THE ROLE OF MOVEMENT IN MEDIEVAL ISLAMIC
COSMOLOGY AS DEMONSTRATED BY
ASTROLABES AND DOMES

A Thesis
Presented
To the Faculty of
California State University, Chico

In Partial Fulfillment
Of the Requirements for the Degree
Master of Arts
in
Art

by
© Sydney Williams 2012
Spring 2012
THE ROLE OF MOVEMENT IN MEDIEVAL ISLAMIC
COSMOLOGY AS DEMONSTRATED BY
ASTROLABES AND DOMES

A Thesis
by
Sydney Williams
Spring 2012

APPROVED BY THE DEAN OF GRADUATE STUDIES
AND VICE PROVOST FOR RESEARCH:

__________________________
Eun K. Park, Ph.D.

APPROVED BY THE GRADUATE ADVISORY COMMITTEE:

__________________________
Cameron Crawford, MFA
Graduate Coordinator

__________________________
Asa Mittman, Ph.D., Chair

__________________________
Matthew Looper, Ph.D.
PUBLICATION RIGHTS

No portion of this thesis may be reprinted or reproduced in any manner unacceptable to the usual copyright restrictions without the written permission of the author.
ACKNOWLEDGMENTS

In many ways, earning my Masters Degree in Art History has brought me full circle in my life. Originally in love with studio art as a child, I took a seven-year hiatus from the world of art to pursue an education in Chemistry at the high school and undergraduate levels. Upon completion of my Bachelors Degree in Chemistry and Biochemistry, however, I found myself drawn back to art in the form of art conservation, a field that I believe perfectly balances my love of both art and science. Originally intending to stay at California State University, Chico for only a few semesters in order to fulfill requirements to apply to a graduate level conservation program, it was Dr. Asa Mittman who scolded me for wasting my potential and pushed me to apply for the Masters program. Without him, not only would this thesis not have been finished, it would have, in fact, never been started.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Introduction</td>
</tr>
<tr>
<td>II.</td>
<td>Literature Review</td>
</tr>
<tr>
<td>III.</td>
<td>Methodology</td>
</tr>
<tr>
<td>IV.</td>
<td>Discussion of the Research</td>
</tr>
<tr>
<td></td>
<td>Visual Representations of the Religious Structure of the Universe in Ancient Rome and Medieval Christianity</td>
</tr>
<tr>
<td></td>
<td>Astrology and the Islamic Structure for Effecting Change in the Universe</td>
</tr>
<tr>
<td></td>
<td>Sufism and the Nature of Physical Reality</td>
</tr>
<tr>
<td></td>
<td>The Phenomenon of Moveable Maps</td>
</tr>
<tr>
<td></td>
<td>The Effects of Scale</td>
</tr>
<tr>
<td>V.</td>
<td>Conclusion</td>
</tr>
<tr>
<td>Bibliography</td>
<td></td>
</tr>
</tbody>
</table>
This thesis is a historical and cultural contextualization of both the astrolabe and the dome in medieval Islamic lands with particular emphasis on the relation of the forms of these objects to spatial organization in Muslim cosmology. Through a comparison of Muslim literature and science and Sufi philosophy, as well as visual analysis of other art objects, it can be demonstrated that astrolabes and domes enable their viewers to interact with the structure of the universe as it was understood in medieval Islam. In order to fully understand the quality of this interaction, phenomenology is employed in order to demonstrate that the experience of these objects hinges upon the ability of the viewer not only to contemplate how both of these objects are themselves moveable, but also to physically and/or imaginatively move him or herself through space in relation to them.
CHAPTER 1

INTRODUCTION

When one wishes to visualize his or her position in the world, one generally consults a map. Although this may seem a reasonable measure to take, modern-day reliance on satellite imagery, radar data, and the entire notion of “global positioning” has obscured the fact that people did not always think of their place on the earth in such a narrow manner. As J. B. Harley has demonstrated, maps have not always been preoccupied with geographic accuracy, but rather have been utilized as devices to spatially organize knowledge, which is itself contingent upon the culture producing the map. While scholars such as Harley have introduced new methodologies for reading the information maps contain, these innovative approaches simultaneously allow for the expansion of the definition of the map itself. Looking at medieval Islamic culture, this thesis proposes that a variety of objects acted to structure an individual’s spatial awareness of his or herself in relation to the universe. However, in considering the cases of both planispheric astrolabes (popular scientific and practical instruments of the Middle Ages) and decorated domes, it becomes apparent that these objects functioned in a capacity beyond mere spatial diagrams for their viewers. The reliance of these objects on the viewer’s own ability to manipulate or move through space enables one in his or her

interaction with the object to perform as part of a replication of the structure of the medieval Islamic universe that, although ever present, was normally invisible behind or underneath the surfaces of one’s everyday experience. Thus, both of these classes of objects give one access not just to a visualization of one’s place in the cosmos, but actually re-enact the process by which that cosmos operates.

Astrolabes and domes have both long been associated with the sky in western civilization, and, in some occasions, have been treated as forms of celestial maps through their decoration with stars and constellations. While one may even categorize astrolabes themselves as a type of star map, they are technically analogue computers, used to calculate quantities such as the time of day, or when the sun would set. This distinction is made clear by the fact that unlike planispheres (actual star maps), astrolabes cannot be superimposed onto the night sky because they are actually a mirror image of the stars’ locations. To illustrate this point, one can imagine making a road map large enough that it could lay on top of actual highways and interstates; however, no matter how large of an astrolabe one made, it could never be placed “onto” the sky because stereographic projection, the mathematical modeling technique utilized to translate the location of objects in three dimensions onto the two dimensional surface of the astrolabe, maps the stars as if one was looking through the heavens down to earth, rather than from the earth up into the heavens.

In addition to the mirror-image aspect of astrolabes, these instruments are also unique among map-like objects due to their numerous moveable parts. Because stars complete a full rotation across the sky during a twenty-four hour period, if astrolabes
were static, they would only mark a star’s location at a single moment in time. This problem was solved by making the surface of an astrolabe, termed a “rete,” also capable of rotation, thus enabling an astrolabe to show all of the conceivable locations of the stars. The term the Arabs used for this piece of the instrument actually translates as “spider,” most likely because, rather than being a solid plate of brass, it is instead a net-like structure often featuring several thorn-like protrusions that act as star pointers. Beneath the rete, and visible through its cut-outs, sits a plate inscribed with latitude lines for making calculations from the specific locale where the viewer is positioned. Because of the phenomenon that as one moves up or down the earth in latitude the stars are located at slightly different positions in the sky, early astrolabe makers often manufactured a set of plates for a single instrument, otherwise an entirely new instrument would have been required every time one travelled. Interestingly, although astrolabes often featured multiple plates for a variety of the larger cities of the Islamic empire (for example, Mecca, Medina, Cairo, Heart, Samarqand, etc.), over time it became common for an astrolabe to have a total of seven latitude plates, each one symbolically associated with one of the earth’s seven climates, a concept derived from classical philosophers that persisted throughout the medieval West. Thus, an astrolabe consists of the body of the instrument (termed the *mater* in Latin), which holds the stack of latitude plates made for the instrument, with the top plate corresponding to one’s current location. The rete is then
placed on top of the assemblage and a pin passed through all of the pieces to hold them together while still allowing the rete to turn over the plate below.²

While the mathematical processes necessary for creating astrolabes existed in ancient Greece, no extant instruments date before the early centuries of Islam, although several hundred of the astrolabes made by medieval Muslim artisans still exist today.³ It is believed that the technology required to manufacture astrolabes migrated from the Classical-era Mediterranean into Muslim lands in the same manner as domes, namely through interaction with Syrian Christians.⁴ At the same time that these groups of Christians were emulating the domed martyrria and memorials of the Roman Empire in their architectural efforts,⁵ scientific and philosophical manuscripts in the original Greek were also being imported into the region. Evidence of the speed at which both of these resources were adopted by the growing Muslim culture can be found in the first great monument of Islam, which was nothing less than the Dome of the Rock (691 CE), as well as in the fact that by the middle of the eighth century, the Abbasid caliph al-Mansur patronized three astronomers who wrote original treatises on astrolabes⁶ based on

---

³ David A. King, World Maps for Finding the Direction and Distance to Mecca (Boston: Brill, 1999), 4-5.
⁵ Andre Grabar, Martyrium, recherches sur le culte des reliques et l’art chretien antique (Paris: College de France, 1946), passim.
translations of Ptolemy’s *Almagest*. One of these astronomers, Massa’allah, would remain the most widely read authority on astrolabes until the publication of Geoffrey Chaucer’s 1391 manuscript, *A Treatise on the Astrolabe* (which utilized a compilation of treatises that had been historically attributed to Massa’allah as its primary source).

Although the publishing of Edward Said’s *Orientalism* and recent political events in the Middle East have spurred interest in Islamic studies in the last few decades, investigations into Islamic art history have generally been concerned more with documenting the historical facts surrounding objects rather than engaging with them as representative of wider cultural concerns of medieval Muslims. This thesis, however, aims to consider how both astrolabes and domes, inherited at roughly the same time from the same cultural background, took on unique cosmographical symbolisms through their historical development within Islamic culture. Rather than writing each object into its own separate discourse within the history of science or the history of architecture, this work constructs a dialogue between these objects in order to demonstrate the manner in which their shared experiential qualities enable them to express the same uniquely Muslim conception of the cosmos.

---

CHAPTER II

LITERATURE REVIEW

A wide variety of sources were consulted for this thesis in an attempt to recreate the intersection of culture, history, and technology that fostered the environment in which the objects under consideration were created. In addition to both modern and medieval treatises on the history of architecture and scientific development in Islam and the Classical era, sources that engaged with related aspects of Islamic art, particularly those concerned with objects depicting illustrations of or references to astrolabes or domes, were also investigated. Well known cultural and religious texts from medieval Islam, including the Qur’an and popular works of literature and philosophy, constitute a third category of source material that enabled an investigation into the vibrant religious and intellectual background of these objects. Lastly, phenomenological studies of architecture and objects were consulted in order to grapple with the concept of how humans interact with objects that organize perception of space and scale.

Given the importance of time-sensitive activities in Islam, including the five daily prayers and the fasting of Ramadan, a fair amount of modern scholarship has been devoted to traditional Muslim horography. As instruments that could determine both direction and time, astrolabes were highly popular in medieval Islamic society, and several scholars have devoted their careers to studying the development of the mathematical and astronomical knowledge required to construct such objects. In
particular, two scholars stand out in this field, Paul Kunitzsch and David A. King, both of whom are historians of science and technology. Although collected volumes of both of these authors works\textsuperscript{10} provide a valuable foundation in understanding how astrolabes were introduced to, disseminated throughout, and developed within Islamic lands, these and other historical studies of the Islamic astrolabe lack an approach to these objects from an artistic point of view. Given the nature of many of these astrolabes as precious objects, sources such as Eva Baer’s *Metalwork in Medieval Islam*,\textsuperscript{11} which investigates the history and symbolism of elite metalwork by Muslim artisans of the Middle Ages, were essential in a reconsideration of these works as objects of art rather than as tools of science.

On the other hand, art historical studies of Islamic architecture are abundant, as many scholars of Islamic material culture have turned to the building to fill the “fine art” gap created by the Muslim aversion to (but not lack of, as shall be discussed below) the depiction of the human figure. Narrowing the focus to studies that exclusively investigate the architectural form of the dome, there are several comprehensive studies, such as Karl Lehmann’s article “The Dome of Heaven”\textsuperscript{12} and E. Baldwin Smith’s monograph *The Dome: A Study in the History of Ideas*,\textsuperscript{13} which attempt to fit the Islamic tradition into architectural history. Although these authors and other art historians agree upon a symbolic, even map-like quality inherent in the universal phenomenon of the dome, those crafted by Muslim artisans are often considered to have a reduced symbolic

\textsuperscript{10} See Bibliography.
capacity due to their lack of figural representation. This conclusion stems from the theory popular among these mid-twentieth-century historians that the heavenly connotations of domes were a result of the use of carpets as celestially-symbolic outdoor canopies in ancient Western cultures. It was argued that the royalty of these civilizations visually constructed the concept of the ruler-in-heaven by presenting themselves beneath an artificial sky (the carpet-canopy, which was embroidered with celestial motifs), thus inserting themselves into a religious cosmological system that was based upon a hierarchy of celestial Gods and heroes. This practice, documented in written records from Imperial Rome, images from ancient Greece, and a surviving Classical text that refers to a similar tradition in ancient Persia (where circular awnings covering royal tents and courts were actually referred to by the term “heaven”),\textsuperscript{14} was believed to have eventually transformed into dome decorative motifs that directly represented human figures on the surface of the ceiling. However, the tradition of decorating domes with arabesque ornament in Islamic buildings was alternatively viewed as a representation of the physicality of the celestial carpet itself, referring directly to the embroidery of the original royal canopies, rather than to the earlier symbolically meaningful juxtaposition of sky and authoritative figure (whether that be god, hero, or ruler).

This interpretation of Islamic dome decoration began to be overturned by the seminal Islamic art historian Oleg Grabar, particularly in his quasi-phenomenological reconsideration of the link between Classical and Islamic domes, which stresses an investigation of the overall effect that viewing a dome has upon an individual rather than

\textsuperscript{14} Lehmann, “The Dome of Heaven,” 11.
the utilization of traditional formalist or iconographical techniques.\textsuperscript{15} The favoring of alternative approaches to Islamic art in order to fully grasp the symbolic meaning of these works has been continued by the most recent scholars of the field, such as Samer Akkach, whose \textit{Cosmology and Architecture in Premodern Islam}\textsuperscript{16} has proven a valuable reference and model for this thesis in its application of religious concepts to architecture.

In addition to considering the development and artistic aspects of astrolabes and domes, an essential part of understanding their place in Islamic society is their employment in other aspects of Muslim life. Given the importance of the Qur’an in Islam, this and other religious texts were invaluable to a cultural contextualization of the role of both architecture and astronomy in medieval Muslim society. Sufi texts in particular, such as those by Ibn Arabi and al Ghazali, were particularly enlightening given their frequent use of material objects, including stars and buildings, as metaphors in religious contemplation and philosophical rhetoric. Their treatment of physical reality and the myriad objects within it as the medium through which God communicates to the everyday individual helps to illuminate a medieval Muslim worldview in which all objects can be contemplated on multiple levels of significance. In addition to religious texts, however, popular literary works were also examined, such as the \textit{Shahnameh} by Aboloasem Ferdawsi,\textsuperscript{17} as well as poetry (particularly that by Sufi mystics such as Rumi

and Hafez), in order to survey works that were not strictly philosophical or scholarly in nature.

In addition to the several genres of sources described above that act to create a background of information for this thesis, a variety of theoretical works were also consulted for their ability to correlate the cultural and religious milieu of Islam in the Middle Ages with the artistic and scholarly conceptions of domes and astrolabes and the physical evidence of the objects themselves. As mentioned above, traditional methods of art historical investigation, such as formalism and iconography, were of limited use given that this project is involved with the consideration of non-standard art objects, often lacking the representational aim that scholars tend to identify in paintings or sculpture. Rather, works concerned with locating the transmission or creation of knowledge through interaction with or observation of concrete objects were considered to provide particular insight to both domes and astrolabes as map-like entities. In particular, Akkach’s work was pivotal in opening up the discussion of how Islamic art could convey ideas to viewers without reliance upon representation systems such as pictorial decoration or writing while Susan Stewart’s study of how size affects an individual’s interpretation of a work on an emotional level in *On Longing*\(^{18}\) provided the structure for a comparison of how the different scales of astrolabes and domes might affect a viewer. The insights provided by both of these sources however, are couched overall in a phenomenological

---

reading of astrolabes and domes. Robert Sokolowski’s *Introduction to Phenomenology*,\(^{19}\) which focuses on an explication of the methodology and its specialized terms as coined by the field’s originator, Edmund Husserl, was an indispensable source for a phenomenological approach, particularly because of its focus on the field itself and its applications, rather than on its reception by later philosophers. The main tenets of this methodological approach and its relevance to Islamic art are discussed in the section below.

\[^{19}\text{Robert Sokolowski, } Introduction to Phenomenology\text{ (Cambridge: Cambridge University Press, 2000), passim.}\]
In his *Introduction to Phenomenology*, Robert Sokolowski states that “a phenomenology of art would describe the various manifolds by which art objects present themselves and are identified.” Although this description may come across as underwhelming, particularly given that iconology has a clear foothold in the world of art historical analysis as a method of identification, what is at stake in the theory of phenomenology is something entirely different from other approaches to art. Rather than treat an object (or parts of an object) as a symbol, functioning like a word that can be read by the viewer to reveal a separate (and often unrelated) meaning from the object, phenomenology works with the basic principle that things simply are what they appear to be. This approach maintains focus on the object itself instead of viewing it as a sign to some outside concept or social phenomenon. The goal of phenomenology is to assert the reality of an object through how it is identified by its audience in order to demonstrate that the interaction of viewing is an essential a component of what we experience.

Phenomenology is particularly well suited for this discussion of Islamic art because it enables one to consider how objects such as astrolabes and domes can be identified by viewers as embodiments of the cosmos without utilizing the symbols that

---

21 Ibid., 14.
22 Ibid., 31.
have come, at least in the West, to be understood as signifying the celestial. As mentioned in the Literature Review section, historians applying iconographical and formalist techniques to Islamic art have often come to the conclusion that it lacks the symbolic depth attributed to European works because of the absence of visual “pointers” to outside cultural meanings—or, in other words, that it lacks imagery that can be clearly identified as representing either a real object and/or a non-material concept. The utilization of phenomenology in this instance enables one to look beyond this expectation that meaning generated by art fundamentally exists outside of the art-object itself and instead urges one to consider how meaning is generated through the interaction between a work and its viewer(s).

In investigating how an individual perceives and identifies an object, phenomenology is invested in examining three sets of binary structures present in a given situation. The first structure pertains to the notion of the whole versus the part, or, in other words, the differentiation between those aspects of an object that can exist independently from the larger context versus those that can exist only if founded on some other aspect of the object. An example of this type of structure relevant to art historians is the concept of color. A color cannot exist on its own—it must have some substrate to bring it into existence. Thus, color is a dependent part of a larger whole. This concept is important for this study not so much because of the insights it provides into the construction of astrolabes or domes, but rather because of how it conceives of the act of viewing an object. As Sokolowski points out, vision is inherently dependent on the physical existence of the eye itself, and the ability to look is intimately tied to the ability
to move, which can be performed by the eye itself, the head/neck, and/or the entire body.\textsuperscript{23} This conceptualization of movement as inherent to experiencing art is fundamental to this study and will be discussed further below.

The second binary structure integral to phenomenological studies is the tension between a singular identity and numerous physical manifestations. This concept is quite easy to grasp in that an object can be experienced in many different ways (through photographs, film, at night or in the rain) and yet that object will continue to be identified as the same object. Phenomenological expansion of this notion, however, leads to the conclusion that different objects can in fact be interpreted by the individuals interacting with them as manifestations of the same identity.\textsuperscript{24} Application of this tenet of phenomenology to the current study thus opens up a discussion of how objects as different as astrolabes and domes can both be interpreted as maps of the cosmos.

The final pillar of phenomenology is the dichotomy of presence and absence. Phenomenology, as mentioned earlier, is based upon the notion that objects are inherently real and exist as they appear outside of the human mind. Thus, when an object is directly in front of us, we can say it is, in fact, present. However, while other forms of philosophy may argue that a form of the object is present whenever the image of that object is conjured up in one’s imagination, phenomenologists hold this statement to be false. If the object exists outside of the self, then the image the self recreates of it is not a true presence, but instead an acknowledgment of the object’s absence. This distinction is important because of the emotional responses generated by absence. Intermediate

\textsuperscript{23} Ibid., 26.
\textsuperscript{24} Ibid., 27-33.
manifestations of an object—a film of it, or a photograph, or even a written description—may present aspects of an object’s presence, and may even offer new information to the viewer about it, but they are never a substitute for the thing itself.²⁵

In this study, astrolabes and domes are considered to be different manifestations of an object, the cosmos, which is unknowable to any individual in its entirety, and yet is still an identifiable thing. These forms thus become the concrete presences that mediate the individual experience of the invisible (and thus visually absent) universe constructed by medieval Islamic society. Phenomenology acts to constantly remind one that neither the object (the cosmos) nor its presented forms in the world (astrolabes and domes) are given a more privileged existence over the other. As the cultural contextualization of these forms hopefully makes obvious, the mundane world of objects and the unseen structure of the universe were, in fact, deeply interpenetrating and equally real to the Muslims of the Middle Ages.

²⁵ Ibid., 38.
CHAPTER IV

DISCUSSION

Although Woodward and Harley have previously set astrolabes and domes into the same context in their comprehensive volume on Islamic cartography, these two classes of objects have not previously been investigated in direct relation to each other as cultural artifacts. Part of this may be due to the fact that the two appear to have very little in common with one another; astrolabes are, after all, sophisticated technical devices used to calculate the time of day, location of the cardinal points, and the rising and setting times of astronomical bodies, whereas domes are, despite their often masterful craftsmanship, basically aestheticized ceilings. However, if one is able to look past their functions and instead focus on the ways that medieval Muslims engaged with these objects, their categorization as cosmic maps is expanded upon and enriched in unpredictable ways. In order to grasp the full meaning of these objects, one must first investigate the way in which medieval Muslims considered their universe to work.

Visual Representations of the Religious Structure of the Universe in Ancient Rome and Medieval Christianity

One method of structuring a cosmos familiar to anyone with a cursory knowledge of religion is to create a hierarchy of important figures. These networks of
religious power are perhaps most effectively articulated through figural representation on a variety of objects, including domes. Such depictions rely upon the ability of the viewer to correctly identify each individual depicted and correlate each figure’s position relative to the others in order to recreate the cosmic pecking order, often with the viewer’s own position on the floor below the dome representing the bottom of the chain. As Lehman has demonstrated in his monograph on the history of the relationship between celestial representation and the dome in western culture,26 Christian domes portray the same general composition of figures over and over. This typical arrangement, in which God’s earthly manifestation Jesus is placed at the apex, surrounded by concentric circles of figures ranked according to their importance, including angels, saints, apostles, and evangelists, emphasizes the spiritual hierarchy of the Christian religion. The Christian dome thus functions as both a depiction of the ultimate focus of the religion, in which the viewer’s confrontation with Jesus Christ reminds him or her of His sacrifice to redeem the viewer’s sins, as well as a map for how to achieve salvation, through the worship of God who is centrally placed at the dome’s apex, directly between the viewer and the viewer’s ultimate goal of heaven, with the surrounding, lesser figures acting as intermediaries between the viewer and Jesus.

However, the main goal of Lehman’s work was not to demonstrate this Christian structuring of the universe, but to instead argue for the inheritance of this visual structure from the Classical era. Examining a few extant architectural remains and several sketches of lost buildings, Lehman describes similar Classical celestial motifs on both

ceilings and floors of a variety of structures that depict the king of the gods, Zeus/Jupiter (or a hybridized or regional equivalent), at the center of the decorative space circumscribed by lower ranking members of the pantheon (often with inclusions or substitutions of local deities). While the Christian domes were connected to the notion of the celestial through the concept that Jesus resides in heaven, which is supposedly above the viewer, the classical connection between the dome and the celestial was perhaps even stronger in that these gods were directly associated with the night sky through the heavenly bodies (including planets, stars and constellations) that shared their names. Thus, Lehman concluded that cosmic space and religious order have been inherently intertwined in Western culture through the notion that the celestial realm is (literally) occupied by religious figures. What is surprising about Lehman’s discussion is that, despite also being characterized as an inheritor of Classical culture, domes in the Islamic tradition are construed as lacking this symbolic connection due to the fact that they rarely contain figures on their vaults. As mentioned earlier, this tradition, and that of Islamic art at large, is compared to the ornamental mode of carpet adornment, with the conclusion that “rich embroidered decoration… obliterates the meaning of (the heavenly dome’s) symbolism.”

In recent years, however, the theory that Islamic artists missed the connection between the celestial and the mythological or religious has been called into question. Excavations of Qusayr ‘Amrah, an early Islamic palace built by the Umayyad dynasty in the eighth century, have revealed a dome depicting the constellations in their Classical

---

27 Ibid., 3.
28 Ibid., 10.
zodiac forms and personifications of stars appear in numerous Muslim scientific manuscripts. Art historians such as Eva Baer have also demonstrated that there was a popular celestial motif utilizing figural representation in twelfth- and thirteenth-century Western Islamic lands that is surprisingly similar to several of Lehman’s examples of Roman celestial mosaics. This motif, which was depicted on numerous portable metal objects, including basins, candlesticks, inkwells, trays, mirrors, and ewers, as well as on ceramics, emphasizes the familiar celestial structure described above, except with a personification of the sun at the center, rather than Zeus or Jesus. Surrounding this most powerful celestial entity are the human personifications of the six planets (the Moon, Mercury, Venus, Mars, Jupiter and Saturn), outside of which are the emblems of the zodiac constellations. Baer’s reading of these pieces differs from those of the Classical or Christian celestial motifs in that the link to god(s) is not asserted, primarily because the sun in Islam was not a symbol of a god, but rather of the king. Thus, these Islamic motifs have been considered to diagram a conflated cosmic/political hierarchy, representing a Cosmic Ruler at the center of the universe, rather than a cosmic/religious hierarchy.

Baer’s interpretation of the king at the center of the universe, however, privileges an unacknowledged notion also at work in Lehman’s study that the center (whose architectural analogue is the dome’s apex) is always the seat of ultimate authority. Part of the concept of a structure is that it not only gives shape to space, but that it also

---

30 Baer, *Metalwork in Medieval Islamic Art*, 248.
31 Ibid., 258-274.
organizes the way in which a totality’s myriad parts influence one another. Viewing these Islamic political motifs through the context of Islamic religious philosophy, it becomes clear that God is not visually located in the celestial model these pieces put forth because He is often described as existing outside of it. Although it is tempting to view these diagrams as the Islamicized version of their Christian counterparts—a static depiction of the ultimate authoritative man/god at the center of his universe—this would ultimately create a false parallel. Utilizing the common practice of astrology as a background for these representations, which was the cultural melting pot where science and religion become miscible for many Muslims, a new interpretation of these works can be crafted which emphasizes not the location of authority in space, but instead how that authority is exerted through it.

Astrology and the Islamic Structure for Effecting Change in the Universe

Although the practice of astrology was not accepted by all medieval Muslims (al-Biruni, one of the greatest Muslim intellectuals of the era, decried the practice of astrology as a “pseudo-science” with the only true benefit that it enabled scientists to appease the masses so that they could continue their true studies in peace), the fact is that the lives of many practitioners of Islam in the Middle Ages were greatly shaped by astrological predictions. Complex explanations for how the stars could be used to predict the future were developed very early on in Islam’s history, with numerous scholars

---

composing treatises on how to read the stars to determine future events (including al-Biruni, in spite of his reservations about the practice). The importance of astrology continued throughout Islamic history, and even as late as the sixteenth century, Murad III, Sultan of the Ottoman Empire, destroyed the observatory he had earlier built for his chief astronomer/astrologer Taqi al-Din after the scholar had incorrectly forecasted that the Ottoman army would defeat the Safavids in battle. However, the belief that the stars could tell the future was not necessarily a blind one: several treatises by Muslim scholars attempt to explain, based on the era’s conception of the structure of the universe, why the stars should be able to convey this information.

Following in the footsteps of Classical philosophers, Muslims considered the universe to be geocentric. Starting with the very first, and arguably some of the greatest, Islamic intellectuals, al-Kindi and Abu Ma’sar (both active in the ninth-century), medieval Muslims envisioned the heavens as a series of celestial spheres, in which the outermost shells of space (outside of which was the realm of God) belonged to the stars. In this universe, where all was subjected to the change brought about by time, stars were held to be the most noble of entities, beyond moral and physical corruption. The Qur’an itself even draws a distinction between the stars and the rest of the cosmos, stating that although humankind is the greatest creation of Allah, stars hold a special place between God and man. Ayah 12 of Surah an-Nahl reads: “And he has subjected to you [humanity] the night and the day, the sun and the moon…” but “…the stars are subjected by His

---

command.” The grammatical distinction between those things that God has designated to serve man and the stars, who appear to serve only God, yields religious support for Abu Ma’sar’s assertion of the star as intermediary between the divine and the mundane.34 In his *Great Introduction to the Science of Astrology*,35 the philosopher gives a detailed explanation of how the movement of the stars, caused by God’s will, leads to alteration of the physical properties of the universe that affect all creation. He states that:

…by their [sc. the stars] movement over this world, heat is produced in the earthly world which is connected to them, and it [sc. the lower world] becomes hot. And when this world becomes hot, it is made more subtle and moves, and as a result of its movement there occur changes in these bodies from one into another, and generation and corruption occur, by the permission of God.36

It is thus the turning of the celestial spheres over the cosmic spheres of air, fire, water, and earth (the lower world), creating friction at each intersection, which causes physical changes through the production of heat and moisture. Furthermore, since everything on the Earth itself is composed of some combination of the four elements (another concept stemming back to Classical times and prevalent in Christian philosophy as well), the changes on earth must be due to the dynamic nature of these elements. Thus, Abu Ma’sar and his followers assert that when the stars move closer to the Earth, the resulting friction causes the warming and subsequent liquefaction of these substances and when they move farther away, the elements become cold and solid (this is most notably observed in terms

35 *Kitab al-Mudhal al-kabir ala ‘ilm ahkam al-nugum*
of the seasons, whose cycle matches that of the night sky\textsuperscript{37}). This understanding of the role stars play in the cosmos helps us in turn to understand why Islamic celestial maps refer to them as “Lords of Change.”\textsuperscript{38}

This conceptualization of the universe as a series of inter-related, turning concentric spheres recalls the use of an interlocking line to connect the astrological symbols together in the Islamic celestial/political motifs discussed above. Reading these through an astrological lens, they appear to indicate that although the sun/ruler is in the center of the diagram, he is not necessarily the master of his environment, but rather dependent upon it, as if caught in a vast net. If any one of these symbols were imagined to move like a star in the night sky, the movement would inevitably set the rest of the celestial figures into motion as well. This turning motion recalls that of an astrolabe’s rete, which can itself be seen as both a depiction of this astrological system and a tool in accessing it.

The Arabic term for astrolabe, \textit{asturlab}, is actually a borrowing of the original Greek term, \textit{asturlabon}, often translated in Islamic treatises as meaning “mirror of the stars.” Although derivations vary, several medieval Muslim scholars argue that the Greek \textit{astur} is derived from the term “aster” which is equivalent to the Arabic term \textit{najm} or star,

\textsuperscript{37} Ibid.
\textsuperscript{38} Translation of text from the Book of Curiosities, fol. 2b-3a Book 1, Chapter 1: On the Extent of the Celestial Sphere and a Summary of the Saying of Scholars Regarding its Knowledge and Structure (digitized manuscript with transcription and translation: Emilie Savage-Smith and Yossef Rapoport, eds., \textit{The Book of Curiosities: A critical edition} <www.bodley.ox.ac.uk/bookofcuriosities> (March 2007). For this page, see http://cosmos.bodley.ox.ac.uk/hms/mss_browse.php?expand=732,803,&state=main&act=chfolio&folio=4)
and lab comes from “labon,” translated as the Arabic mir’a (mirror).³⁹ A second, even more provocative Islamic translation defines the term as meaning “mirror/balance of the sun,”⁴⁰ recalling Baer’s discussion of the motif of the sun-king on elite metalwork, including mirrors,⁴¹ discussed earlier. The connection between astrolabes and rulers in medieval Islamic society is strengthened by several anecdotes that link Alexander the Great with the instrument. The twelfth century Persian poet Nizami recalls an incident in his Iskandarnamah in which the king utilizes an astrolabe to make essential calculations in order to win a decisive battle, and in a later Persian narrative from the sixteenth century, the Sharafnama by Ibrahim Faruqi, the great hero declares that all of the sages shall make him something that would remain in the world as a memorial of his existence. The greatest creation was of course Aristotle’s gift of the astrolabe, which allowed sages to decipher all of the secrets of the celestial spheres.⁴² The connection these literary anecdotes imply between Alexander and astrolabes is reflected in the inscriptions of at least one extant medieval Islamic astrolabe, and may have also been present in the inscriptions of specimens now lost. Crafted by Muhammad Mahdi in the seventeenth century, the astrolabe states that it “is the mirror of Alexander, and the mirror represents the whole universe.”⁴³

These stories and the inscription support an interpretation of the astrolabe as a symbol of kingship by reflecting the ruler’s ability to manipulate his environment. In

⁴⁰ Ibid., 44.
⁴¹ Baer, Metalwork in Medieval Islamic Art, 248.
⁴³ King, World Maps for Finding the Distance and Direction to Mecca, 318.
medieval Islamic society, the astrolabe was indeed a tool, but one that was not merely used to determine when the sunrise would take place. It was a tool that, if used properly, could enable one to make informed decisions about fateful events. It is also possible to see Islamic domes acting as both models of the cosmos and tools for mediating the celestial sphere’s effects on the sub-lunar realm. Two of the most famous Islamic domes, the muqarnas domes of the Hall of the Two Sisters and the Hall of the Abencarrajes in the Alhambra Palace in Spain, are clearly meant to be interpreted by viewers as models of the heavens. As poems carved into the stucco walls below the domes state, “In here is a cupola which by its height becomes lost from sight; beauty appears in it both concealed and visible. The constellation of Gemini extends a ready hand and the full moon of the heavens draws near to whisper secretly to it,” and “When [the parts of the ceiling] are illuminated by the rays of the sun, you would think that they are made of pearls by reason of the quantity of celestial bodies in them.” However, art historians have been quick to point out the discrepancy between these poems and the appearance of the domes. With their overwhelming amount of detail and monumental cave-like appearance, they are not the pleasurable planetarium-type architectural forms one would expect from the elegant verse below. The Islamic art historian Oleg Grabar has even gone so far as to state that if not for the inscriptions, a viewer would never guess that these domes are meant to represent the night sky at all. However, returning to the literary sources discussed above, one can find passages that argue that these ceilings were so elaborately designed and crafted not necessarily to replicate heaven, but to perfect it. The Persian poet Nizami

44 Grabar, “From Dome of Heaven to Pleasure Dome,” 16.
mentioned above described in his epic poem *Haft Paykar* the building of a palace for Bahram Gur, a fifth century Sassanian ruler who was immortalized in Islamic writings, including the *Shahnameh*. The king was rumored to have seven wives, each of whom had a magnificent chamber in which to receive her husband topped by a different colored dome, which the narrator links to such temporal and astronomical phenomena as the seven days of the week and the seven planets. However, in the lines where the architect asks the king for the honor to construct the palace, he elaborates upon the astrological significance of the domes, saying:

> If by the king I’m given leave, I’ll keep the evil eye far from his lands;  
> For I can weigh the sky, I know the stars, by reason know the business of the stars…  
> I’ll form a likeness to the lofty spheres, by means of which they will not harm the king.  
> Whilst he is in the picture room, the world, he’ll have no fear of the celestial stars.  
> Placed in the place of safety as to life, on earth he’ll be, (in power), as the sky.

Clearly, the architect is also an astrologer comfortable with using an astrolabe: “For I can weigh the sky” is reminiscent of one of the translations of the term *asturlab* as “balance of the stars” and he claims to know the process by which the stars effect change (“I… know the business of the stars”). However, his proposal entails more than just building domes that resemble the night sky; he claims that his constructed celestial environments would ensure a fortunate fate for the king. The poem betrays an understanding of domes not just as symbols of the cosmos, but rather, like astrolabes, as tools that allow one access to it, with the possibility of potentially altering its course. It is thus possible to consider the “artificial” appearance of Islamic domes as stemming not from a lack of

---

45 Ferdawsi, *Shahnameh*, 600-678.  
46 Grabar, “From Dome of Heaven to Pleasure Dome,” 16.
symbolic reference to the celestial, but rather from a complete embrace of their heavenly nature, rendering them as mini-cosmoses in their own right as opposed to realistic models of the sky.

The conceptualization of physical objects such as domes and astrolabes as interactive cosmological maps is supported not just by Muslim astrology, but in the Islamic religion as well. For example, the same word used to denote a form (the visible shape or structure of a thing), *surah*, is also roughly translated as “map” in Arabic. In addition, however, *surah* is also the term used to refer to the chapters of the Qur’an. The interweaving of art, science, and religion reflected in the multiple definitions of the word surah can be further elaborated upon through an investigation of the mystical practices of Islam, known as Sufism, which reveal a deeper religious dimension to the use of astrolabes and domes by medieval Muslims.

Sufism and the Nature of Physical Reality

Sufism, the inner, personal approach to Islam, as opposed to the external, community-oriented code of ethics and prescribed behaviors known as Shari’a law, is considered to be one of the strongest forces shaping the practice of Islam and an inextricable aspect of the religion itself. However, because the oldest Sufi orders and much of Sufi literature did not emerge until at least two or three centuries after the death

---


of Muhammad, some conservative Muslims have argued that Sufism was a later invention that utilized “hidden meanings” in the Qur’an in order to create excuses to ignore Shari’a law. This framing of Sufism is problematic, though, in that all Sufi orders trace their roots back to the Prophet and his companions, particularly Ali, one of Muhammad’s cousins and sons-in-law who became the fourth Imam in the Sunni tradition as well as the first Imam of Shi’a Islam. Sufis thus argue that, far from a later heretical development of Islam, Sufism was part of the religion from its beginning. In fact, Ibn Khaldun, a fourteenth century Andalusian historian, considered Sufism to be so closely connected to proper Islamic practice that he wrote that Islam and Sufism were interchangeable terms.

While Islam can be considered a set of communal rules practitioners must follow in order to demonstrate their faith to God in exchange for reward in the afterlife, Sufi mystics pursue a personal development of specific behavior and thought practices that are believed to enable a reunification with the divine spirit of God during life. However, investment in this path does not necessarily mean that Sufis have to lead an ascetic lifestyle outside the bounds of normal society. In fact, many Sufi mystics were prominent academic and political figures, held in high esteem for their scholarly accomplishments and formidable religious knowledge even by those who did not approve of their mystical leanings. Although Sufism is perhaps best known for its spiritual poetry,

---

52 Huda, “The Light Beyond the Shore,” 461.
particularly in the Modern West, through authors such as Rumi, Hafez Shirazi, and Omar Khayyam, two of the most influential Muslims after Muhammad himself, Al-Ghazali and Ibn Arabi, were Sufi mystics as well as philosophers whose works integrated a mystical spirituality into their theological, political and scientific writings. Sufis have also contributed to the fields of Islamic law, astronomy, mathematics, medicine, and music in addition to literature, and have held positions as Imams, teachers and lecturers, jurists and advisors to ruling caliphs. Thus, a reading of the more popular mystical works from medieval Islam can help give insight into cultural undercurrents not necessarily accessible through more traditional religious literature.

A discussion of Sufi philosophy is particularly valuable to the subject of Islamic art because it reasserts the presence of symbolism within Muslim culture that is often ignored or unnotice in Islamic art. In Islam, the material world, the world of sight and sound and smell, is conceived of as a mere illusion, covering the true divine reality of the universe. Shaykhs (Sufi teachers) commonly employed allegories, metaphors, similes and other figures of speech as a method to lessen the audience’s grasp on the pseudo-reality of the material world in order to reveal essential religious truths, which would in turn hasten spiritual enlightenment. By stressing the shared nature of a variety of physical objects and by freely substituting such objects for abstract ideas and concepts, Sufis aimed to demonstrate to the audience the divine reality that was always behind the perceived veil of physical existence.

---

An example of one of these metaphorical teachings is the poem *Salaman and Absal* by the fifteenth century Sufi Mystic Jami, which is an elaborate allegory relating the need for the immortal essence of man (Salaman) to reject the illusion of the physical world (embodied by Salaman’s beloved, the beautiful Absal) in order to attain a higher state of existence. One verse of this poem that exemplifies the type of complex symbolism at play in much of Sufi teaching reads:

```
Sate a Lover in a garden
    All alone, apostrophizing
Many a flower and shrub about him,
And the lights of Heav’n above.
Nightingaling thus, a Noodle
Heard him, and, completely puzzled,
‘What,’ quoth he, ‘and you a Lover,
Raving, not about your Mistress,
But about the stars and roses-
What have these to do with Love?’
Answer’d he, ‘Oh thou that aimest
Wide of Love, and Lovers’ language
Wholly misinterpreting;
Sun and Moon are but my Lady’s
Self, as any Lover knows;
Hyacinth I said, and meant her
Hair—her cheek was in the rose—
And I myself the wretched weed
That in her cypress shadow grows.’
```

Although at face value one could dismiss this poem as a cliché story about a young man sitting in a garden at night lamenting the absence of his lover, of which there are numerous others from throughout Islamic culture, this poem can be interpreted on at least three levels. The first, and most literal, level of interpretation is voiced by the foolish, 

---

55 Ibid, 48-51.
uneducated speaker in the poem (referred to as a “noodle”) who is confused by the lover’s words. Knowing that the young man is love-sick, this noodle cannot figure out why he keeps going on and on about flowers. Frustrated by the noodle’s simpleness, the lover, as the second speaker, quickly explains that his words are symbolic of his beloved, with the rose compared to her cheek, the hyacinth to her hair, and the cypress to her body or presence in general. However, it is interesting to note that the lover does not explicitly explain how various parts of his beloved are like any of these plants; while the comparison of a cheek to a rose can be made logical by noting the similarity of their colors, it is not quite as obvious how hair can be like a hyacinth (perhaps they are both fragrant, but hair rarely occurs in the same colors as hyacinths, nor do they have a similar texture or appearance), or why his lover should remind him of a cypress tree. Rather than employing each of these plants as signs, physical markers that are present merely to point the viewer to something else, Jami appears to be leading the reader into an area where roses and cheeks, hyacinth and hair, and cypress trees and women, become true symbols, mutually enriching the reader’s understanding of both plants and the human body by depicting them as parallels to one another in the physical realm.

The third interpretation of the poem is represented by yet another speaker, who is, in fact, none other than Jami himself giving voice to the entire verse. For the Sufi, the entire concept of a lover longing for his beloved is itself a metaphor for man’s longing for God. Just as a lover is created by the object of his desire (one cannot be a lover without some thing to love, after all), God creates man, whose entire existence is dependent upon Him. Furthermore, the lover sitting in a garden separated from his
beloved may also be interpreted as all people who, finding no physical form of God, look to His worldly creations, such as flowers, for proof, as well as a reminder, of His existence.

At least part of the Muslim refusal to resort to figural representation in religious settings is this underlying concept that God has no physical form. This belief is upheld even in light of Qur’anic verses that refer to ‘the face of God,’ implying that God actually has a head; even the most conservative Muslims qualify such statements with the understanding that God is ultimately outside of the physical realm where things such as faces exist. Although the paucity of figural imagery is often interpreted as a strong adherence to the second commandment by Muslim artisans, in truth, a distinction should be drawn between Islamic art of the religious and secular spheres; there are actually numerous works of Islamic art featuring human and animal figures, including the metal-ware cosmic diagrams described earlier, as well as illuminated manuscripts of several of the epic poems mentioned above. In fact, the lack of images of God and other religious figures perhaps only seems unusual when compared to the plethora of such images in Christian culture; however, Christian belief in the physical manifestation of God in the person of Jesus Christ enabled an embrace of artistic representation in the religious sphere that in many ways is at odds with the most basic tenets of Islam.

Despite the relatively common use of the figure in secular art, the embrace of what has been referred to as “ornament” in much of Islamic art, and which is often used to decorated both astrolabes and domes, can perhaps be interpreted as a solution to the

---

conundrum of visually communicating what cannot be depicted. This notion of a divine, unsensible reality and its relation to abstract representation was suspected by Grabar, who wrote in the *Formation of Islamic Art* that “abstraction is not, like a chemical formula, the simplified symbolization of some reality; like certain mathematical abstractions it is a reality in itself.”

Grabar’s understanding of Islamic ornament as being itself a concept rather than viewing it as alluding to something else in the physical realm allows one to approach the question of the significance of the Islamic tradition of art from a different vantage point. Rather than ask, “what does the ornament symbolize?” one could perhaps start with the question of “what did it mean to make ornament in the first place?”

The Sufi philosopher Al-Ghazali has proposed an answer to this question in his explication of how man can come closer to God by emulating one of his ninety-nine titles present in the Qur’an, that of al-Musawwir or ‘Form-Giver.’ He explains that form-giving is the final step of constructing a building, following the activities of a Designer, who creates the plans for the structure, and those of a Producer, who actually assembles the raw materials into the Designer’s prescribed arrangement. For a building to be truly complete, al-Ghazali states that it must be decorated. But the resulting ornament is not just mere whimsy; al-Ghazali argues that because God made the physical world of forms in order to communicate with man, forms are thus an integral part of understanding God. How this type of communication was conceived of in medieval Islamic scholarship was perhaps best summarized by Ibn ‘Arabi in his writings on dream interpretation.

---

Writing about how a dream (which is in essence a series of forms and sounds and sensations just like one’s experience of the material world) is transferred from the dreamer to the dream interpreter, Ibn ‘Arabi describes how the dreamer “by means of his words… passes from the presence of his own self to the self of the listener. Hence he transfers his words from imagination to imagination, since the listener imagines to the extent of his understanding” the physical forms of the dreamer’s words.\(^{60}\) In light of the discussion of form-giving, both creation on the part of God, which is the translation of the invisible divine reality into something intelligible to man (anything physically experienced, such as words or forms), and on the part of man, whose own creative acts parallel God’s through the formation of words or the decoration of surfaces with ornament, are analogous to Ibn ‘Arabi’s description of the transfer of mental symbols into physical manifestations. Form-giving appears to be particularly special to al-Ghazali, however, because it allows man to participate in an activity that is seen as divine, and gives him occasion to contemplate how the material world is the result of an invisible intellect just as the images he creates are the result of his imagination. The importance of communication through the visual, rather than via the aural or the tactile or even the olfactory, is supported by the fact that “humankind” in Arabic is an idiomatic expression that is translated as “pupil,” emphasizing man’s inherent visuality.\(^{61}\)

One other aspect of Sufi philosophy relevant to this discussion is the prevalence of a multitude of meanings within a single entity. For example, the increasing


\(^{61}\) Akkach, Cosmology and Architecture in Premodern Islam, 82.
complexity of the three interpretations of Jami’s poem *Salaman and Absal* discussed above (the literal, the physical-metaphorical, and the spiritual-metaphorical) does not necessarily mean that one of them must be valued as more correct than the others. In fact, just as Jami’s symbolic use of roses and hyacinth to refer to cheeks and hair leads to a richer understanding of all of these physical objects, the interpretations can also be seen to reinforce each other. Together, they work to create the overall concept that God is longed for like a lover because he is spiritually beautiful like a perfect garden. This idea that symbolism can result in multiple correct interpretations of written works is not limited to poetry; the journey of the Sufi was to seek the invisible reality of God by searching for “hidden” truths, or, in other words, non-literal interpretations, of all things, including religious texts such as the Qur’an. Many Sufi scholars, including Al-Ghazali, have justified such activities by quoting a hadith by Ali which he states that “if [he] wished, [he] could load seventy camels with the exegesis of the opening surah of the Qur’an,”62 which would be quite miraculous indeed, considering the opening surah consists of a grand total of only seven lines, including the *Bismallah*, which is the repeated opening line of almost every surah.

This interest in a multiplicity of meanings conveyed by a single text would eventually reach its pinnacle in the works of Ibn ‘Arabi, who asserted that the Qur’an was in essence an infinite text, meaning that it in fact had a never-ending supply of correct interpretations. Less than two centuries after al-Ghazali, Ibn ‘Arabi argued that multiple interpretations are in fact possible because God’s speech, recorded as the Qur’an, has no

---

meanings that God did not intend or could not foresee, considering the fact that he exists outside of time and space.\textsuperscript{63} Therefore, whenever anyone interprets the Qur’an, this interpretation is the one intended by God for that individual at that moment. This philosophy was perhaps most succinctly stated in Ibn Arabi’s \textit{Futuhat}, where he writes “Every existent thing finds in the Qur’an what it desires.”\textsuperscript{64} However, it has been argued that this understanding of the nature of the Qur’an could also be applied to other texts; in a passage that is reminiscent of the overall meaning of Jami’s poem, the \textit{Futuhat} also states:

\begin{quote}
Poets exhaust their words writing about all existent things without knowing, but the Gnostics never hear a verse, a riddle, a panegyric, or a love poem that is not about Him hidden beyond the veils of forms.
\end{quote}

Although Ibn ‘Arabi’s assertion that all interpretations of the Qur’an are correct is rather extreme, when viewed as part of a tradition of thought espoused by Ali, al-Ghazali and later Jami, among others, it stresses that the notion that a physical object could embody a multiplicity of meanings continued to be at least mildly popular throughout Islamic history.

Contextualizing both astrolabes and domes within this Sufi conceptualization of the meaningfulness of forms in the physical world opens up these objects to the possibility of being more than the utilitarian tools conceived of by either their mundane or astrological applications. The employment of a phenomenological approach can

\textsuperscript{63} Almond, “The Meaning of Infinity,” 97-117.
\textsuperscript{64} Almond, \textit{Sufism and Deconstruction},” 67.
demonstrate how these two forms communicate through their physical appearances to their viewers the same concept of the structure of the Islamic universe.

The Phenomenon of Moveable Maps

In the introduction to this thesis, it was acknowledged that domes and astrolabes appear to have very little in common with each other. However, from a phenomenological perspective, they are structural quite similar, and in medieval Islamic culture they shared an important feature: the ability to evoke the sensation of movement. As described earlier, movement is inherent to the conception of an astrolabe—the rotation of its rete creates a series of varying profiles for the viewer to not only witness, but to actually enact through his or her physical manipulation of the object. Although domes cannot be manually adjusted in the same manner as astrolabes, Grabar has argued that the design of the Hall of the Two Sisters and the Hall of Abencerrajes mentioned earlier create a similar illusion of movement through the clever use of muqarnas. A type of corbel ornament popular throughout the Islamic world, muqarnas appear as three-dimensional triangles that have been curved to create a shallow cave or niche-like space. The variety of arrangements one can make by stacking these decorative elements creates complex designs due to the ability of muqarnas to either catch or block light. Grabar thus argues that these domes not only allude to the celestial through their star-like arrangements of the muqarnas, but that as the light entering into the vaulting through the clerestory windows at the base of the domes changes in quality and direction with the movement of the sun, the pattern and color of the domes themselves change, resulting in
what appears to be a moving dome. However, celestial movement in medieval Islamic domes did not necessarily have to be conveyed through actual visible change. For example, returning to Nizami’s poem about the palace of Bahram Gur, he wrote “And for the seven days of every week and the seven planets, it is plain, appear. On such days, days to light a festive scene, let him [Bahram Gur] take pleasure in a dome each day; Put on attire in color as the house, and with the charmer of the house drink wine.” Rather than place the burden of creating the illusion of rotation on the dome itself, the design of this palace demonstrates another solution to the problem of emulating the movement of heaven by having the viewer move instead. The cycle of observing the different colors of the domes becomes akin to watching the color change of the sky, with a full revolution in time signaled not by the movement of the sun, but instead by rotating through visits to each wife.

Grabar has interpreted this tradition of the rotating dome in Islam as part of a lineage stretching back to the Classical era, evoking the grandeur of domes such as that above the banquet hall of Nero’s Domus Aurea. He emphasizes the placement of this dome in a large hall meant for feasting and other activities with aims of physical gratification, rather than within a room meant for political or religious rites, to argue that the dome’s function was not to proclaim overtly a politically motivated cosmic hierarchy with the king at the center of the universe, but was instead meant to evoke visual pleasure. The dome acted as a visual component to the decadent atmosphere, with its actual rotation that mimicked the sky above creating a visual feast for the viewer, to be

---

65 Grabar, “From Dome of Heaven to Pleasure Dome,” 16.
66 Ibid., 18.
consumed along with the decadent food, furniture, music, and the scent of perfume that was released into the room through hidden pipes in the walls.

It is possible that this model of the dome was known in the Middle East through the palace of Kisra, who, known from Classical sources as Chosroes, was a Sassanian King who ruled the Persian empire during the sixth century. Later Muslim writers, particularly Persians such as the renowned Ferdawi, whose famous Shahnameh mythologizes the figure of Kisra as one of the great Persian kings, describe his palace in terms that are interchangeable with those referring to Nero’s rotating dome of heaven in the Domus Aurea. Standing only roughly twenty miles from Baghdad, it remains unclear from the ruins whether Kisra’s palace, the Iwan-e-Kisra, contained an actual revolving domed structure decorated with celestial imagery that emitted sounds of thunder and rained droplets of perfume, but the remaining single huge vault may have evoked memories of Nero’s dome that lead to the eventual displacement of the Classical structure onto the Sassanian palace in the cultural memory of medieval Muslims.

A major issue in the interpretation of rotating domes as objects of royal luxury and pleasure is the fact that many magnificent Islamic domes are located within highly sacred structures, such as mosques and martyria, which do not carry the connotations of physical sensuality described by Grabar. Furthermore, many Islamic domes are decorated in such a way as to make them unpleasureable to look at. As mentioned earlier, Islamic domes are not realistic representations the sky; in fact, one can easily imagine that staring

---

67 Ibid., 17.
69 Ferdawi, Shahnameh, 679-716.
up at the elaborate abstract designs of mosaic domes while crossing the room could be dizzying, perhaps even overwhelming. Many of the complex compositions play with the viewer’s ability to distinguish between positive and negative space, flipping back and forth between the two like a child’s optical illusion, a phenomenon heightened by the use of gold or other precious materials that shimmer when the light hits them just right, causing some elements of the design to advance while others recede. While these effects may add to a sensation of movement or even rotation, like a hypnotist’s spiral, the pleasurable nature of such an experience is open to debate.

An alternative interpretation of the dome opposed to the reading of these forms as functionless objects for pure visual delight arises when one returns to the fact that a single Arabic term denotes both a form and a map. Observing cosmological diagrams from both Sufi and non-Sufi manuscripts from throughout the history of Islam, one finds a repeating conceptualization of the universe in which God is given a central location with the entities of his creation radiating outward. Although the different parts of an Islamic dome are not labeled like a diagram, it is relatively easy to see how the apex of a dome, which is often decorated to stand apart from the rest of the dome’s ornament, might be interpreted as the singular God, from whom all else emanates. The various ornamental decorations of the dome, referencing physical objects such as flowers and stars, thus become a representation of the infinite variety of God’s creation. What has been considered the absurdity of this ornament, meaning that it has no rational or orderly

---

relation to the human experience, thereby becomes a testament to the artist as Form-Giver, in which even the most unique products of his imagination cannot approach the limitless capacity of God’s creative abilities.

Although this sort of cosmic diagram enables one to visualize the titles of God such as Al-Mubdi (The Originator or The Producer), Al-Awwal (The First, The Beginningless), Al-Muta’aliy (The Most High) and Al-Batin (The Inner), other titles such as Al-Wasi (The Vast, The All Embracing, The Boundless), Al-Akhir (The Last), and Az-Zahir (The Outer), cannot be conveyed through this scheme. However, the ambiguity of ornamental decoration does not restrict the viewer to a single interpretation. In fact, the assertion of Sufi philosophers of a multiplicity of meanings for a single text could be extended to the contemplation of material reality, allowing for a multiplicity of identities for physical objects. Thus, returning to Islamic scholarly diagrams to search for an alternative method of visualizing the cosmos, one can find evidence that the physical universe in the Middle Ages (and in Classical times as well) was conceived of as a sphere with the earth located in the exact center, and the endless realm of God beginning at the edge of material creation. Returning to the dome, the apex can be seen as the earth at the center of the physical universe instead of God at the center of existence. The encircling ornament in this scheme becomes the spheres of celestial bodies surrounding the earth. This association of the dome to both the celestial and the earth itself is reinforced by the palatial domes discussed earlier in which Bahram Gur’s seven domes simultaneously signify the seven planets as well as the seven climates of the earth (each

———

72 Ibid.
of his seven wives were supposedly the daughter of the king of each of the seven climates\(^\text{73}\)). In addition, the common use of clerestory windows at the base of the dome becomes symbolic in this interpretation as well, representing God himself. A common metaphor for God in Islam, as well as one of his ninety-names, is Light, and the light let in by these windows that shines across the ornament of the dome can be interpreted as the presence of God that sustains and illuminates the material world. The conception of God’s existence at the circumference of the circle rather than its center is supported by the fact that the term for “circumference” in Arabic, *muḥīt*, also means “surrounding” or “encompassing,” recalling the aspect of God himself that is all-encompassing.\(^\text{74}\)

Yet another interpretation of the embellishment of Islamic domes is made possible through the consideration of any decorations on the floor. There is a tradition of mosaic floors in Classical structures that, although on the ground, reflect the heavenly symbolism of the ceilings above them\(^\text{75}\) and it appears that in Islam a similar practice may have been retained through the crafting of dome or celestial imagery on embroidered carpets. One example is the carpet from the funerary mosque of Shaykh Safi al-Din, which appears to have two lamps, similar to those that hang from the ceilings of mosques, emanating from the central decoration (which is itself highly evocative of dome designs) on the carpet.\(^\text{76}\) This characterization of the carpet as a ceiling is possibly a result

---

\(^{73}\) Grabar, “From Dome of Heaven to Pleasure Dome,” 18.

\(^{74}\) Akkach, *Cosmology and Architecture in Premodern Islam*, 72.

\(^{75}\) Lehmann, “The Dome of Heaven,” 5.

\(^{76}\) It is interesting to note that a carpet as large as that from the funerary mosque of Shaykh Safi al-Din would most likely encourage the physical movement of the viewer around the space, thus provoking a very similar phenomenological response as that caused by one’s reaction to a dome.
of the fact that prayer in Islam involves placing one’s head on the floor, causing the inversion of one’s vision. However, if the carpet is now the ceiling, then the dome itself must have taken on some meaning as the floor. If this is so, one can imagine that one’s body should be pulled towards the dome by gravity, as if it were returning to the ground. This alignment of the dome with the earth is reflected in the way that some domes, exhibiting either real or decorative ribbing emanating from the apex, appear very similar to maps of the Earth centered on Mecca, which was considered from early on in Islamic history as the navel of the world. 77 A documentation of an experience similar to this phenomenon can also be found in the poem “Flightpaths” by the famous Sufi Rumi:

Today I see Muhammad ascend.
The friend is everywhere,
In every action.

Love, a lattice.
Body, fire.

I say, Show me the way.
You say, Put your head
Under your feet.

That way you rise through the stars
And see a hundred other ways
To be with me.

There are as many as there are
Flightpaths of prayer at dawn. 78

---

Rumi’s poem not only emphasizes the idea of inversion of the dome and floor in Islamic religious settings, however; he also points to the fact that despite the occurrence of the inversion, the dome does not stop representing the celestial. Thus, just as the multiple interpretations of the poem discussed earlier by Jami appeared to actually reinforce rather than contradict one another, it is possible that the multiple interpretations of ornamental domes discussed above also act in a synergistic manner. However, another key to understanding how these domes work overall is to take Rumi’s advice and include a consideration of the viewer’s relation to the dome. As he states in the poem “A Bowl Fallen from the Roof,”

The looking itself is a trace
of what we are looking for.

But we have been more like the man
who sits on his donkey
and asks the donkey where to go.\(^79\)

One cannot rely on the dome alone to reveal any great essential cosmic truth, but must actively work through the signs embedded in the ornament to reach it.

Returning to the first interpretation of the dome as representing a map of divine reality, with God occupying the center of the dome, the viewer is clearly situated in the material realm below, symbolized by the space of the mosque itself. In the second interpretation, however, the apex of the dome becomes the earth, which the viewer recognizes as where he or she is located, while the entire space surrounding the dome, starting at the clerestory, symbolically becomes the non-physical realm of God. And in our last interpretation, the viewer’s physical inversion through prayer initiates an

\(^{79}\) Rumi, *Bridge to the Soul*, 27.
imaginary blurring of the spiritual and physical realms, in which one can conceive of transcending the boundary between the floor and dome, potentially leaving the surface of the earth to travel through the stars, as Rumi describes in “Flightpaths,” or, taking into account the ceiling symbolism on the carpet itself, moving not towards outerspace, but instead, towards a metaphysical innerspace, symbolized by the dome’s apex as both the physical and spiritual center of the cosmos.

This blurring of the spiritual and the material, or the earthly and the celestial, appears to be integral to works of Rumi, whose followers founded the Mevlevi Sufi order, also called “whirling dervishes,” known for their spinning in order to bring about intense religious experiences through sensory instability. This bodily movement through space was in fact a tool, much like allegories and metaphors of Sufi poetry, in order to see beyond the physical forms of the world by experiencing them as illusion once one’s point of view was altered. This link between physical movement and spiritual journey is described in yet another poem by Rumi, “Miles of Riverside Canebed,” in which the poet instructs the reader to have faith that the Sufi path, with its focus on personal and inner practices, will in fact lead to a closeness with God symbolized by a physical movement towards the Ka’ba—the holiest place on Earth according to Islamic tradition.

The copper of your being
Has already been transmuted to gold
By Moses’ alchemy, and yet you fumble
In a moneybag for coins.

You have within you an Egypt,
Miles of riverside canebed,
The source of all sweetness,
Yet you worry whether candy will come
From a store outside yourself.

External form, you reach for shapes,
Yet you are the Joseph.

Close your eyes, and gaze in the mirror,
At the flame that lit your senses.

Your body is a camel going swift
And straight to the Kaaba.

You think you are idling around town
On a donkey, or heading off
The opposite way, but you are not.

This caravan is a triumph
Being drawn directly into God’s reality.  

Rumi’s metaphorical movement towards the Ka’ba also reinforces the interpretation of the apex of domes as representing Mecca, because although Mecca-centered maps are named for the holy city, their true focus is the Ka’ba. In light of this, the concentric rings of decoration radiating out from the central point of a dome recall not just the movements of the celestial spheres around the earth, but the circular motion of Muslims praying at the Ka’ba, which itself can be seen in the movement of all things in the universe that submit themselves to God. Rumi’s own experience of the cosmos emphasizes this inherent motion of the universe:

I circled awhile with each of the intelligences  
The nine fathers that control the levels of spirit growth.  
I revolved for years with the stars  
Through each astrological sign  

---

80 Rumi, *Bridge to the Soul*, 72-73.
81 The intelligences are metaphysical emanations of God’s primary essence that act as a cascade of his own existence that eventually enables the material world of forms to manifest.
However, the Qur’an itself utilizes cosmic motion as an affirmation of and connection to the divine will through a number of verses that describe the submission of stars, planets, the sun and the moon, etc. to God and ask humankind to see their orderly movement as a sign of His existence.\textsuperscript{83}

If orderly rotation is a sign of God, then there is perhaps no better object for witnessing this phenomenon then the astrolabe. In fact, the movement and structure of astrolabes builds the same sort of relationship as that between the viewer and domes. Clearly, the rete symbolizes the celestial realm and the latitude plate beneath it symbols the earth, leaving the viewer located in the non-physical realm of God. This is emphasized by the fact that the extension above the main body of the instrument where a rope could be attached so that the astrolabe could be suspended in air is termed the \textit{kursi}, or “throne,” a reference to Allah’s throne that is supposed to extend over all of creation. Although many astrolabes have \textit{kursi} that are very plain, one that is elaborately decorated by Abd al-A’imma from around the year 1700 states “His Throne encompasses the heavens and the earth,” encouraging the interpretation of the astrolabe as a complete representation of the universe. The position of the viewer as God-looking-in is also reflected in the fact that the representation of the stars on an astrolabe is a mirror-image of their positions as observed from Earth; the viewer is not seeing the stars as he or she sees them at night, but instead as God would see them from the edge of the material universe as it was believed to exist in the Middle Ages.

\textsuperscript{82} Rumi, \textit{Bridge to the Soul}, 34.
\textsuperscript{83} 14:33; 16:12; 22:18; 41:37; 56:75-76 are examples.
The multiplicity of one’s position is also inherent to astrolabes in the same manner as with domes through the presence of the latitude plate. Recalling how an individual praying in a mosque might interpret the dome to be both sky and ground at the same time, the viewer of the astrolabe both locates himself in his current position on earth and associates that position with the plate in the instrument. This duality of locations sets up an *axis mundi* that is made tangible by the presence of the pin running through the astrolabe upon which the entire assemblage turns. The possibility of traversing along such an axis evokes the movement of Rumi’s “Flightpaths,” with the rotation of the rete actually allowing one to “circle awhile… and revolve… with the stars through each astrological sign.” A reading of astrolabes acting as such meditative objects might even help to explain why there are a plentitude of both anthropomorphic and zoomorphic figures that function as the star pointers on a number of astrolabe retes.\(^{84}\) These figures rarely, if ever, conform to the zodiac or constellation symbols, and appear instead as circus characters, tumbling, and jumping and falling through the sky.

The use of astrolabes as interactive Islamic cosmological aids is further supported by the number of beautiful specimens from the Middle Ages that were intentionally manufactured to be non-functional. The smallest extant medieval Islamic astrolabe is less than 2 inches diameter, despite the fact that if an astrolabe is smaller than some 5 or 6 inches in diameter, the location of the star pointers relative to the latitude plate...
plate is simply not accurate enough to be useful;\textsuperscript{85} thus, we might consider many of these smaller instruments to have been precious objects rather than tools for astronomical observation. Even more interesting are astrolabes like that of al-Sahl al-Nisaburi, which was made sometime in the thirteenth century. Although this astrolabe is not tiny, studies of the star pointers of its rete have indicated that they are based on the arrangement of the night sky in the year 600.\textsuperscript{86} This detail is significant because of the fact that the universe is not static. To humans on earth, stars often appear to lie on the same plane of space. However, in reality, the stars seen “next to each other” at night may be several light years apart and moving in different directions. The movement of stars over time, termed “proper motion,” is significant enough that a typical medieval Islamic astrolabe would only be functional for fifty to seventy-five years after the date it was made, assuming that the data used to design its plates and rete was accurate at the time of production. Although the model of their cosmos did not conceive of the expanse of the universe, Muslims were aware of the effects of proper motion, and thus astrolabes such as al-Sahl al-Nisaburi’s are peculiar artifacts since they were scientifically inaccurate at the time of their manufacture.

The Effects of Scale

Despite the similarities of the experiences of viewers of astrolabes and domes in medieval Islamic culture, there is one very large difference between the two objects: their scale. The relatively small, often portable nature of astrolabes yields a different

\textsuperscript{85} King, \textit{In Synchrony with the Heavens}, 422.
\textsuperscript{86} Ibid.
experience than standing beneath a dome that spans an entire hall in a mosque, particularly given the fact that astrolabes are physically manipulated by the viewer to move, whereas the viewer (or the sun) must move to create the illusion of a moving dome. In her book *On Longing*, Susan Stewart has invested much thought in the different psychological reactions individuals have to extremes in scale, arguing that the miniature is evocative of the serenity of the infinite whereas the gigantic induces the passion of the transient.

For Stewart, the miniature represents a moment frozen in time, in which exacting detail is prized over narrative or action.\(^{87}\) However, in perfecting the miniature through careful attention to maintaining the proportionality of the “real” world, the minute manages to encapsulate the entirety of existence in its one single moment because theoretically, by observing the scale used to create the miniature, any event or entity can be recreated (think of miniature railroad enthusiasts who create small towns and country-sides to scale for their trains to travel through).\(^{88}\) Astrolabes are perhaps both perfect examples of this miniaturization and its exception: they are capable of demonstrating every potential location of the stars at any given moment, but they are capable of creating every possibility because they do actually move (thus, they break Stewart’s rule of the miniature as against action). However, the case of the astrolabe is still quite similar to Stewart’s own description of almanacs and calendars as popular subjects for miniaturization—they are already in a sense microcosms, containing everything about the entire cycle of the year in a much smaller space, and their miniaturization only further

---

\(^{87}\) Stewart, *On Longing*, 47.

\(^{88}\) Ibid., 48.
emphasizes this fact. The existence of miniature handwritten Qur’ans is an example of the Muslim awareness of this phenomenon, and perhaps a better comparison to astrolabes due to the fact that the Qur’an, as discussed above, is a potentially infinite book incapable of interpretive exhaustion in the Sufi mystical tradition just as the astrolabe is temporally and spatially infinite in its ability to continuously turn the entire universe. As Stewart emphasizes, it is this sense of the infinity of the miniature that makes it so important to its audience, because it is not a quality that can be experienced within our temporal interaction with the world. In human experience, there is always a beginning and an end, and the destabilization of time and space that occurs in one’s interaction with the astrolabe potentially functions as a closure to this conundrum through the emphasis of God’s existence outside of this construct. The viewer’s own experience as manipulator of the microcosm that is the astrolabe only furthers this conclusion, allowing one to play at what Stewart has described as experiencing everything simultaneously, an experience reserved for solely for God because of his position outside of time and space.

If the astrolabe is the miniature conceived of as promising closure through the presentation of infinity to the viewer, then the dome is the gigantic, potentially threatening disorder and destruction to the viewer according to Stewart. However, these connotations are not necessarily negative; as discussed earlier, the aim of Sufi teachings was to destroy the individual, in a sense, to lead to the reunification of the spirit with God. Stewart’s description of the experience of the gigantic as a movement through a

\[89\] 57
\[90\] 73-74.
landscape,\textsuperscript{91} which can lead to the sudden expansion of the soul and the emotions,\textsuperscript{92} fits quite nicely with Rumi’s poetry describing floating into space to meet the celestial bodies and find God. However, application of Stewart’s conception of the gigantic to Islamic domes contains a major flaw: that the dome, no matter how large or magnificent, is always a miniature of the sky. While domes may take the place of the celestial to their observers, the sheer vastness of the heavens will always be qualitatively larger, and thus the dome takes on a unique identity as a miniature-gigantic, expressing both the ability to be moved through (as stressed by the imaginary movement of floating out to space) and the ability to be moved (as in the examples of the muqarnas domes which appear to rotate with the movement of the sun).

In this discussion of scale, it is also interesting to note that the size of both astrolabes and domes produced by medieval Muslims varied enormously. While the smallest astrolabe, mentioned earlier, had a diameter of less than two inches, truly qualifying as a miniature object, the largest specimens were several feet in diameter, effectively making them giants compared to the modern notion of these instruments as portable objects. And although the Ottoman architect Sinan did manage to build the largest dome in the world as part of the Selimiye Mosque in Edirne, Turkey, many Islamic domes, particularly those directly above or nearby the \textit{mihrab}, or prayer niche, in mosques were often only a few yards in diameter, relatively close to human scale. The role of both astrolabes and domes as models of a cosmos that was truly Stewart’s conception of the gigantic, in that is was always only partially visible, and thus always

\textsuperscript{91} 71
\textsuperscript{92} 74-75
only partially accessible, to medieval Muslims emphasizes the way in which these objects are perhaps not necessarily miniaturizations of the celestial, but humanizations of it. The cultural contextualization of these objects within this thesis hopefully emphasizes the fact that medieval Muslims understood their interactions with astrolabes and domes as neither spaces where one “can only stand outside, looking in, experiencing a type of tragic distance,”\textsuperscript{93} reminiscent of the miniature, nor as spaces that “collapsed into partiality,” where “perception becomes fragmentary and above all temporal,” as is the case with the gigantic.\textsuperscript{94} Returning back to the Muslim derivation of the term astrolabe, the term “mirror” seems appropriate for the interaction with the universe that both astrolabes and domes were believed to provide; they were objects that one looked into to see himself reflected back in his environment.

\textsuperscript{93} Ibid., 71.
\textsuperscript{94} Ibid., 79.
CHAPTER V

CONCLUSION

This thesis has attempted to demonstrate that Islamic domes and astrolabes are not representative of the celestial because they are realistic depictions of the sky, or because they stand as symbols for the heavens, but because they actually reenact the way in which the cosmos was believed to function by medieval Muslims. If God is conceived of as “the great mover of things,” then astrolabes and domes both exemplify this characterization and provide human access to it. Guided by Sufi philosophy that emphasizes an inherent multiplicity of meanings present in physical objects, it becomes possible to view astrolabes and domes as concrete “texts” that could be read in a variety of ways depending on their immediate location within Islamic culture.

On the most basic level, Islamic astrolabes and domes participate in a pan-cultural understanding of the sky as a realm associated with super-human entities that originated with some of the oldest civilizations. However, the subsequent transformation of these forms within the Middle East lead to the development of very different cultural dynamics than those witnessed in their Christian counterparts. Astrologically, both domes and astrolabes took on the ability to mediate the effects of the cosmos, becoming tools of the elite members of society to craft fate in their favor. However, the religious connotations of these objects also encourages one to consider how their ability to mediate between the cosmos and the individual could have been a meditative tool in the practice
of mystical Islamic teachings.

In addition to the reconsideration of the cultural importance of astrolabes and domes within medieval Islamic society, this thesis has also argued for the continued effort to approach Islamic art on its own terms. Although Muslims were clearly in dialogue with a variety of outside societies from which they inherited much of their cultural foundation, the application of art historical approaches tailored for investigation of the material culture of these other civilizations is not capable of generating the same discourses that are possible from a detailed focus on developments within Islamic society itself. As more efforts are made to increase scholarship on all aspects of the lives of medieval Muslims, hopefully the ability to produce interdisciplinary studies such as this one will become more commonplace and encourage a deeper understanding and appreciation of Islamic culture.
BIBLIOGRAPHY


Harley, J. B. *The New Nature of Maps: Essays in the History of Cartography.* Baltimore:


