The Stars in the Sky and on the Globe

ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī's Visualization of the Heavens

by

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Abstract

In this paper, I analyze about 50 manuscript copies of ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī's *Book of the Images of the Stars* (*Kitāb ṣuwar al-kawākib al-thābita*). I investigate how the constellations were visualized in those copies, what their changes tell us about the contexts in which Ṣūfī's book was used, and which iconographic model dominated the transmission.

About the Author

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Keywords Arabic astronomy, al-Ṣūfī, visualization of the heavens, iconographic models, sociocultural contexts of science

1. Introduction

In the early decades of the fourth/tenth century,[1] the sons of a humble fisherman, Būya ibn Fannā Khusrow, from Daylam in Gilan (northern Iran) began their career as mercenaries in the service of two dynasties ruling within the Abbasid caliphate over parts of Iran and Central Asia. After the death of one of their overlords in 323/935, the three sons of Būya, ʿAlī, Ḥasan, and Aḥmad, managed to convince Caliph al-Rāḍī (r. 322–329/934–940) in Baghdad to recognize them officially as his governors in major parts of western and southern Iran. Their ascent as ruler *de facto* of Abbasid Iraq and Iran began in December 334/945, when Aḥmad entered Baghdad peacefully, was named the new emir of the emirs (*amīr al-umarāʾ*)—the highest military rank in the caliphate endowed with full administrative powers over the empire—and received the honorific title « Muʿizz al-Dawla » (Fortifier of the Dynasty). His two brothers were confirmed as governors in their holdings and received the honorific titles « ʿImād al-Dawla » (Support of the Dynasty: ʿAlī) and « Rukn al-Dawla » (Pillar of the Dynasty: Ḥasan). However, his title did not make Aḥmad the head of the family. It soon was contested by his older and more powerful brothers, and remained a bone of contention among the clan leaders and their offspring. Moreover, the other military leaders of the caliphate did not recognize the supremacy of the three brothers but had to be subdued in numerous campaigns. Nonetheless, with this event the almost 100 years of often volatile and violent Buyid rule over most of the central and eastern parts of the Abbasid caliphate began. This event also set the ball rolling that transformed the former mercenaries and their descendants into one of the most powerful families of patrons of culture, including the sciences, from the middle of the 4th/10th to the middle of the 5th/11th century, and created the political, financial, and cultural background for the career of ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī (291–376/903–986) at the Buyid courts.

[1] The first date is in the lunar Hijra calendar, the second the corresponding date in the Gregorian calendar. The epoch of the Hijra calendar is 19 Apr 622 in the Gregorian calendar.

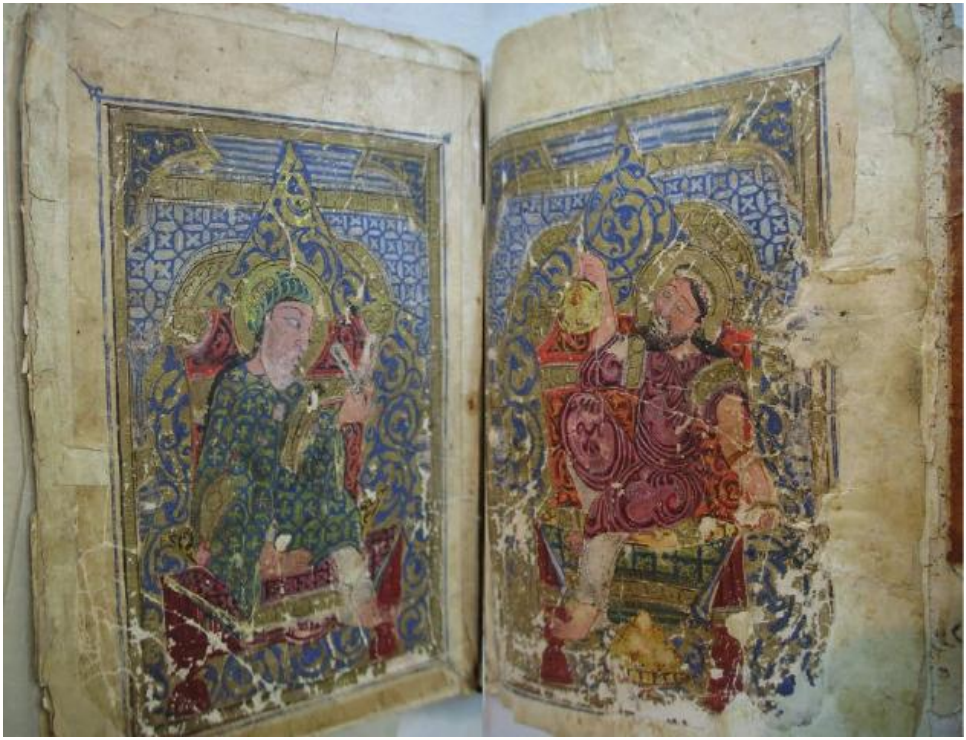

Plate 1. Double frontispiece, possibly showing on the left ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī and on the right his son Ḥusayn

From Ibn al-Ṣūfī's *Poem on the Stars* (*Urūjza fī-l-kawākib*), dated 554/1159–1160. MS Tehran, Reza Abbasi Museum, M 570, fols 1b–2a. Photographer: Moya Carey. © Reza Abbasi Museum, Tehran.

ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī was born in 291/903 in Rayy. He died 83 years later, probably in Shiraz. We know nothing about his upbringing and education, but his works declare him a master of the astral sciences, including their mathematical, observational, and instrumental methods and tools. Most of his adult life Ṣūfī spent apparently at Buyid courts serving as a teacher of Rukn al-Dawla's eldest son Fannā Khusrow and later as court astrologer. In 338/949, at the age of 13, Fannā Khusrow was appointed governor of Fars in Shiraz (r. 338–372/949–983) and received the honorific title «ʿAḍud al-Dawla» (Support of the Dynasty). After the death of his father Rukn al-Dawla, he became the most powerful emir of the Buyid family. To

him, Ṣūfī dedicated his most successful and influential work, *The Book on the Constellations of the Stars*, *Kitāb ṣuwar al-kawākib al-thābita* in Arabic, which literally means "Book of the Images of the Fixed Stars". Other Buyid emirs also received dedications of astronomical and astrological treatises by the scholar. Altogether, the titles of five such treatises are known today, and four are preserved as fragments or in different stages of completeness. The most frequently copied and widespread of them, by far, is the work to be presented here.

2. The content of the *Book on the Constellations of the Stars*

Ṣūfī divided his book into four main parts:

- a long preface,
- narrative explanations of the stars grouped as constellations,
- numerical tables providing data for all stars of a constellation and occasionally some of their neighbors, and
- visual forms of 48 constellations in a twofold representation as seen in the sky and on the globe.

The title that Ṣūfī chose for his book suggests that the latter were his main topic. He wished to visualize the heavens. For this goal, he chose the information provided in Ptolemy's (*ca* 100–170) *Almagest*, which combined data from various sources of the ancient world in verbal and numerical formats. Ṣūfī left out some of the constellations such as the Pleiades and added a few stellar groupings known to the nomads of the Arabian Peninsula, among them Equus (not Pegasus or Equuleus), or the Camel. The names of the constellations as found in copies of Ṣūfī's book are either (occasionally misspelled) transliterations of their Greek predecessors such as «Barsā'ūsh» for "Perseus" and «Qanṭūrus» for "Centaurus" (Κένταυρος), or translations and descriptive assimilations into Arabic such as «ʿAdhrā'» for "Virgo" or "The Chained Woman" (*al-Mar'a al-musalsala*) for Andromeda, the daughter of Cepheus (Κηφεύς). The transliteration of "Cepheus" as «Qayqā'ūs» may be a secondary form, since it also is undoubtably a reference to the mythical Iranian king of that name.

Since Ptolemy did not provide visualized representations in his star catalog, and images of the stellar configurations known among the Arab tribes are not documented among the tens of thousands of inscriptions all over the Arabian Peninsula, the questions arise:

(1) Why was the visual representation of the heavens so important for Ṣūfī?

(2) What did he wish to achieve with this transformation of verbal and numerical data into visualized information?
(3) From where did he acquire the inspirations or even models, and
(4) Which design patterns did he use?

Several answers to the first three questions can be derived from Ṣūfī's preface to his work in which he is surprisingly explicit on some of the issues that motivated him in his work. The fourth question cannot be answered in full, because none of the versions that he produced himself have come down to us. But I will offer arguments on the basis of a good part of the surviving copies that I believe shed light on this point. The surviving material instantiations of Ṣūfī's work are the main key to understanding Ṣūfī's preferences and choices when visualizing the textual information appropriated from the *Almagest* and Arabic treatises on knowledge of the stars ascribed to the nomads from the Arabian Peninsula.

The material objects that serve to define, teach, and spread knowledge of the heavens in visual forms are manuscripts that combine in most cases verbal descriptions and explanations with numerical data in tabular format concerning latitude, longitude, size, and degrees of brightness of the individual stars that participate in forming the constellations, and drawings of male and female figures—of royals, heroes, or mythical personae—or beasts, birds, and quadrupeds as well as material objects of daily life and religious practices. In many of the surviving manuscripts, words, numbers, and drawings or, in later periods, paintings interact with each other through mutual verbal and numerical references. But they also serve different purposes and are used in different ways.

Five centuries after Ṣūfī had produced his book, the meanings of some of his words had apparently become unfamiliar to some of his readers, who checked them with the help of the famous Arabic-Arabic dictionary *al-Qāmūs al-muḥīṭ* (*The Encompassing Dictionary*) by Majd al-Dīn al-Fīrūzābādī (1329–1414). The numerical data suffered under the burdens of scribal practices and needed to be verified and corrected. Some users did this by acquiring other copies of Ṣūfī's work or perhaps even checking astronomical handbooks as Ṣūfī himself had done. Others went back to the heavens and observed and measured again the positions of at least some of the stars. The images of the constellations were a different matter. They could not be seen in the sky, despite Ṣūfī's claim. They could only be imagined or checked on a globe or in some other manuscript. This indeed happened in some cases; in most of the extant cases, however, the images

were adapted to the contemporary tastes and cultural contexts of the person who drew them.

Depending on the interests of the producers or recipients of each copy, the interaction between the three components (text, numbers, images) of Ṣūfī's work were reinforced, weakened, or altogether neglected. This finds expression first in the placement—accurate or sloppy—of the stars in and outside the constellation figure, or their absence. Second, it is reflected in the absence of text and numbers, leaving behind only the images, or in the complete absence of the drawings, leaving behind various fragments of texts or tables. A third form that breaks to some degree the interaction between the three components that Ṣūfī had taken pains to establish is the partial disappearance of the figurative drawings from the visual presentation of the constellations. In one group of manuscripts this leads to the depiction of the stellar positions between words for the cardinal direction: that is, to a kind of elementary stellar map and, hence, to a new type of visualization with a greater degree of abstraction. In the other group, the separation between the figurative representation and the stellar positions is not completely finalized yet. Sometimes a figurative drawing stands beside the new visual format of mapped stars only. Since this turn to visualizing the heavens through a stellar map appears mainly for the human figures, it is possible that it reflects struggles over sociocultural norms concerning visual depictions of humans rather than new scientific ideas about how to see and visualize the sky.

The constellations are differentiated into three groups:

(1) those seen in the northern sky,
(2) those seen in the southern sky, and
(3) the 12 constellations (called zodiacal) that are imagined to intersect a narrow band extending above and below the zodiacal circle (or ecliptic), which is the projection onto the celestial sphere of the Sun's oblique course through the heavens.

The zodiacal circle is also divided into 12 equal segments (called zodiacal signs) named after the zodiacal constellations that are observed along this solar path. Introduced around the middle of the first millennium BC in Mesopotamia, during Ṣūfī's times and later, the zodiacal constellations no longer stood in the zodiacal signs named after them. Certain issues that people in premodern Islamicate societies had with the visualized division of the night sky resulted from this deviation between these eponymous constellations and the zodiacal signs. Ṣūfī's view on this issue, which was explained

by the precession of the equinoxes, will be presented in the following section [p. 67 below].

The northern constellations in Ṣūfī's book are Ursa minor, Ursa major, Draco, Cepheus, Boötes, Corona borealis, Hercules, Lyra, Cygnus, Cassiopeia, Perseus with the Demon Head, Auriga, Serpentarius and Serpens, Sagitta, Aquila, Delphinus, Equuleus, Pegasus, Andromeda (visualized in three forms as The Chained Woman, Andromeda with the Two Fishes, and Andromeda with the Fish), Equus, and Triangulum.

The southern constellations are Cetus, Orion, Eridanus, Lepus, Canis major, Canis minor, Argo Navis, Hydra with Corvus and Crater, Crater, Corvus, Centaurus with Lupus, Ara, Corona australis, and Piscis australis.

The zodiacal constellations are Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces.

Altogether, there are only 47 constellations, because Serpentarius and Serpens are visualized as a single constellation. In copies of the 6th/12th and later centuries, an image of the Camel can be found, but it is not fully integrated into the set of constellations because it is not accompanied by either a separate explanatory text nor separate tables.

Because of the interaction between verbal explanations, numerical tables, and images, and because the preface highlights Ṣūfī's motivations and goals when giving the visualized heavens such an extended space and, hence, such prominence in his work, I will first present my understanding of this preface. The following section surveys what we know about the surviving copies of Ṣūfī's work, in order to clarify the corpus of material objects needed for a complete analysis of the history of Ṣūfī's visual stratagems but which I cannot fully incorporate here due to its substantial size and variegation. Sections 3 and 4 discuss Ṣūfī's sources and the surviving corpus. Section 5 argues in favor of the visual program of MS Oxford, Bodleian Library, Marsh 144 as the most authoritative version of Ṣūfī's visualization of the heavens. Section 6 presents the impact of this program and its changes over the centuries as one outcome of the changes in the makeup of the many Islamicate societies in which Ṣūfī's work was reproduced for different purposes and their arts. Section 7 shows that in the early modern period, Ṣūfī's work not only was appreciated as a tool for acquiring knowledge or as an art object but also served for expressing political messages or ambitions.

3. Ṣūfī's scholarly goals and contributions to the knowledge of the stars

Ṣūfī's book was written in or shortly after 353/964 when he was 61 years old. It is remarkable in a number of aspects, and at the same time characteristic of the critical, innovative, and ambitious spirit among the scholars of what was then called the sciences of the ancients: philosophy, logic, medicine, the four core mathematical sciences (number theory, geometry, astronomy/astrology, and theoretical music, *scil*. theory of proportions) with their numerous branches (several types of reckoning, algebra, optics, burning mirrors, mechanics, and so on), and what were called the occult, remarkable, strange, or hidden sciences (alchemy, mineralogy, physiognomy, chiromancy, magic, and various kinds of divination).

Ṣūfī begins his book with an introduction that for his time is unusually long and detailed. It is highly critical of the works of his predecessors and contemporaries. It focuses on methodological issues of how to see, measure, and identify the stars and constellations in the sky, and reports on Ṣūfī's efforts to overcome the diagnosed shortcomings. After a religious opening, which was not yet standard in scientific texts, Ṣūfī begins his explanation of why, how, and for whom he collected and arranged the knowledge of the stars, and divides the people known to him who "sought to learn about the fixed stars, their positions at the celestial sphere and their images" [Schjellerup 1874, 29] into two groups: those who

> follow the way of the astral experts (*munajjimūn*) and trust in the globes made by artisans who do not know the stars themselves but only take the longitudes and latitudes that they find in the books and place the stars in this manner on the globe without being able to differentiate between truth and error [Schjellerup 1874, 29]

and those who

> follow the method of the Arabs in the science of the *anwā'* and the lunar mansions and attach themselves to what is found in the books on that matter. [Schjellerup 1874, 32]

The artisans who produce globes, Ṣūfī reports, sometimes also use data from the tables in astronomical handbooks (called *zīj* in Arabic). Since such tables were calculated by leading experts in the field of astral knowledge, one would think that this is a quite impressive thing to do. But far from it. In a massive broadside against such experts, Ṣūfī declares that the authors of such handbooks frequently choose only the most famous stars, which everybody knows anyway. Their claims to having seen the less well-known stars in the sky for themselves are often untrustworthy.

When he tried to locate those mentioned by Muḥammad ibn Jābir al-Battānī (244–317/858–929)—the son of an instrument maker originally from Harran, a compiler of an influential astronomical handbook and thus a famous scholar of the astral sciences—at the coordinates provided by him, they were not there and the data given for their respective size and brightness were often wrong [Dodge 1970, 2:661–662; Schjellerup 1874, 29–30]. Even worse, after having checked many of the handwritten copies of Ptolemy's *Almagest* with its star catalog to verify the transmitted data and, if possible, to sort out scribal mistakes, Ṣūfī is of the opinion that his illustrious predecessors suppressed many stars for which such data conflicts emerged without making any effort to repair them [Schjellerup 1874, 30]. Thus, not only does handwritten-book culture by its very nature create confusion and distortions for seeing and knowing the heavens as they are; even the experts are guilty of contributing to the troubles.

But obstacles for seeing and knowing the heavens do not only result from lack of attention to scribal mistakes, careful calculations, or reliable observations. They also surface in those sources that visualize the heavens in various anthropo- and zoomorphic forms, as mythical beings, and as material objects. A book by the astrologer called Mercury (ʿUṭārid; third/ninth century), who also was an instrument maker, visualized the 48 constellations of Ptolemy's *Almagest* and depicted the face of Sagittarius in the opposite of the correct direction. A globe by ʿAlī ibn ʿĪsā from Harran[2] (today in eastern Turkey, see below), a famous instrument maker and a teacher of al-Battānī's father in the craft, wrongly placed a star, situated according to the *Almagest* on the wing of Virgo, in her face [Dodge 1970, 2:671; Schjellerup 1874, 30–31]. ʿAlī ibn ʿĪsā also moved a large star from the leg of Sagittarius to its rump, while still describing it as on "the leg of Centaurus". Both scholarly artisans depended in their craft of visualizing the heavens on words and numbers which they found in faulty copies of the *Almagest* and contemporary tables. They knew of the continued changes of the positions of the stars and their

[2] Emilie Savage-Smith is of the opinion that this information about ʿAlī ibn ʿĪsā's place of origin is an addition of modern editors to Ṣūfī's text [Savage-Smith 2013, 154 n9]. But several Arabic as well as Persian manuscripts that I checked contain this information. See, for instance, MSS Preußischer Kulturbesitz, Staatsbibliothek Berlin, Landberg 71, fol. 2a, 31; Preußischer Kulturbesitz, Staatsbibliothek Berlin, Sprenger 1854, fol. 160b, 1; Dublin, Chester Beatty Library, Ar. 4119, fol. 2b,10; Dublin, Chester Beatty Library, Ar. 4222, fol. 3b,1 (unpaginated); Istanbul, Süleymaniye Manuscript Library, Fatih 3422, fol. 4a, 5.

constellations over time, which the authors of the handbooks indicated in their calculations. But the two scholarly craftsmen apparently never looked up at the night sky to see where the objects they visualized truly were in their times [Schjellerup 1874, 31].

As for the other group of people who followed the star lore of the Bedouins of the Arabian Peninsula, Ṣūfī acknowledged that they knew well their poems and meters but had little knowledge of the night sky and repeated the mistakes of the poets and more recent writers whom they quoted [Schjellerup 1874, 32]. Ṣūfī acknowledges Abū Ḥanīfa al-Dīnavarī (d. 281–290/894–903) as the most accomplished among them, but accuses him of severe incompetence in the physics of the heavens in addition to his following the same two practices as the members of the first group—relying on bookish knowledge and observing only the best-known stars, while ignoring the others [Schjellerup 1874, 32–33]. Abū Ḥanīfa raised a problem apparently not discussed in the works of the other group: the naming of the zodiacal signs by the names of constellations, which no longer appeared in those signs named after them. Abū Ḥanīfa apparently believed that the names of the signs were not derived from the likeness of the visualized constellations to certain beings and things, although the signs and the constellations shared the same designations. Ṣūfī enters into a lengthy discourse on why the names of the constellations and the signs always were the same, while the positions of the former change over time [Schjellerup 1874, 33–34].

After discussing other mistakes that he sees in al-Battānī's works and in claims made by people admitted at court and locally considered famous experts of the stars, Ṣūfī gets to the heart of the matter of what was wrong with all his illustrious predecessors and not so famous contemporaries:

> After I saw that those men despite their reputation, their superiority in this art, the trust they inspire, the generally widespread usage of their works merely followed their predecessors without trying to distinguish with their own eyes the truth from the error so that those who read their works are induced to believe that those works are the fruit of their knowledge of the stars and their positions; and finding in the books compiled on the *anwāʾ*, as much as they encompass the stories of the traditions according to the Arabs and other things referring to the mansions and the stars, contradictory and evidently false things, which would enlarge this book without any benefit, would I mention them all, I decided more than once to make those things public and to write a book about them. [Schjellerup 1874, 39]

Thus, the two goals of Ṣūfī in his *Book on the Star Constellations* were to produce the first correct account of the 48 constellations listed by Ptolemy

in his *Almagest* and all of their stars plus those not considered or even unknown by the Greco-Egyptian astral expert, and to teach not merely bookish knowledge but the scientific method that he considered the only reliable way to know the heavens correctly and completely. The key to this method was to look at the heavens, to search the stars with one's own eyes after one had learned all the other components of the way of the astral experts from the texts. Texts clearly did not suffice for knowing what was up in the sky. Careful observation alone could lead both the expert and amateur to the truth. Constellations were the means to create systematic order and helped to locate the hundreds of individual stars beyond the few famous ones known by everybody. Tabulating and identifying them through numbers were well-established and indispensable tools for getting to know them. But they did not suffice, since they led to pretense, inaccuracy, and even blatant falsehood. The only way to truth was to visualize them after having undergone the pain to look for them, to determine their correct positions, to recognize their true sizes and degrees of brightness, and thus to distinguish between them through the sense of seeing. But seeing needed to be taught and learned. Teaching a visualized sky and thus to learn how to see properly and skilfully was the ultimate goal of Ṣūfī.

These epistemic and didactic ambitions shaped the production of the material specimens of his knowledge: the manuscripts. Although no manuscript from Ṣūfī's time has come down to us, traces of the process of production are left in the colophons of several extant copies. Such colophons tell us that Ṣūfī wrote his book in at least two stages. In the first, he continued to add new insights and to alter passages after having finished the draft. This version went into the library of his patron ʿAḍud al-Dawla. Then he produced a finalized version, which he employed when teaching. The colophons also state that Ṣūfī drew the images of the constellations himself. According to art historian Moya Carey, this means that he plotted, marked, and labelled the positions of the stars and perhaps might also have drawn the figures of the constellations [Carey 2009, 199 n9]. Additional information about how he drew them comes from a remark of the polymath Abū l-Rayḥān Muḥammad ibn Aḥmad al-Bīrūnī (362–d. after 444/973–d. after 1053) in his *Treatise on the Plane Projection of the Constellations and the Melon-Shaped Projection of the Countries* (*Risāla fī tasṭīḥ al-ṣuwar wa-tabṭīḥ al-kuwar*). He reported that a contemporary of Ṣūfī worked in Shiraz when the latter was present there. One day, the two astrologers had a conversation about how Ṣūfī had created his images of the constellations. Ṣūfī told him that he had achieved this by placing thin paper on the globe and wrapping it around it

until it conformed very neatly to its surface. Then he drew the constellations and indicated a specified position for each star with regard to the bodily or other parts of the constellation.[3]

Bīrūnī commented on this procedure: "And this is an [adequate] approximation when the figures are small, but it is far from adequate when they are large" [Savage-Smith 2013, 154 n10]. Thus, he was of the opinion that further mathematical skills had to be acquired before one could properly bring the visualized forms of the heavens to paper. Careful observations of the stars, their absolute and relative positions, their magnitudes, and their brightness did not suffice. In Bīrūnī's view, reliable two-dimensional figurative depictions of the constellations presupposed the knowledge of at least the stereographic projection.

Colophons in more than one copy of Ṣūfī's work further report that in the exemplar produced in the classroom, his student copied with painstaking care the visual forms that his teacher had designed. According to a standard way of teaching at that time, Ṣūfī checked the copy of his student and signed it, confirming thereby that it was correct and that his student could now teach his work [Savage-Smith 2013, 136–37].

At least one later copyist had the same commitment to reliability and accuracy. Having come into the possession of Ṣūfī's draft for ʿAḍud al-Dawla, he claims to have carefully copied what he found there. But things were obviously more difficult than that. His copy presents the two images of Boötes in the sky and on the globe, but with one and the same distribution of the stars of the constellation. Since one looks up to the heavens and down at the globe, not only do the figures turn in opposite directions but the stars need to be placed accordingly. The scribe commented that he knew that the image was wrong but stressed that he had found it in his source. He clearly missed the main message of Ṣūfī's preface: knowledge is found in the sky, not necessarily in a book or on a globe.

4. The sources of the *Book on the Star Constellations*

As shown in the previous section, Ṣūfī mentions five kinds of sources:

(1) astronomical handbooks,
(2) treatises with poems and stories on lunar mansions and *anwāʾ*,
(3) globes,

[3] Summarized according to Savage-Smith's translation [2013, 133–134].

(4) an illustrated book on the 48 constellations of Ptolemy's *Almagest*, and
(5) conversations with astral practitioners,

in addition to his own observations and measurements. The one globe maker mentioned by name, ʿAlī ibn ʿĪsā, came from Harran. The compiler of the illustrated book of the constellations, Mercury (ʿUṭārid), also seems to have been an instrument maker. His name points to a similar geographical and religious origin as that of ʿAlī ibn ʿĪsā, namely northern Mesopotamia (today northern Iraq and eastern Turkey). The religious community to which both men seem to have belonged came to be called the Sabians in the early Abbasid period. They are known as followers of an astral faith who erected temples for the seven planets known in Antiquity (the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn) to whom they prayed. In addition to the Aramaic dialect that they spoke as their mother tongue and used in their liturgy, they seem to have known Greek. Their knowledge of Greek probably was the heritage of the Seleucid kingdom that arose in Mesopotamia, Asia Minor, Iran, and parts of northwestern India after Alexander III of Macedon's death in 323 BC after lengthy struggles between his former commanders. The main city of this community was Harran. After the Seleucids, it came under the rule of the eastern Iranian Parthian dynasty, the Roman Empire, and other smaller, local kingdoms. At least until the fourth century, Roman and Byzantine emperors worshipped Selene, the Greek lunar goddess, in the city's famous temple of the Moon. Not surprisingly, many of the early instrument makers and scholars of the astral sciences, among them al-Battānī's father, came from that city or its environment.

Since none of those early globes is extant today, nor a copy of Mercury's (ʿUṭārid's) visualization of the heavens, we do not know how their drawings of the star groups called constellations looked. David Pingree believed that the Sabians had somehow acquired aspects of their images of the stars from northern Indian versions of Greek and Egyptian models that had moved there with Alexander's soldiers [Pingree 1980, 8; 1989, 4].[4] But he also admitted that the wanderings of the visual representations of the planets—the Mesopotamian zodiacal signs or the Egyptian decans—from the Near East to the Mediterranean as well as to Iran, Central Asia, and India was a highly complex cultural phenomenon and difficult to disentangle [Zimmermann n.d.]. Moreover, the lack of visual evidence from Harran itself puts such ideas in the realm of historical speculation.

[4] For the relationship to Greek astral sciences and philosophy, see Pingree 2002.

Another possible source of Ṣūfī's visual forms of the constellations was the *Phaenomena*, a poem on the stars by Aratus of Soli (d. 245 BC) [see Mastorakou 2020]. Due to a dearth of research, this is difficult to confirm at the moment. The main feature that speaks against too great an influence of Aratus' poem is the complete absence of drawings and precise numbers of stars for each constellation. Since many of the extant Latin versions of the poem contain paintings, however, it is not impossible that the late antique Greek copy that was translated into Arabic also carried images [Honigmann 1950, 31; Sachau 1910, 383–385]. According to Bīrūnī, one of the commentaries on Aratus' poem seems to have been translated into Arabic [Sachau 1910, 97]. This too, might have brought Graeco-Roman imagery of the heavens into Islamicate societies.

But not all visualizations of the constellations described in Aratus' poem are reflected in Ṣūfī's book. For the constellation Cassiopeia, for instance, Aratus only talks of the stars used by the Babylonian experts, comparing them to a key [Zimmermann n.d.]. This account of Cassiopeia did not guide Ṣūfī's perspective. He never compares the placement of her stars with a key but rather piecemeal with almost straight lines [Schjellerup 1874, 82–83]. Instead, he adds to the list taken from Ptolemy's *Almagest* information attributed to the Bedouins on the Arabian Peninsula. Another example, where the variety of representations found in copies of Ṣūfī's book does not always agree with Aratus' description is Virgo. She appears in some copies with wings and in others without them.[5] Occasionally, she has wings and carries a flowering plant, probably standing in for the ear.[6] In at least one case, she carries a grape vine.[7] Thus, a more detailed analysis of the extant Latin versions of Aratus' poem and their illustrations is needed to determine whether some Greek version of the poem or of an illustrated commentary may have inspired Ṣūfī's visual choices.

[5] MSS Doha, MIA, 2.1998, fols 93a–93b; Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Landberg 71, fols 52a–b; Dublin, Chester Beatty Library, Ar. 4222, fols 98b–99a; Istanbul, Süleymaniye Manuscript Library, Fatih 3422, fols 131a–b; Oxford, Bodleian Library, Marsh 144, 223–24; Istanbul, Topkapı Palace Library, Ahmet III, 3493, fols 79a–b; Uppsala, Universitetsbiblioteket, 325, unpaginated.

[6] MSS Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Sprenger 1854, fols 197b–198a; Istanbul, Süleymaniye Manuscript Library, Lala Ismail, 318, fol. 27b; Tehran, Majlis Library, 566, fol. 87b.

[7] MS Strasbourg, Bibliothèque nationale et universitaire, 4330, fol. 8a.

Finally, art works were time and again sources of inspiration for those who copied images of the constellations. This was most likely also the case for Ṣūfī himself. Since none of the manuscripts mentioned in the colophons of later copies has come down to us, it cannot be said for certain which art style and typology of humans, dress, accessories, animals, and other imaginations of the heavenly figures Ṣūfī had chosen (but see below). Disregarding quality and secondary details, for instance, at least four basic types of male representation, three types of scale, four forms of Aquarius, three forms of Gemini, four forms of Virgo, three types of Taurus, or three types of Cetus populate the extant copies of Ṣūfī's book. The four types of male bodily features concern primarily facial properties and hair styles. They encompass at the very least four different types, each one with some local variations, which I label for the sake of convenience "Mediterranean", "western Asian", "South Asian", and "eastern Asian". Art historians have given the second type the special label post-Sasanian, Perso-Iranian, or Samarra style [Wellesz 1959, 13].

The male figures of the Mediterranean type usually show their head hair mostly straight and cut short below the ears.[8] In the colophon of one of the manuscripts with this kind of personification of the male figures of stars, the Muslim scribe names Mosul as his place of work. He claims that he worked with a copy related to the manuscript made by Ṣūfī's student Faraj ibn ʿAbdallāh, the Ethiopian.[9] He also states that the images and tables in Faraj's copy had been drawn by Ṣūfī himself.[10] Although this is not completely impossible, it is not confirmed by the respective colophon in a copy from 519/1125, now in Doha [Savage-Smith 2013, 136]. If true, this would mean that Sufi got his typological inspirations either from an illustrated version of a Greek text on the constellations or from an Arabic text or globe illustrated in a Christian artistic style.

The western Asian males have curled hair either of shoulder length or cut short and sometimes a forelock, or they cover their hair with a turban or

[8] MS Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Landberg 71, fols 15b, 18b, 23b, 25b, 27b, 30b–31a, 38b–39a, 49b–50a, 52a–b, 66b–67a, 72b–73a.

[9] MS Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Landberg 71, fol. 93a, 20–21. The colophon contains several mistakes, including the date 454/1062 and its linkage to al-Ṣūfī. Hamid Bohloul and I are discussing our current interpretation of this colophon in a forthcoming paper on colophons.

[10] MS Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Landberg 71, fol. 93a, 21–22.

some other headdress.[11] The eastern Asian male figures carry three or four long, braided plaits and felt hats or caps.[12] The South Asian type appears with Indian forms of turbans, hats, or scarves which either fully cover the head hair or show shoulder-length straight hair.[13] The Mediterranean and western Asian male figures very often have full beards, while the South Asian males sport only occasionally mustaches, and the eastern Asian figures possess no facial hair. In addition to such bodily differences, those types simplified for the sake of recognition and discussion also differ visibly in their headdresses, robes, and accessories.

The manuscripts either show just one of the four types or mix them more or less generously. Depending on the drawing and painting skills of the illustrators, the images are of high quality [see Plates 5 and 6] or rather schematic either with or without misplaced stars [see Plates 2, 3, and 4]. According to the period and region of copying, Mediterranean male faces in the Renaissance style can appear in manuscripts produced in India; images in the Renaissance style or Rubenesque paintings of the constellations can be found in an Ottoman historical work; Seljuq-style images represent the constellations in a medieval Latin manuscript from Italy, possibly Bologna; and early modern Latin adaptations of Middle Eastern forms of the constellations printed probably somewhere in the Netherlands were repainted in the same period in Cairo, carefully preserving features of the printed book.[14]

Analogous observations apply to female, zoomorphic, and mythical representations of the constellations, as well as to the object types. This variability

[11] MS Dublin, Chester Beatty Library, Ar. 4119; Istanbul, Süleymaniye Manuscript Library, Fatih 3422; Istanbul, Süleymaniye Manuscript Library, Ayasofya, 2595; Berlin, Preußischer Kulturbesitz, Staatsbibliothek, or. qu. 704; Doha, MIA, 2.1998 (Sagittarius and so on); London, British Library, 5323; Paris, BnF, arabe 2488 (Boötes, Hercules, Perseus, and so on).

[12] MSS Doha, MIA, 2.1998 (Cepheus, Boötes, Orion, and so on); Paris, BnF, arabe 2489; London, BL, 5323 (Perseus, Gemini, Sagittarius, Aquarius, Orion, Centaurus with the Beast).

[13] MS Strasbourg, Bibliothèque nationale et universitaire, 4300 (Perseus, Hercules, Sagittarius, Centaurus).

[14] MSS New York, MET, 1975.192.2, unbound, eighth leaf; Istanbul, Süleymaniye Manuscript Library, Pertev Pasha, 375, fol. 25b; Istanbul, Süleymaniye Manuscript Library, Lala Ismail, 318, fols 19b–30b; Paris, BnF, Arsenal, 1036; Copenhagen, Royal Library, Cod. ar. 83.

Plate 2. Perseus with the head of a demon (*ghul*)

MS Doha, MIA, 2.1998, fol. 42b. © MIA, Doha.

of the visual forms—reflecting in many of the extant Arabic, Persian, Ottoman Turkish, Latin, or other copies the tastes and norms of the illustrators' specific environments—highlights that the visualization of the heavens is first and foremost a visualization of a concrete human context.

5. Preservation and distribution of Ṣūfī's work

It is unclear how many copies survive in the languages in which it had been written or translated into: Arabic, Persian, Latin, Castilian, and Ottoman Turkish. The greatest number, perhaps about 100, encloses versions of the Arabic original with and without the figures of the constellations, the tables of coordinates and indications of brightness and size of individual stars, or the verbal descriptions of the constellations. These differences in format alone highlight the variability of the interests that producers, buyers, collectors, teachers, or students pursued when acquiring a copy in the market,

Plate 3. Andromeda with the fishes

MS Berlin, Preußischer Kulturbesitz, Staatsbibliothek, Springer 1855, fol. 20a. © Preussischer Kulturbesitz, Staatsbibliothek, Berlin, Orientabteilung.

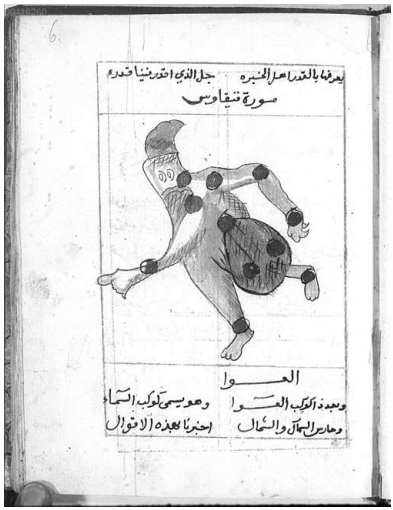

Plate 4. Cepheus; from the *Poem on the Stars* (*Qaṣīda fī l-kawākib*) by Ḥusayn ibn Umar al-Ṣūfī, the son of Abd al-Raḥmān al-Ṣūfī

MS Munich, Bayerische Staatsbibliothek, cod. arab. 870, fol. 6a. © Bayerische Staatsbibliothek, Munich, Orientabteilung.

penning it in class, or commanding it from the scribes and painters in a courtly or urban workshop. Other features of the impressive variability of form and content will be presented in the following sections.

Persian translations of Ṣūfī's book were produced at least four times between the 6th/12th and the 11th/17th centuries. Two of them were undertaken in courtly contexts. The third was the work of a member of one of the most important families of architects in Mughal Lahore and beyond. A fourth one is anonymous and cannot yet be attributed to any known translator or patron. So far, some 16 copies of those Persian versions are known to exist in libraries of Asia, Africa, Europe, and North America.

The most famous and widespread Persian translation stems from the pen of one of the best-known scholars from Islamicate societies, Nāṣir al-Dīn al-Ṭūsī (597–672/1201–1274). Given the date in the extant copies (647/1250), Ṭūsī probably studied and translated Ṣūfī's book at the Ismāʿīlī fortress Alamut, the seat of the famously notorious "Assassins". His translation was

copied and read at the courts of Aḥmad ibn Uways (r. 783–813/1382–1410), the ruler of the Turkmen White Sheep Confederation in Tabriz, and of the Timurid prince and later head of the Timurid Empire in Samarkand, Ulugh Beg (r. 812–850/1409–1447 as governor of Samarqand; 850–853/1447–1449 as head of the dynasty). A century or two later it was also known in Mughal India and in the Ottoman Empire. The second Persian translation was commanded by the Safavid governor of Khurasan, Manūchihr Khān (d. 1046/1636), and executed by his court astrologer Ḥasan ibn Saʿd al-Qāʾinī (d. after 1043/1633). The third Persian translation was the work of Luṭfullāh Muhandis (the master builder), the second son of Aḥmad al-Nādir (the Exceptional), Miʿmār (architect) from Lahore (11th/17th century). Ḥasan ibn Saʿd al-Qāʾinī was also involved in the production of a beautiful globe, which today is held by the Adilnor Collection in Sweden. In addition to authoring three further astronomical texts, three arithmetical treatises, and a didactic work in the form of questions and answers on geometry, Luṭfullāh Muhandis and his father, as their bynames indicate, together with other family members, were highly appreciated builders for the Mughal rulers. They headed or contributed, for example, to the construction of the Red Fort in Delhi and the Taj Mahal in Agra.

The Latin versions of Ṣūfī's book have not yet been systematically studied. Hence, we do not know yet whether they all derive somehow from a translation carried out by an anonymous scribe or scholar at the court of the Norman king William II (r. 1166–1189) in Palermo. The Norman rulers were famous not only for their military prowess but also for their cultural and political dexterity and flexibility. Their administration copied many features of that of the Fatimid caliphs (r. 297–567/909–1171) in Cairo, and high-ranking administrators had come from there. Arabic-, Greek-, Latin-, and even Syriac-speaking scholars from North Africa, Syria, Italy, Byzantium, the British Isles, and possibly other regions were members of their entourages and translated philosophical, mathematical, astronomical, medical, and other works of famous scholars from Antiquity and the Middle Ages. In such a multilingual and multicultural environment, it is not difficult to imagine that Ṣūfī's book was among the works that attracted royal as well as scholarly interest and patronage.

Despite the lack of comprehensive studies, it is nonetheless clear that the textual and numerical differences between the (at least) nine surviving manuscripts are fairly substantial. Thus, researchers sort them into four different groups. As in the case of the Persian translations, some members of those groups were produced for kings, among them Wenceslaus IV of Bohemia

(r. 1378–1419). Others whose places of production are not known yet were later bought by bishops or dukes such as Nicolaus of Cusa (1401–1464) or Ernst II of Saxonia-Gotha-Altenburg (r. 1772–1804).

The Castilian as well as the Hebrew versions were produced in the 13th and 14th centuries at the courts of Alfonso X of Castile, León, and Galicia (r. 1252–1284) and Pedro IV of Aragon (r. 1336–1386). As in the case of some of the Latin versions, they do not always agree with the Arabic texts and tables.[15] The images of the constellations, in contrast, show important similarities that leave no doubt of their derivation from a Ṣūfī ancestor.

At the same time that Ṣūfī's book spread in Christian Europe, great parts of Asia and eastern Europe, including former territories of the Abbasid caliphate, came under the rule of Mongol warrior kings and queens. After a period of massive destruction of cities, towns, villages, and agricultural, artisanal, and intellectual infrastructures, and the loss of many lives, Buddhist, Christian, and later Muslim Mongol rulers adapted to the local cultures and invested social, intellectual, economic, and financial means to repair the damage and to revive societies. During the so-called Pax Mongolica, merchants, doctors, astrologers, priests, ambassadors, and other educated men and women traveled wide and far between Mongol China, Mongol Tibet, Mongol Iran, Iraq, and Anatolia, as well as Mongol eastern Europe—carrying with them manuscripts, instruments, remedies, silks, and other valuable goods, and images. The celestial and terrestrial maps that graced the newly built observatories in Maragha and Tabriz are unfortunately lost forever. But we know from the fragmentary Persian and Arabic reports extant about scholars and books that the libraries at those places also contained copies of Ṣūfī's book. A Chinese list of books and instruments from the Northern Astronomical Observatory proves that at least one such copy had also arrived in Beijing, the capital of Mongol China. After the Mongol Yuan dynasty (r. 1271–1368) had been overthrown in 1368 by the Chinese Ming dynasty (r. 1368–1644), the Arabic and Persian manuscripts and instruments were moved to their new capital, Nanjing. There, several of the astronomical and astrological texts were translated into Chinese. There are no indications that Ṣūfī's book was among those translations [Weil 2018, 263–267].

[15] In the case of the Hebrew version, the tables might be appropriated from the *Almagest*.

6. Which visual model did Ṣūfī privilege or even create?

In her analysis of the manuscript copy preserved at the Museum of Islamic Arts at Doha, Emilie Savage-Smith argues that it is the most authoritative copy extant today of Ṣūfī's work. She based her conclusion on the manuscript's multiple colophons.[16] This does not apply, however, to its visual components. The manuscript's version brings together two partial copies of Ṣūfī's book produced at different times and places. The excellently painted male constellations of the older part show a mixture of what I called the eastern Asian type and the western Asian style. The males of the eastern Asian type wear Turkic hairstyles, dress, and accessories (Boötes as seen in the sky, Cepheus as seen on the globe, Boötes as seen on the globe, the Kneeler as seen in the sky, Serpentarius as seen on the globe, Orion) [see Plate 5]. The males of the western Asian style appear with curled short-cut or shoulder-length head hair, fully bearded faces, and a special kind of dressing, the turban (Serpentarius as seen in the sky, Sagittarius), or are beardless and bareheaded (Cepheus as seen in the sky, the Kneeler as seen on the globe, Auriga, Aquarius, Centaurus with the Beast).[17] A further style perhaps mixing western Asian with eastern Asian forms can be found in the depictions of Gemini. Their hair reaches down their backs and may be a single-braided plait. In front of the ears, they show forelocks. On their heads they do not wear hats or turbans but diadems.[18] This mixture of older with more recent forms of male representations corresponds well to the time and place of production of that part: 519/1125 in Baghdad, then under the rule of the Seljuq dynasty (r. 429–552/1037–1157) of Oghuz Turks. The four images of Cygnus, Cassiopeia, Perseus, and Aries in the younger Ottoman part, in contrast, were drawn by a particularly ungifted copyist and show no specific cultural features.[19]

A study of some 50 Arabic, Persian, and Ottoman ink drawings and paintings of Ṣūfī's visual forms allows me to claim that the overwhelming majority of those extant copies follow to different degrees an ancestor closely related to the ink drawings in MS Oxford, Bodleian Library, Marsh 144 but not MS Doha. MIA, 2.1998. Even the latter still shows features of that type of

[16] Savage-Smith 2013; MS Doha, MIA, 2.1998.

[17] MS Doha, MIA, 2.1998, fols 23a, 26a, 36a, 39a, 42b, 45b, 50b, 51a, 104a–b, 113a–b, 126a–b, 154b–155a.

[18] MS Doha, MIA, 2.1998, fols 85b–86a.

[19] MS Doha, MIA, 2.1998, fols 69b.

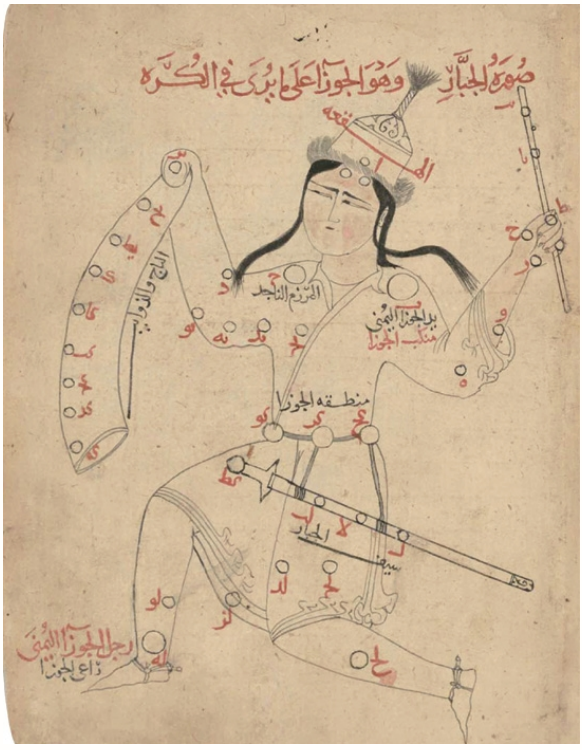

Plate 5. Orion as shown on the globe

MS Doha, MIA, 2.1998, fol. 126a. © MIA, Doha.

ancestor as do three of the Latin copies, despite being far removed from it.[20] The turn to an eastern Asian type of some of the male figures in MS Doha, MIA, 2.1998 can be understood as the result of the copyist's efforts to "improve" the drawings:

> I improved its illustrations as much as it was possible to do so in their given position, but when it was not possible, I drew it by itself on leaves of paper which I added to the book after the poem. And in the production of the illustrations I took as a model the workmanship and draftsmanship of al-Sufi. [Only] in God is there success. [Savage-Smith 2013, 137].

The individual drawings on added leaves of paper are unfortunately lost. The mentioned poem is an abbreviated and modified summary of Ṣūfī's

[20] MSS Gotha, Research Library, Memb. II.141; Paris, BnF, Arsenal, 1036; Prague, Strahoviensis, D.A.II.

prose work by his son [Carey 2009]. Regrettably, Savage-Smith does not offer her understanding of the introduced improvements of Ṣūfī's visual forms mentioned by the copyist. Two interpretations seem possible: he corrected the positions of the stars or he changed the appearance of the figures.

When we now compare the images in the manuscript Marsh 144 of Ṣūfī's book—long considered the oldest copy of his work due to its colophon dating it to 400/1009–1010—with the manuscript of 519/1125 today in Doha, we see that the first 11 pages contain no images but are written on a different kind of paper and in a different hand than the following 404 pages. The remaining 4 pages stem in the lower halves from the same manuscript as pages 12–415, while their upper halves are written in a different hand on a different kind of paper onto which the old half pages are glued. The current catalogs estimate the paper of the first 11 pages to come from around the 8th/14th century, and the last 4 pages from the 10th/16th century.[21] The colophon below the end of the text on the lower half of page 419 has been declared a later addition due to various features of the script, ink, grammar, and possibly the paper [Savage-Smith 2013, 147, 152]. Although I am not convinced by all those arguments, this problem is of no immediate relevance for the discussion of the manuscript's visual forms and their historical impact.

From my experience with manuscript copies of Ṣūfī's book, the visual content of the Marsh 144 manuscript is to be labelled authoritative, not the one found in the Doha copy. While this latter manuscript offers a mixed visual program as described earlier, the human figures in MS Oxford, Bodleian Library, Marsh 144 consistently belong to the western Asian type. They wear dresses with a very specific and characteristic cut and decoration [see Plate 6]. It is this cultural program that left its traces in many representations of the constellations for almost 1000 years. Nonetheless, this fact does not necessarily signify that the version found in Marsh 144 was indeed written and drawn in 1009–1010 by Ṣūfī's son Ḥusayn, nor that Ḥusayn reliably copied his father's visual forms. The version of Marsh 144 may indeed have been produced later. But if so, the absence of strong Turkic elements would then point to a region outside those parts of the Abbasid caliphate by now ruled by the Seljuq family and less powerful Turkic groups in northern Mesopotamia.

Arguments against such a later production of Marsh 144's visual program can be drawn from one of its earliest studies. The author of those studies, Emmy Wellesz, argued convincingly that a number of iconographic features

[21] See MS Oxford, Bodleian Library, Marsh 144.

Plate 6. Hercules

MS Oxford, Bodleian Library, Marsh 144, 82. © Bodleian Library, Oxford.

of the human figures and their accessories clearly point to Sasanian and Zoroastrian visual art, at the same time showing visible relationships to Manichaean wall paintings in Kocho (today in northwest China), elements of Mediterranean Hellenistic art, and much older Iranian-northwestern Indian coins [Wellesz 1959, 13–16]. As mentioned above, art historians have called the style of representation in this manuscript post-Sasanian or Samarra style after the artwork known from the Abbasid capital Samarra [Wellesz 1959, 13]. Two particularly striking Sasanian features of the human figures in MS Marsh 144 are the long, fluttering bands of Sagittarius' turban and the folds and draperies of female and male garments. Many examples from Sasanian rock art and silverware testify to this connection [Wellesz 1959, 15–16]. These two features resurface in many of the surviving copies of Ṣūfī's book, making the iconographic style of Marsh 144 the dominant visualization of the heavenly constellations in Arabic and Persian manuscripts.

In the Doha manuscript, Sagittarius as seen on the globe sports less exuberantly fluttering bands, which thus resemble even more clearly the Sasanian predecessors.[22] It carries the double bow known from Sasanian hunting scenes, like Sagittarius in the Oxford manuscript. The figure has facial hair and his head hair shows an arrangement into a thick neck knot as found in many representations of Sasanian kings. In this manner, Sagittarius in the Doha manuscript looks more clearly Sasanian than in the Oxford manuscript. The folds and draperies of the Oxford, Marsh 144 manuscript are present in the Doha manuscript in different executions. A fairly strong example is the representation of Andromeda on the globe.[23] A relatively weak form can be seen in the representations of Cepheus, Aquarius, and Orion as seen on the globe.[24] Still weaker but visible are the folds in the representation of Orion as seen in the heavens.[25] Cepheus and Orion, however, belong to the so-called eastern Asian type and thus should not wear post-Sasanian-style garments. They clearly are hybrids, neither fully Turkic nor fully Iranian. Further Sasanian-type elements are the various diadems found in the Oxford manuscript, some of which also appear in the Doha copy.[26] This comparison leaves no doubt that the visual forms of the old part of the Doha manuscript come from a western Asian-type ancestor, not an eastern Asian kind. This means that if the content of the colophons in the Doha manuscript can be trusted, Ṣūfī's own way of visualizing the constellations used a set of post-Sasanian artistic components, including the expansive folds. Given the latter's exclusiveness in Abbasid art [Wellesz 1959, 15], Ṣūfī seems to have created a new iconographic model for visualizing the heavens as a courtly assembly with explicit references to Sasanian kingship. Such a decision, if indeed taken, corresponds well with the turn to Sasanian symbols of political power by the Buyid family, as the transformation of some human constellations in the Doha manuscript reflects Seljuq rule. Whether such a selection of politically explicit artistic symbols meant more than the combination of science with courtly patronage cannot be evaluated with any degree of certainty on the basis of the extant copies of Ṣūfī's work. None of the images goes recognizably beyond the political. Neither does the text

[22] MS Doha, MIA, 2.1998, fol. 104a.

[23] MS Doha, MIA, 2.1998, fol. 62b.

[24] MS Doha, MIA, 2.1998, fols 23a, 113a–b, 125a.

[25] MS Doha, MIA, 2.1998, fol. 126b. Here the pagination is wrong. It should be 125b.

[26] MSS Oxford, Bodleian Library, Marsh 144, 81–82, 100, 164–65, 169; Doha, MIA, 2.1998, fols 85b–86a, 93a–b.

contain any references to astrology, magic, or cosmology that would encourage a reading of wonders, creation, or supranatural powers into Ṣūfī's book. On the contrary. The celestial imagery of works on magic and astrology deviates clearly from the one found in Ṣūfī manuscripts. The appropriation of Ṣūfī's astronomical imagery by Zakariyyāʾ ibn Muḥammad al-Qazwīnī (d. 682/1283), Shāh Mardān ibn Abī l-Khayr (d. after 477/1084–1085), Shams al-Dīn al-Āmulī (d. after 753/1352), and other "encyclopedists" needs to be evaluated for each single author, his contexts, and those of later copies of his respective work. Inferring from his usage and the usage of later copyists of his work to Ṣūfī's own intentions and purposes is certainly methodologically the wrong approach.

7. The arts of the heavens in copies of the *Book on the Star Constellations*

The surviving specimens of Ṣūfī's work on the fixed stars exist in four formats:

(1) text with or without tables,
(2) tables with almost no text and no images,
(3) images only, and
(4) complete or fragmentary copies of the entire work.

These formats reflect important aspects of manuscript culture, which apply to any kind of work. Copies were produced either on command (usually for rulers, courtiers, and members of the nobility), for sale on the book market, which existed in many cities, or as a private copy. Depending on the financial and material means that producers or clients had at their disposal, the copying process ended at various moments—yielding the different kinds of products just described. Intellectual interests, representational purposes, and commercial exigencies were further factors that contributed to the variety of surviving products. Climatic conditions, natural and man-made disasters, and the available means for reproducing old copies and protecting books against water and insect damage contributed their own shares to loss and survival.

Copies made for high-ranking, affluent members of society were often produced as luxury products with expensive materials, including the chosen paper, the selected colors, and types of script or the kind of cover. They were manufactured by a team of highly skilled calligraphers, draughtsmen, painters, gilders, and book binders. The best-known copies of this kind, of which many images can be found on the Internet [see p. 98 below], were produced for the Timurid prince Ulugh Beg in circa the second third of the

Plate 7. Orion

MS Paris, BnF, arabe 5036, fol. 193b.
© BnF, Paris

Plate 8. Serpentarius with a smiling Serpens

MS Paris, BnF, arabe 5036, fol. 82a.
© BnF, Paris

9th/15th century in Samarqand (today Uzbekistan) and for the Safavid governor of Khurasan Manūchihr Khān (d. 1046/1636) about two centuries later in Mashhad (today Iran). Both adapt the dominant iconographic tradition of the Ṣūfī manuscripts described above to the artistic styles and tastes of their times and places. This includes the bodily features of the male and female constellations and their dresses and accessories, as well as the animals and the material objects. Although both patrons clearly stated their dedication to the scientific content of Ṣūfī's work, the money and skills invested in the production of these copies declare them at the same time as objects of high art, refined culture, and lifestyle. They are the noble enactment of knowledge of the heavens. The interaction between knowledge, the arts, and rulership in the images of the constellations of these copies is expressed in the care given to the placement and naming of the individual stars, the framing of each constellation by the cardinal directions, the depiction of costly materials for the textiles like silk and furs, the precision of the brush strokes, and the change of mainly the male faces from a standardized icon as in the case of the Oxford Marsh 144 manuscript [Wellesz 1959, 12–13] to more individualized textures and expressions [see Plate 7]. Some of the

faces even express emotions—looking sad, happy, or strained—in addition to the unemotional, neutral, iconic faces. Even some of the mythical beasts, for instance Serpens, seem to smile in the Timurid manuscript [see Plate 8].

The distorted bodily proportions or positioning of limbs, heads, throats, shoulders, or upper bodies characteristic for numerous human and animal representations that feature in many Ṣūfī manuscripts since early times do not reflect a lack of artistic skills—at least not in copies with well-executed drawings—but try to capture the numerical, positional determination of the individual stars of each concerned constellation. The result of such conflicts between mathematical and observational astronomy and physical properties of human or animal anatomy in rest or movement are upturned soles of feet of a walking man or woman, arms strangely pressed along bodily contours, excessively elevated shoulders or images that show the front of a body with a half or three-quarter profile of a head, and other odd combinations. Such contradictions between mathematical and observational astronomy on the one hand and the physics of human and animal bodies, which the artists closely observed in their works in literary, historical, or medical contexts on the other, are less prominent in copies of Ṣūfī's work illustrated by unskilled amateurs, than in the luxury copies executed by first-rate artists. These distortions signify that either the princely client or his artists obviously were committed to the scientific content provided in the text and tables. In such cases, those conflicts catch immediately the eye of the observer. Visualizing the heavens was thus recognizably not only a highly challenging task for Ṣūfī himself but for each artist, who had to paint figures in poses against his better knowledge. In the Timurid manuscript, this increased attention to the stipulations of the text is also visible in the depiction of Andromeda, called in Arabic the Enchained Woman (*al-Mar'a al-musalsala*). No longer familiar with the legend of the princess, her mother Cassiopeia, and her savior Perseus, the painter did not attach the chains to Andromeda's wrist but shackled her feet as if she were a prisoner of one of the many Timurid campaigns.

The human faces in the Timurid copy do not belong to any of the four types described above. They represent the facial features of the Turkic people of Central Asia and are in this respect fairly similar to modern Uzbeks. But while many modern Uzbeks are often lean, the men and women in this copy for Ulugh Beg's palatial library are well nourished and have rounded faces and bellies. They seem to express an ideal of beauty held dear at the prince's court.

The mythical beasts Draco, Serpent, and Hydra are very beautiful and reflect the centuries of Chinese influence in Central Asia and Iran during the Mongol dynasties and their Turkic or Turko-Mongol successors. The Ilkhanid dynasty in Iran and Chinghiz Khān himself were role models, whom Tīmūr Lang (r. 771–807/1370–1405), the founder of the Timurid dynasty, explicitly emulated, not only in the political but also in the intellectual spheres. Thus, it is not surprising to find Chinese patterns in illustrations of scientific books also in the times of his grandson Ulugh Beg. With its flaming wings and tail fin, even the Whale Cetus sent by Poseidon to devour Andromeda has taken on delightful Chinese elements, although it is represented as a Mesopotamian cross between a fish, a snake, and a quadruped. The constellation Sagitta and the arrow in Sagittarius might reflect local changes in weapons production. The animals, in particular Aquila and the three constellations involving horses, speak to the increased interest in observing nature. So far this was only known from the later Timurid dynasty, who ruled as the Mughals in South Asia.

The Persian translation made for Manūchihr Khān begins with a beautiful first page framed by a golden-colored floral design and headed by a multicolored title box. Cepheus, the first human constellation, marks with his Timurid crown the cultural indebtedness of Safavid art, science, and political symbolism to the Timurid dynasty [see Plate 9]. Boötes appears fully metamorphosed into a Safavid tribal courtier with his mustache resembling somewhat the trademark of Shāh Abbās I (r. 995–1038/1587–1629), a reddish turban around a soft two-tipped skull cap, a reddish textile girdle, and his high boots [see Plate 10]. The transformation of the human faces and bodies into those dominating Safavid art in the 10th/16th and 11th/17 centuries is completed in most of the human constellations. The only other wearer of a Timurid crown is Cassiopeia as seen on the globe. This corresponds well to the elevation of the Ethiopian king, originally depicted as barbarian, to a Timurid ruler, since she was his wife. This parallel depiction might also be a late acknowledgment of the lofty positions of the wives, sisters, and other female relations of Timurid rulers and princes.

Their daughter Andromeda appears in a posture unusual in Islamicate societies until the 11th/17th century. She is depicted half nude and from the rear as in classical and early modern Greco-Roman or western European images. Her back is muscular and broad like that of a man. Her bottom and legs are fitted tightly into trousers over which she wears a light reddish diaphanous skirt, a trademark of Indian elite apparel. Western European books, paintings, prints, and maps were known at Muslim and Hindu courts

Plate 9. Cepheus

MS New York, NYPL, Spencer Persian 6, fol. 27a. By permission, NYPL, New York.

Plate 10. Boötes

MS New York, NYPL, Spencer Persian 6, fol. 30b. By permission, NYPL, New York.

since the 10th/16th century and were copied, adapted, and integrated into the local fine arts. In Safavid Iran, French and perhaps Dutch celestial maps and Italian fortress drawings have been documented since about the middle of the 11th/17th century, that is some 20 years after the two copies of the Persian translation commanded by Manūchihr Khān had been finished. A direct inspiration of this unusual appearance of Andromeda by material from Paris, Venice, or Amsterdam is thus less likely than a familiarity with some folios, if not an entire copy of Ṣūfī's work of South Asian provenance with possibly some European facets.

Another innovation is the replacement of the mythical creature Cetus by a giant Safavid youth. Aquila is depicted—as in the Timurid manuscript—as a living bird and looks even more like a true eagle than the Timurid painting. All those and more images from one of the three manuscripts linked to Manūchihr Khān can be found on one of the websites of the New York Public Library.

There are several other copies of Ṣūfī's work produced for rulers and other members of the various elites from the 6th/12th to the 13th/19th centuries.

Extract: Ulugh Beg

Extract: Orion [see Plate 7]

Plate 11. Painting of Ulugh Beg with identification in the heading

National Gallery of Asian Art, F.1946.26. Purchase — Charles Lang Freer Endowment. © Smithsonian, Washington, D.C. Compare with the face of Orion.

Some follow the dominant visual model discussed above. Others adapt this model to local and temporal conditions, as did the two Timurid and Safavid specimens elucidated in this section. In almost all cases, however, highly skilled calligraphers and/or painters were involved in their production. Thanks to Ṣūfī's work, the astral sciences acquired a stable place in the worlds of art and elite book collection. As an art form, visual representations of the heavens became less a tool for investigating the heavens themselves and more a document of elite display and entertainment.

8. Political and sociocultural uses of heavenly icons

Book art as a tool of courtly propaganda and self-representation can be traced in extant manuscripts at the latest from the 6th/12th century onwards. Famous frontispieces with rulers and their courtly entourages are known from medical works produced in northern Mesopotamia. Occasionally, an Ottoman sultan is depicted in his study in an astrological luxury volume. Farther to the East, ruler portrayals appear relatively late in illustrated scientific books. Remarkably, it is in copies of Ṣūfī's work where they can be found between about the 9th/15th and apparently the 11th/17th centuries. Faces with characteristic trademarks of Shāh ʿAbbās I (mustache, a particular type of hat)—a depiction strongly resembling a portrait attributed to Ulugh Beg in a historical chronicle [see Plate 11] and easily recognizable images of the Mughal ruler Jahāngīr (r. 1014–1037/1605–1627) and his son Khurramshāh, his successor on the Mughal throne as Shāh-i Jahān (r. 1037–1076/1627–1666)—can be found in at least three copies of Ṣūfī's work from Central Asia, Iran, and India.

We have no information about the motives for this politicization of the heavenly constellations. This process might be understood in company with the Mughal and Safavid recognition of horoscopes as readable images of the personality of a ruler and hence of his political goals and practices.

While not providing more detailed information, the case of Manūchihr Khān has moved art historian Barbara Schmitz to suggest that the highly personal face of Sagittarius is his portrait [see Plate 12; Schmitz 1992, 123]. Art historians Babaie and Farhad together with Safavid historians Babayan and Baghdiantz-MacCabe support this identification with a string of arguments. The governor had possibly been born in the month ruled by that constellation. According to the astrologer and historian at the court in Isfahan, Jalāl al-Dīn, Shāh ʿAbbās I had instructed officials to begin building his new capital in Isfahan approximately in Safar 1000. This corresponds to mid-November

Plate 12. Manūchihr Khan as Sagittarius

MS New York, NYPL, Spences Persian 6, fol. 121a. By permission, NYPL, New York.

1591, that is, the month ruled by Sagittarius [Babaie, Babayan, Baghdiantz-MacCabe, and Farhad 2004, 129]. Thus, it is possible that Manūchihr Khān had wished to underline his connection to the seat of royal power and his status as a patron of the arts and sciences equal to that of the royal capital, the erstwhile center of such activities. This zeal to identify himself not only in the preface as the text's patron, the standard place for such a declaration, probably reflects his pride at achieving such a feat as one of the military

slaves of Shāh Ṣafī (r. 1038–1052/1629–1642), while the shāh himself had not yet sponsored any illustrated manuscript and would not do so until his death [Babaie, Babayan, Baghdiantz-MacCabe, and Farhad 2004, 130].

Manūchihr Khān had every reason to be proud of himself and the scientific manuscripts and instruments created at his court. The painter of the manuscript, Master Malik Ḥusayn, had experimented with new painting techniques, sizes of the constellations, and material (cotton instead of paper) [Babaie, Babayan, Baghdiantz-MacCabe, and Farhad 2004, 128]. He thereby underlined the innovative character of the new Persian translation and ensured the everlasting impression of majestic greatness that this manuscript (today in New York) makes on its viewer. Scientific verification of the true state of the heavens and philological transformation repeating the deed of the since long-venerated master of the astral sciences, Naṣīr al-Dīn al-Ṭūsī, were symbolically elevated to new heights of significance by the artistic novelties. They validated the work of the court astrologer and propagated the cultural prowess of a military and administrative leader of foreign (Armenian) descent. Visualizing the heavens served here to achieve a lofty and complicated social goal.

In a highly complex, structured, and illuminated late Safavid multiple-text work that exists in this format but in different degrees of completeness in several copies, images of the 48 constellations appear in order and sorted in a table split over four pages [see Plate 13]. Some names of the constellations are transliterations of the Greek terms corresponding to them. This fact of a long-term preservation of classical aspects of visualized specimens of the heavens is as surprising as the variability of individual images, which characterizes the many Arabic and Persian copies of Ṣūfī's work. The variations do not only concern interpretive aspects such as the change in royal identity of Cepheus mentioned above or the shifts in social status of Auriga and Aquarius, whose dresses, skin color, or posture could mark them as lowly servants or high-ranking members of the courtly personnel. They also include the kind or composition of the chosen visual specimens. This is particularly the case for the constellations Lyra, which also appears as a tortoise or a Persian harp; Aquarius with a vase filled with water or a well from which he draws water; and Hydra being shown alone, with Corvus and Crater, or with abstract geometrical figures encompassing several stars. These variations can result from information drawn from the text or its neglect but also from different stellar narrative traditions. Perhaps even different painting patterns or canonical sets circulated, which we cannot trace anymore with certainty.

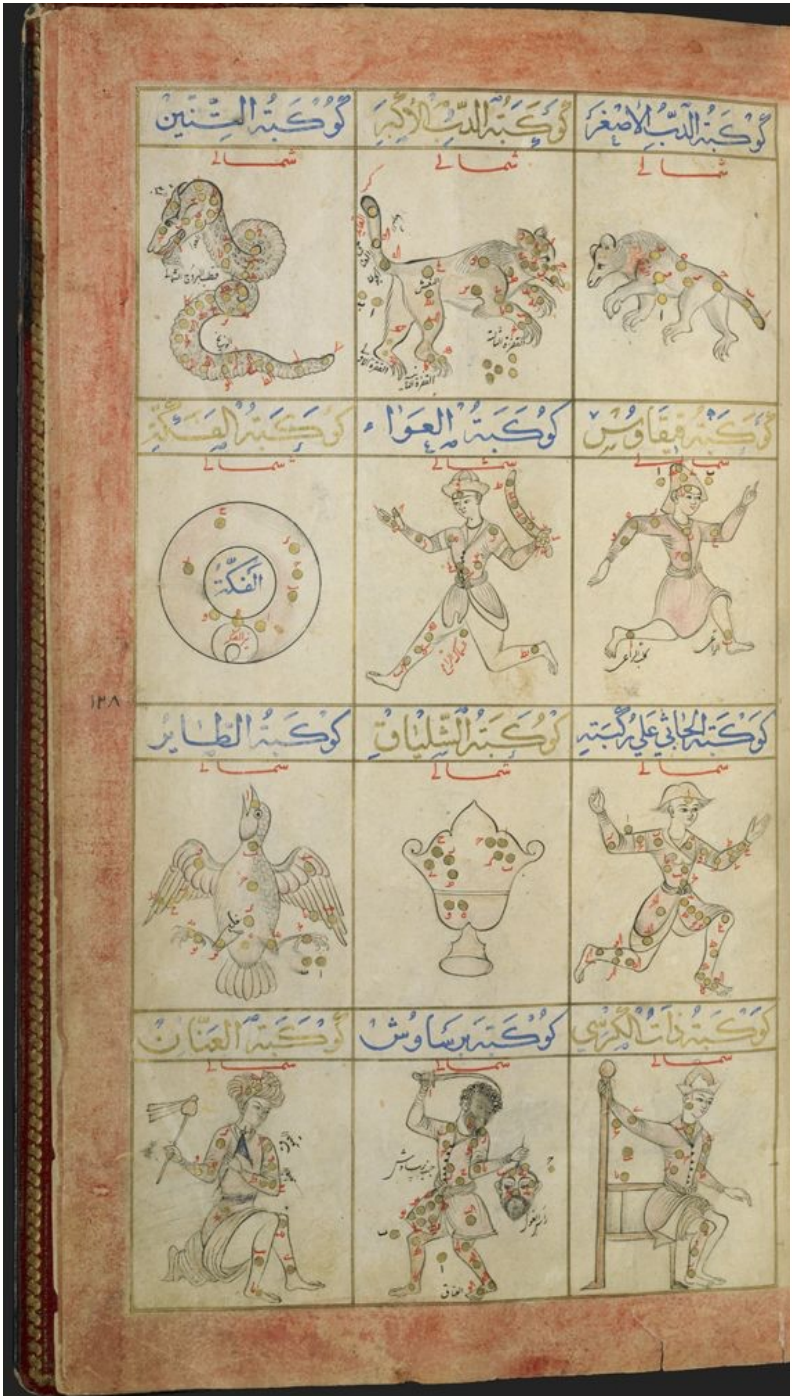

Plate 13. Table of stellar constellations

Harvard Art Museums/Arthur M. Sackler Museum, Gift of Philip Hofer, MS 1984.463, f. 132a. Photo © President and Fellows of Harvard College.

The presence of the stellar images as a table of necessary knowledge in this multiple-Safavid compilation is all the more interesting as this work is clearly marked as a collection for afternoon or evening entertainment among the men of nobility. Riddles focused on the relation between numbers and letters are offered in the center of many pages. Between their lines and around them in the margins, bits and pieces of lavishly decorated texts, diagrams, and tables from a large range of scholarly disciplines and literature offer hints and inspirations for solving them. The images of the constellations, while coming late in the game, are part of this reservoir of expected knowledge of the refined courtier on which the guests of the party could reliably draw in their conversations.

Another new feature in the permeation of the cultural fabric of Safavid elite society by a visualized sky is the migration of individual constellations from the book format into a single-sheet format of a richly decorated miniature of high quality, and into other types of astral texts painted in the style of a famous Safavid court painter of the early 11th/17th century. In Muslim regions of the Indian subcontinent, the opposite process occurred. A visual form of Sagittarius with astrological meaning moved into a copy of Ṣūfī's work and replaced its standard astronomical depiction. Copies of Naṣīr al-Dīn al-Ṭūsī's Persian translation document the disappearance of the figurative representations of the constellations and their replacement by clusters of stars only. In some copies this is the case only for the human constellations; in others, the phenomenon is more widely spread. In the current state of research, it is not clear whether this change in visual preference resulted among scholars of an an-iconic bent or among scholars who disregarded the artistic orientation due to scientific motives. All in all, however, the early modern period in Iran and Muslim India experienced a very vivacious usage of Ṣūfī's work visualizing the heavens.

9. Conclusions

The relationship between verbal explanations, numerical data, and visual representations of the night sky in ʿAbd al-Raḥmān ibn ʿUmar al-Ṣūfī's *Book on the Star Constellations* was created by the Muslim scholar as an expression of his epistemic and didactic positions in the astral sciences. His critical stance towards bookish and partial knowledge motivated him to push for privileging the visual sense as the main tool for producing reliable knowledge on the heavens and memorizing it. His visual program drew on older, pre-Islamic artistic forms with political and sociocultural connections to the policies of his patron and the whole Buyid family. It was also in conversation

with late antique Christian iconographic models, views of the asterisms held by the nomads on the Arabian Peninsula, and possibly Manichaean and eastern Hellenistic artistic idioms. In this sense, Ṣūfī apparently created his own stylistic expressions of a scholarly as well as political visual narrative about the night sky that was truly multicultural and innovative.

The multiple layers of Ṣūfī's work appealed to many different groups and individuals in various Islamicate and Christian societies in Asia, North Africa, and Europe, including some of their Jewish circles. They provided the main impetus for transforming Ṣūfī's own material versions of his work through teaching, collecting, translating, annotating, and gift giving into a living body of knowledge, the arts, elite lifestyles, and politics. It served for cultural and political power plays, provincial engagements with domesticating visual, numerical, and verbal knowledge of the stars, and struggles over the right forms of visually expressing such knowledge. Above all, Ṣūfī's work invited, time and again, rulers, scholars, artists, and amateurs to express their views about their own sociocultural contexts through visual depictions of the constellations. Visual knowledge of the heavens thus also often functioned, if not always, as a human society's representation to itself of what it considers important. Various outcomes resulted from this intimate interaction between specialist knowledge, highly skilled as well as amateurish art, cross-cultural encounters across Asia, North Africa, and Europe, financial means, and social settings. Among them, we find new visual formats of stellar mapping, various engagements with text, numbers, and imagery, and the broad variety of material instantiations of Ṣūfī's work typical for manuscript cultures.

All in all, the words and numbers alone might have given Ṣūfī's book a long life extending over many centuries. But its success as the most frequently and most diversely reproduced work organizing astral knowledge in formats appealing to many different societies and their social groups rests on its visualized expressions. Thus, Ṣūfī's visualization of the constellations did not merely combine knowledge with didactics, politics, the arts, and noble entertainment. It also created the conditions for its own survival over almost a millennium in the region of its invention and far beyond to the East and the West—by ennobling astral knowledge.

Abbreviations

BnF Bibliothèque nationale de France, Paris, France.

MIA Museum of Islamic Art, Doha, Qatar.

NYPL New York Public Library, New York, USA.

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