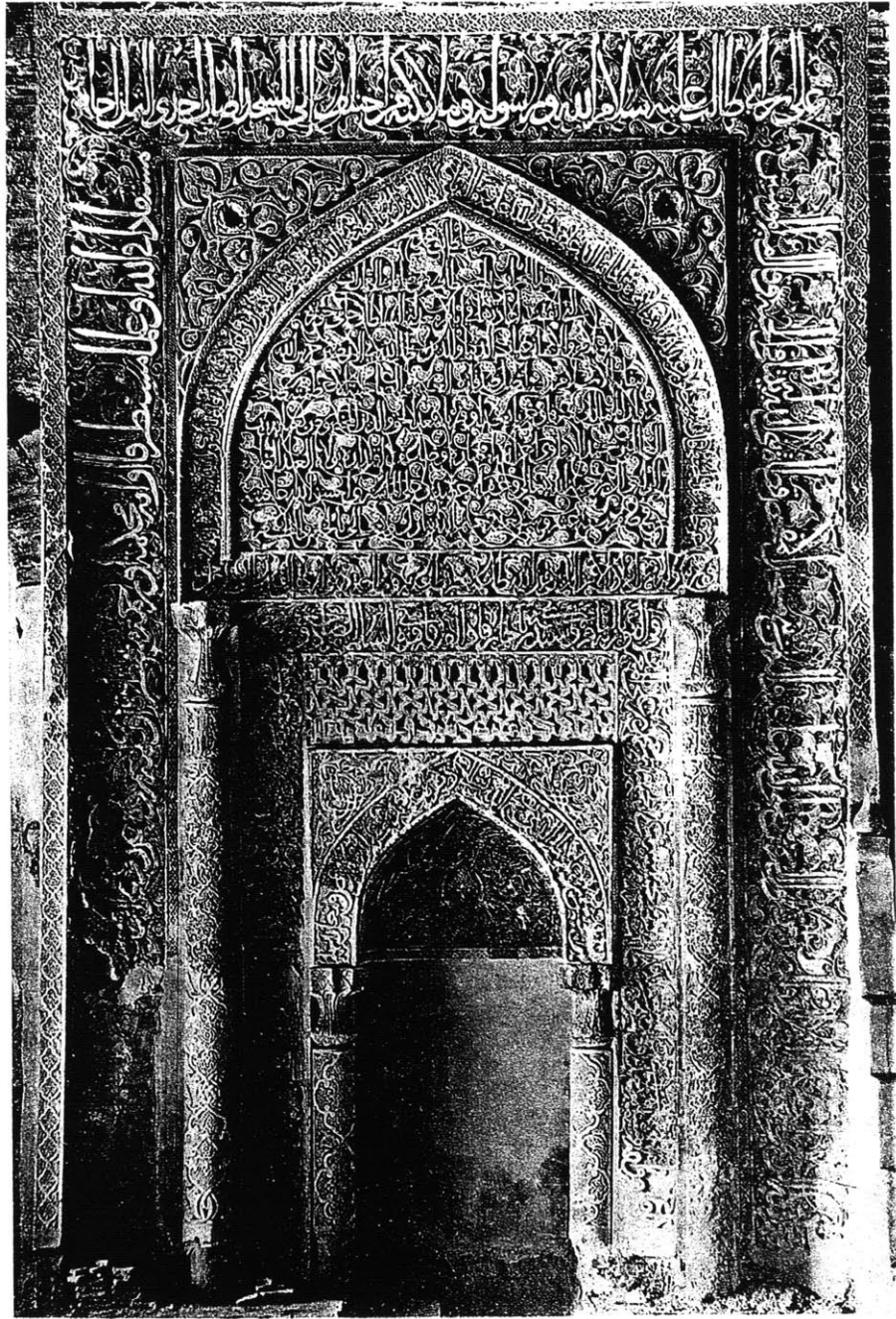
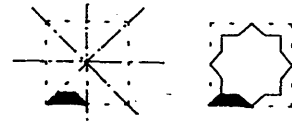
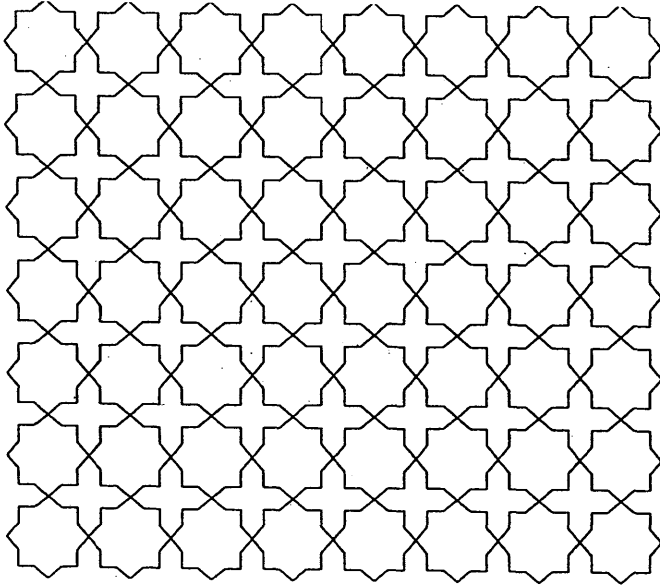
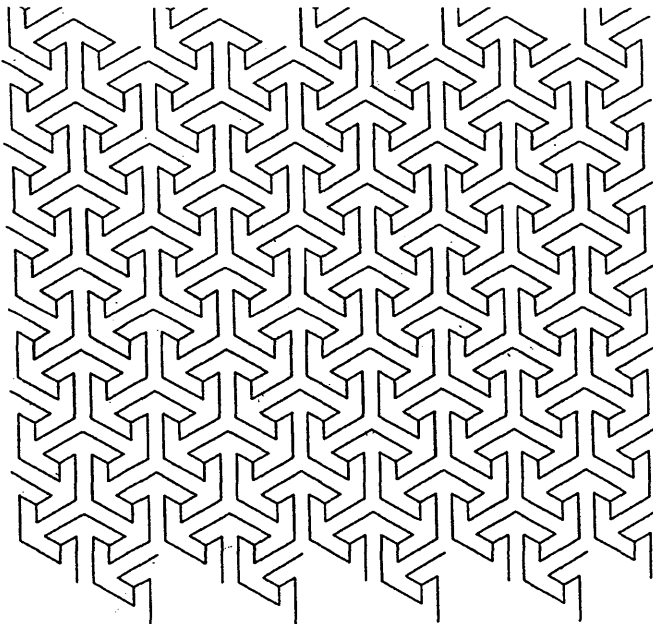


Fig.24. Mihrab of Sultan Uljaytu, (1310): Masjid-i Jami, Isfahan.





25a. Analytical diagram of Star Cross pattern



25b. Analytical diagram of Three Pronged Arrow

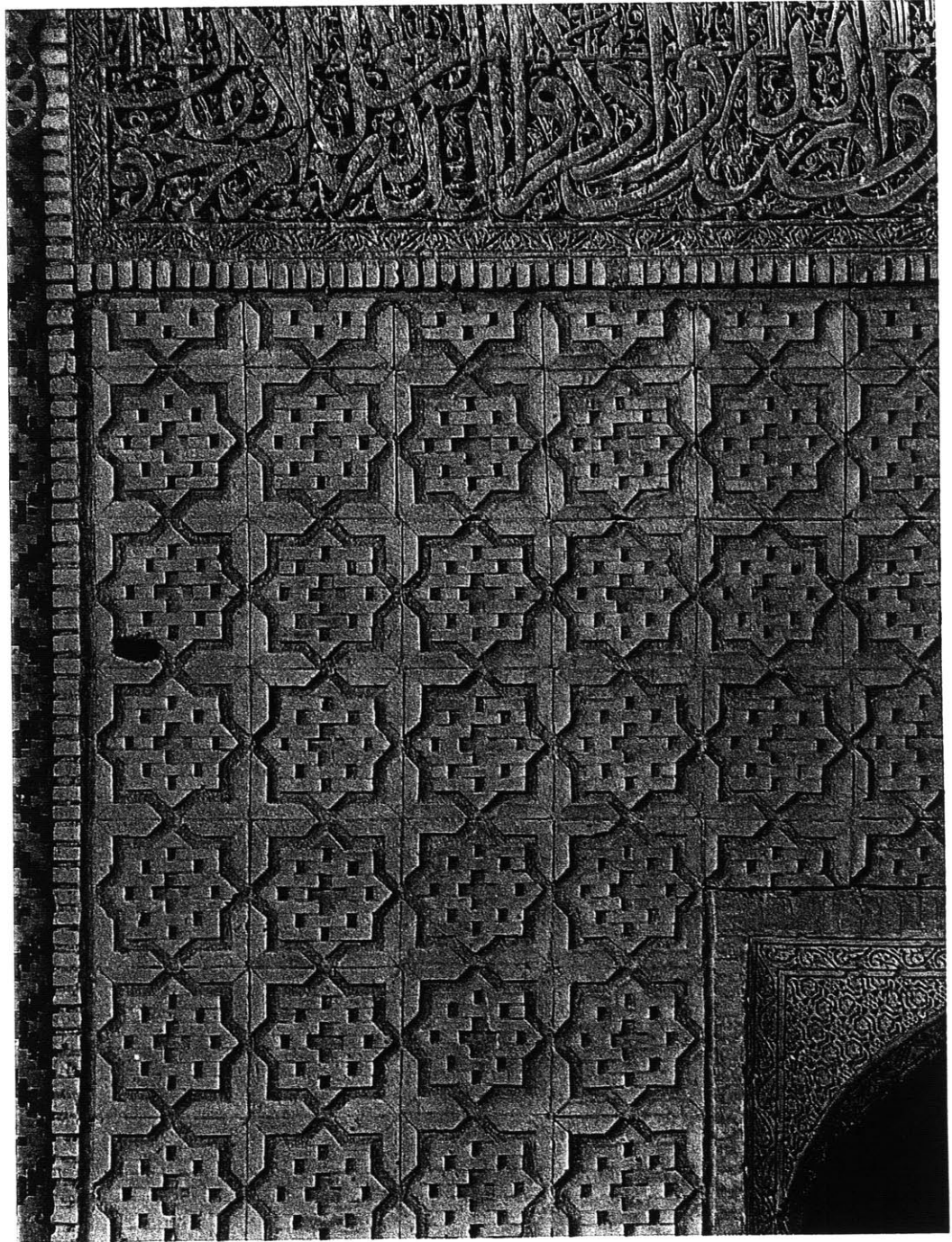


Fig. 26. Star and cross terracotta tile surface in Iwan, Masjid-i Jami, Varamin,

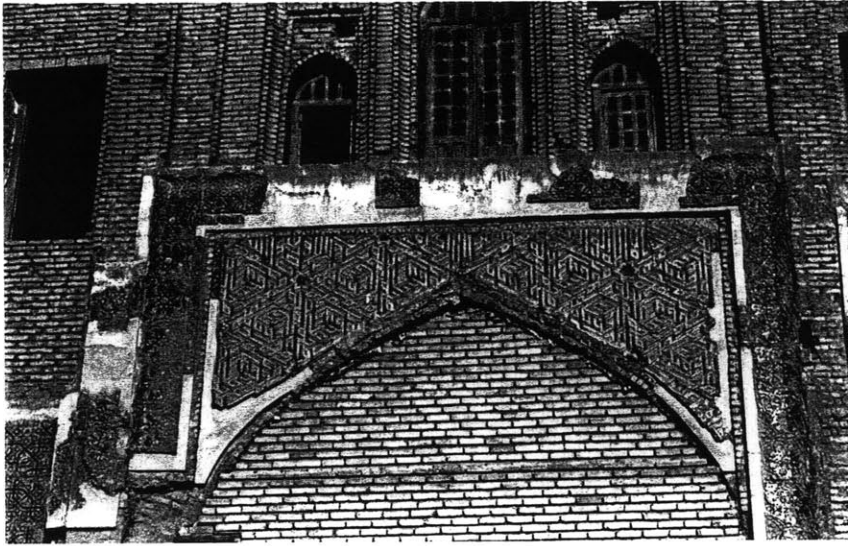


Fig. 27. East portal, exterior detail of spandrel:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

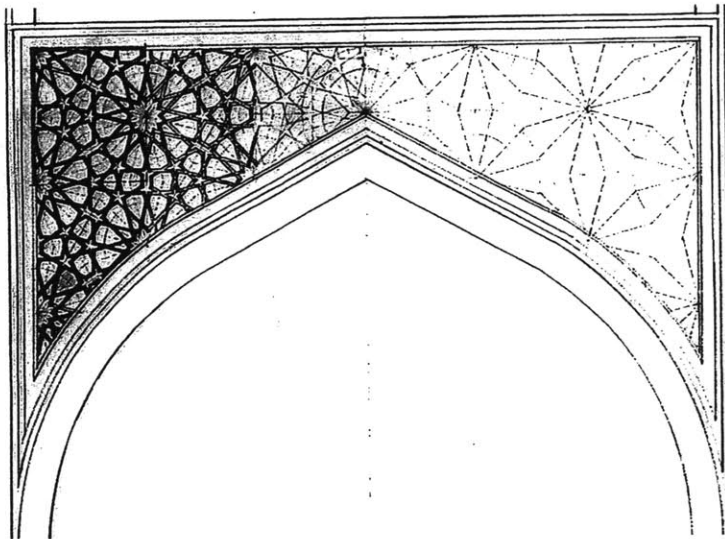


Fig. 28. Interior spandrel above lower arch, bay 6:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

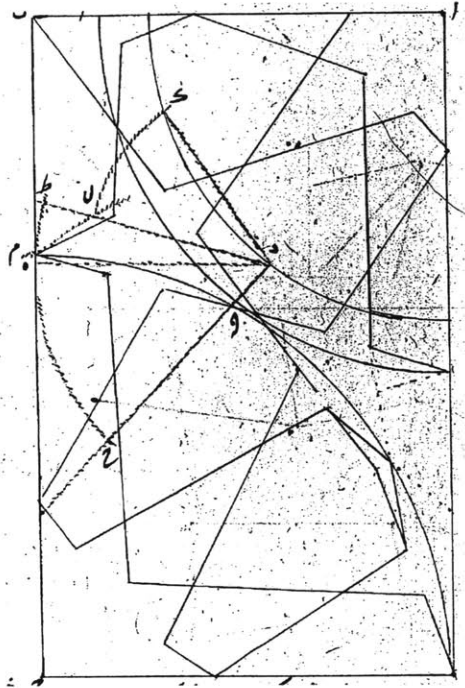


Fig. 29. Page showing ten and twelve pointed star pattern:  
Fi tadakhul al- ashkal al-mutashabiha aw al-mutawafiq  
(eleventh to thirteenth-century)

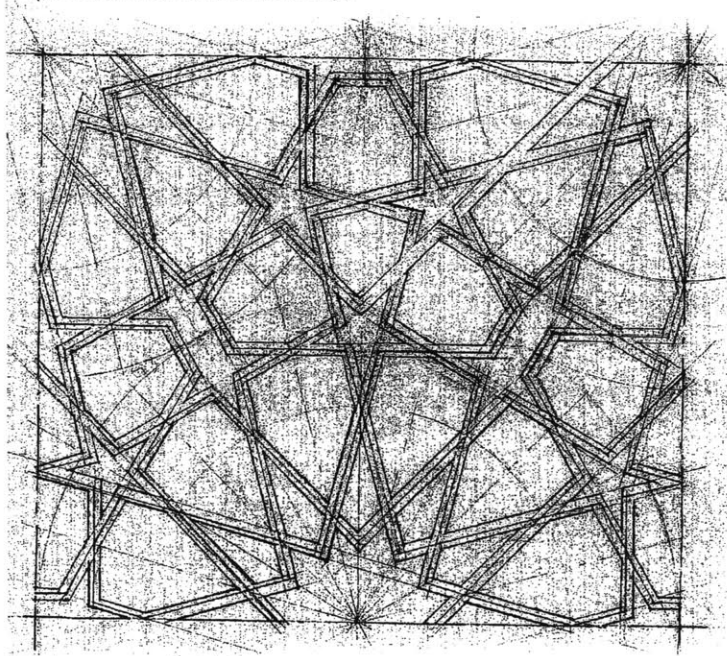
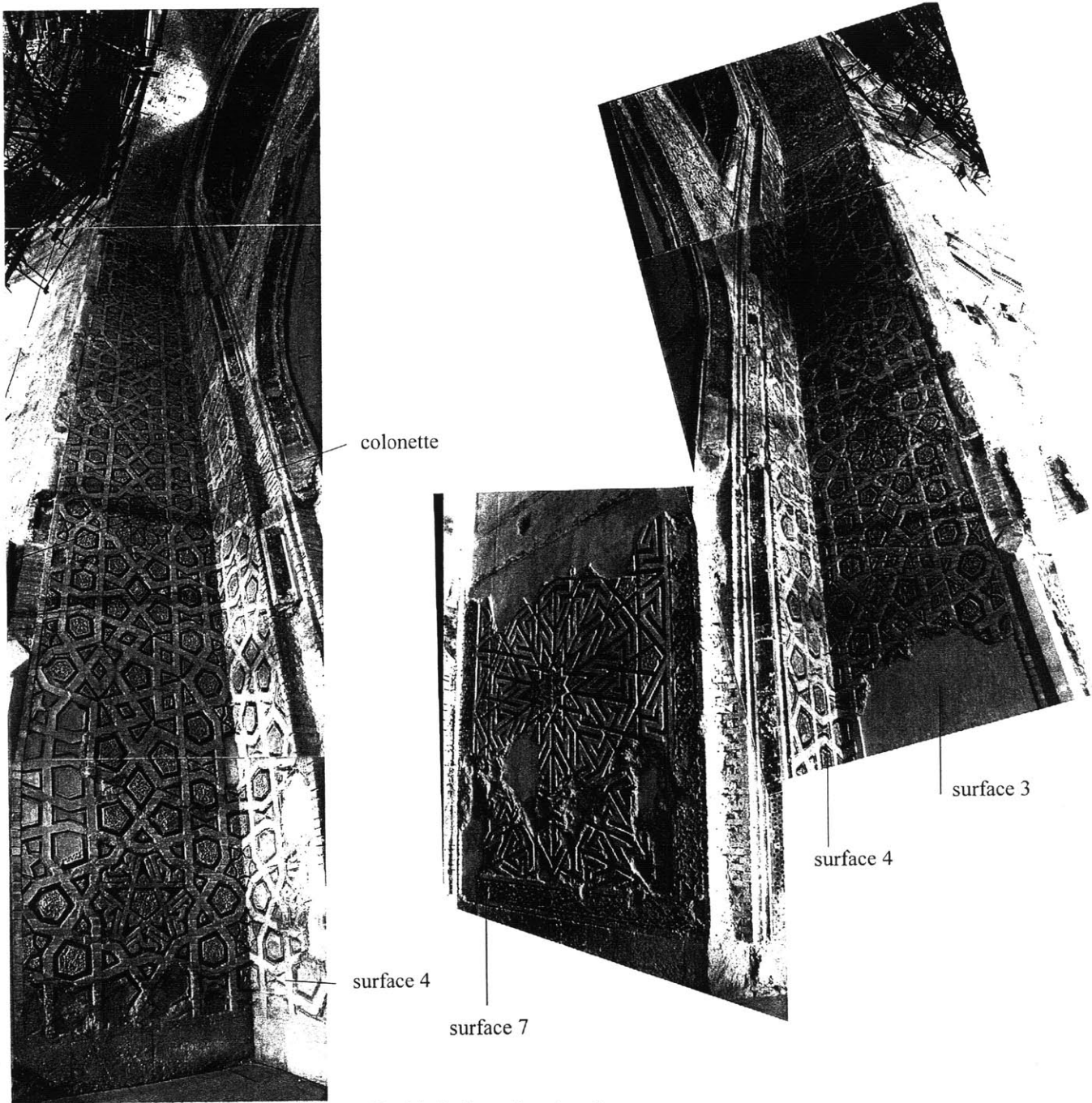


Fig. 30. Analytical detail of spandrel from bay 6 (fig.28):  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).



colonette

surface 3

surface 4

surface 4

surface 7

Fig. 31. Collage view, bay 4:  
Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

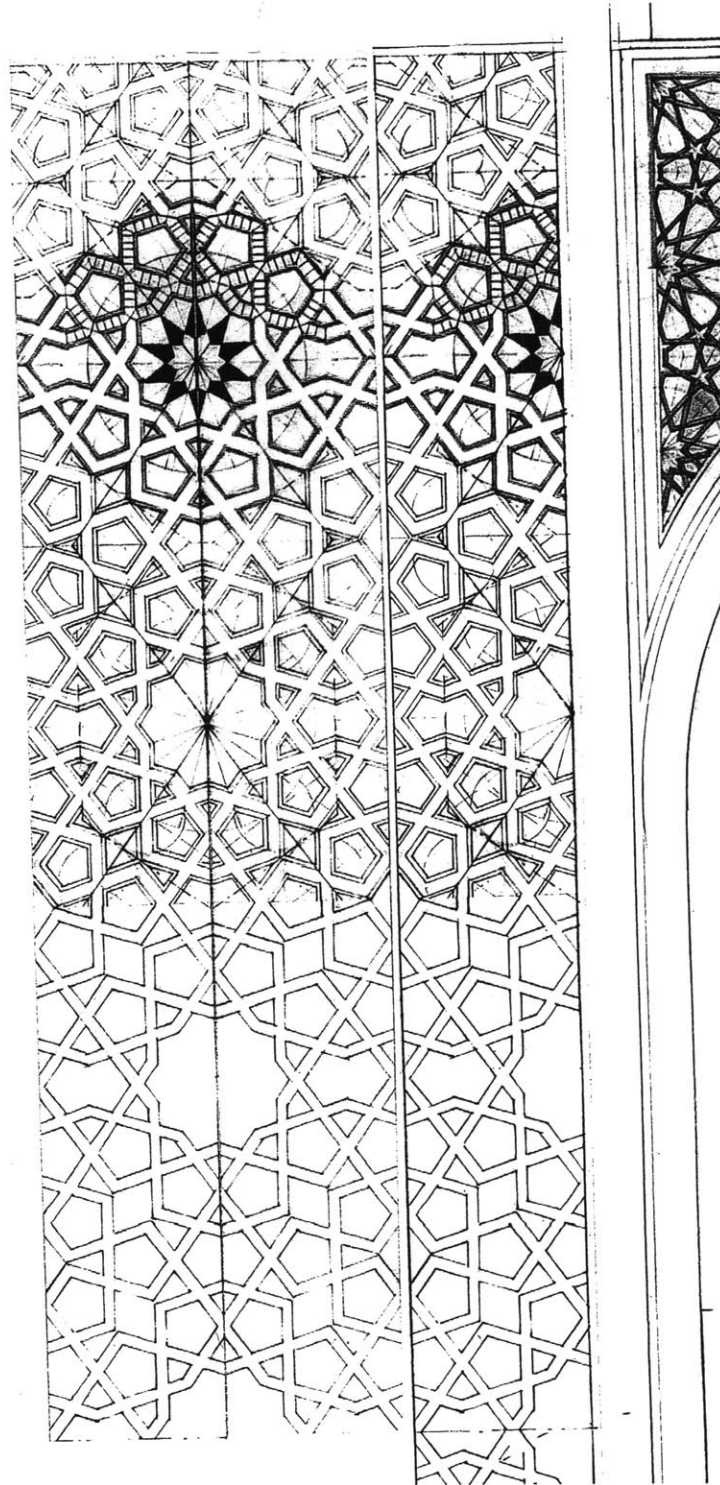


Fig.32. Drawing of surfaces 3 and 4, bay 6: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).



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Fig.1. Plan showing orientation and numbering of bays: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Ink drawing from: Progetto di Restuaro del mausoleo di Olgietu a Soltanieh  
Prof. Ing. Arch. Piero Sanpaolesi; Collaboratore Dott. Arch Reza Kassai.

Fig.2. Sketch of typical bay, numbering of surfaces: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Drawing by: Lionel Bier. After Sims, "Internal Decoration," and Blair, "Epigraphic program."

Fig.3a. North Elevation: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Ink drawing from: Progetto di Restuaro del mausoleo di Olgietu a Soltanieh,  
Prof. Ing. Arch. Piero Sanpaolesi; Collaboratore Dott. Arch Reza Kassai.

Fig. 3b. North view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author

Fig. 4a. East Elevation: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Ink drawing from: Progetto di Restuaro del mausoleo di Olgietu a Soltanieh,  
Prof. Ing. Arch. Piero Sanpaolesi; Collaboratore Dott. Arch Reza Kassai.

Fig. 4b. East view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author

Fig. 5a. West Elevation: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Ink drawing from: Progetto di Restuaro del mausoleo di Olgietu a Soltanieh,  
Prof. Ing. Arch. Piero Sanpaolesi; Collaboratore Dott. Arch Reza Kassai.

Fig. 5b. West View: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author

Fig. 6. View: Gunbad-i Kabud, Maragha, Iran, (1196-97)

Photograph from: Sonia P. Scherr-Thoss and Hans C. Sherr-Thoss, *Design and Color in Islamic Architecture*, Plate 34.

Fig.7. Page (original page: 56.5x 41cm) from the frontispiece to part 22 of a Quran in 30 volumes written and illuminated in Hamadan.

Colophon credits: Abd Allah Muhammad al-Hamadani, 713/1313 as illuminator and calligrapher.

Illustration from: Martin Lings, *The Quranic Art*, Plate 59.

Fig.8. Partial view of surface 7, bay 4, interior: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph from: Pope, *Persian Architecture* Plate 4.

Fig.9. Isometric view: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Ink drawing by: Marcella Giutini, from: Progetto di Restuaro del mausoleo di Olgietu a Soltanieh, Prof. Ing. Arch. Piero Sanpaolesi; Collaboratore Dott. Arch Reza Kassai.

Fig.10. Plaster tablet incised with quarter plan of muqarnas vault: Takht-i Suleyman, Iran, (1270).

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Photograph from: Eva Baer, *Islamic Ornament*, Plate 46.

Fig.13. Tiled niche in northern Iwan: Pir-i Bakran, Iran, (1310).

Photograph by: Author.

Fig.14. Frontispiece (original page: 47.5x 32cm) from vol. 1 of a 7 vols. Quran written and illuminated in Cairo, for the Rukn ad-Din Baybars al-Jashankir.

Colophon credits: Muhammad ibn Mubadir and Aydughi ibn Abdallah al-Badri as illuminators, and Muhammad ibn al-Wahid as scribe, (704/1304).

Illustration from: Martin Lings, *The Quranic Art*, Plate 62.

Fig.15. Left hand frontispiece (original page: 57 x 37cm.) from part twenty-six of thirty- part Quran written and illuminated in Tabriz, for the Ilkhanid vizier Rasid al-Din Fadlallah.

Colophon credits: Abdallah al-Tuvi al-Rudravari as scribe (715/ 1315).

Illustration from: David James, *Qurans of the Mamluks*, Fig. 83, cat.46.

Fig.16. Right hand frontispiece (original page: 50 x 35cm.) from part two of a thirty- part “Anonymous Baghdad Quran,” perhaps begun for the Ilkhanid Sultan Ghazan Khan.

Colophon credits: Ahmad ibn [al-Shaykh] al-Suhrawardi al-Bakri as scribe, and Muhammad ibn Aybak ibn Abdallah as illuminator (715/ 1315).

Illustration from: David James, *Qurans of the Mamluks*, Fig. 58, cat.39.

Fig.17a. Partial fragment of epigraphic panel, Kufic with star and polygonal extention, surface 1, bay 8: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author.

Fig.17b. Partial fragment of epigraphic panel, Kufic with star and polygonal extention, surface 1, bay 3: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author.

Fig.18. Detail of intrados of arch, surface 3, bay 6: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author.

Fig.19. Band of knotted Kufic writing on minaret: Shrine complex of Abd al-Samad, Natanz (1304).

Photograph from: Scherr-Thoss, *Design and Color in Islamic Architecture*, Plate 55.

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Photograph by: Author.

Fig. 22. Finispiece (original page: 35 x 25cm) from Quran written and illuminated in Cairo, for an unknown patron. Colophon credits: Muhammad ibn Mubadir as illuminator, and Muhammad ibn Abdallah ibn Ahmad al-Ansari al-Khazraji as scribe, (1306-15).

Illustration from: David James, *Qurans of the Mamluks*, Fig.28, Cat.4.

Fig.23. Opening page of text (original page: 47.5x 32cm) from vol. four of a seven volumes. Quran written and illuminated in Cairo, for Rukn ad-Din Baybars al-Jashankir. Colophon credits: Muhammad ibn Mubadir and Aydughi ibn Abdallah al-Badri as illuminators, and Muhammad ibn al-Wahid as scribe, (704/1304).

Illustration from: David James, *Qurans of the Mamluks*, Fig.26, Cat.1.

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Fig. 26. Star and cross terracotta tile surface in Iwan, Masjid-i Jami, Varamin, (1322).

Photograph from: Scherr-Thoss, *Design and Color in Islamic Architecture*, Plate 31.

Fig. 27. East portal, exterior detail of spandrel: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photograph by: Author.

Fig. 28. Interior spandrel above lower arch, bay 6: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Drawn by: Author.

Fig. 29. Page showing ten and twelve pointed star pattern: *Fi tadakhul al- ashkal al-mutashabiha aw al-mutawafiqa* (eleventh to thirteenth-century)

Copied from: Necipoglu, *Topkapi Scroll*, p.147. Original at Bibliotheque Nationale de France, Paris, MS Persan 169, fol. 195v.

Fig. 30. Analytical detail of spandrel from bay 6 (fig.28): Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Drawn by: Author.

Fig. 31. Collage view, bay 4: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Photographed by: Author.

Fig.32. Drawing of surfaces 3 and 4, bay 6: Mausoleum of Uljaytu, Sultaniyya, Iran, (1304-1316).

Drawn by: Author