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Evolution of Arabic Astronomy in Relation with the Translation Movement in the Early Abbasid Era

Nasser B. Ayash

Abstract: In this work, the emergence of the Arabic astronomy in the early Abbasid era will be presented as an amalgam of various traditions. For this to be illustrated, a close analysis of the development of the cultural and political aspects in the Middle East will be presented that eventually allowed for the so-called Arabic or Islamic culture to flourish. The translation movement will be discussed briefly in order for various aspects of this period to be shown, emphasizing the duality of tradition and innovation. These aspects will be followed more closely in the field of astronomy, illustrating the various tendencies especially in the case of incorporation of Greek Uranography, and the relation between the Lunar Mansions and the Anwa. Political, religious and cultural changes left their traces on the accepted Academic tendencies of the period. For a better understanding the astronomical view at the dawn of the Abbasid era, a close look on the work of Ibn Qutaiba will take place, depicting the transitional period in which he lived.

The so-called Arabic or Islamic Culture in the period from the seventh until the eleventh century CE adapted quickly to the cultural environment of its surrounding and preceding cultures. A main turning point was the rise of the Abbasid dynasty to power in the mid-eighth century CE, putting a stop to the policy of conquering new lands and focusing on internal organization. This was possibly due to a sense of security due to military successes and the internal conflicts of enemy states. In this period a flourishing of culture and science was observed, and it is even today considered as a golden era.[1]

One of the main problems the Abbasids had to face was the issue of rivalry between the Arabic party on the one hand and the populations of the conquered areas converted to Islam, such as Persians and Syrians, on

[1] George Saliba, *A History of Arabic Astronomy: Planetary Theories During the Golden Age of Islam* (New York: NYU Press, 1994), pp. 245–57; P. Adler and R. Pouwels, *World Civilizations* (Boston: Cengage Learning, 2014), p. 214.

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the other.[2] These had long pressed for equal rights, which the previous dynasty, the Umayyads had to some extent denied, a fact that contributed to their fall in 750 CE.[3] The Abbasid Khalifs who rose to power afterwards, made an effort to establish themselves as universal rulers, above nation-divisions, and more importantly above the religious law and its limitations.[4] This step would put the Khalif on a collision course with the scholars of the Arab fraction and for this debate, a philosophical dialectic was useful, which explains the Khalif's interest for purely philosophical works.[5]

The translations of the Abbasid period, which showed their peak in the ninth century CE, offer a way of understanding the tendencies of this period, as the translations had, apart from the scientific importance, also a fundamental political and religious role in the society of the time. In the previous translation period, during the Umayyads, the focus of the translation projects was primarily bureaucratic and practical.[6] The State Archives were written in Greek until the shift towards Arabic was performed by 'Abd al-Malik. Also private collectors sought practical knowledge such as the medical treatises of Galen.[7] After the middle of the eighth century, the Abbasid Khalif, showed interest in acquiring rhetorical and philosophical works and so began ordering translated works, such as the 'Topics of Aristotle' by Khalif al-Mahdi which was one of the first commissions emerging from the need of the Khalif to insert philosophy in the debates of the period.[8]

The books, gathered allegedly in the House of Wisdom, were written in a variety of languages including Greek, Sanskrit, Middle Persian and

[2] Elisabeth Urban, 'The early Islamic mawālī: A window onto processes of identity construction and social change' (PhD Thesis, The University of Chicago, 2012), pp. 86–93.; H.A.R Gibb, *The Arab Conquests in Central Asia*, (London: The Royal Asiatic Society, 1923), p. 10.
[3] A. Khanbaghi, *The Fire, the Star and the Cross: Minority Religions in Medieval and Early Modern Iran* (London: I.B. Tauris, 2006), p. 19; Albert Hourani, *A History of the Arab Peoples* (London: Bloomsbury, 1991), pp. 30–32.
[4] D. Gutas, *Greek Thought, Arabic Culture*, (London: Routledge, 1998) (trans. M. Makri Greek edition: Periplous, 2001), pp. 112–13, 145.
[5] Gutas, *Greek Thought, Arabic Culture*, pp. 86–95.
[6] Gutas, *Greek Thought, Arabic Culture*, pp. 32–39.
[7] I. Giannakis, *The Greek Thought in the Court of the Khalifs* (Greece: Ioannina University: 2000), p. 9.
[8] Gutas, *Greek Thought, Arabic Culture*, pp. 96–97.

Aramaic.[9] This situation gave birth to an institutionalised translation movement, whose organisation and standards rose rapidly, to cope with the high number of books to be translated. The gradual shift of interest to scientific works was a by-product of the tendency of the time, which provides an insight to the priorities and the necessities of cultural thought and political agendas of the period. It is not a coincidence that in the translations the minorities such as the Nestorians played a major role.[10] Also, the Zoroastrian tradition of the Iranians manifested itself in the importance of astrology, hence the endorsement of works related to astronomy in the early Abbasid era.[11] A. Beinorius argues that translations of astrological works from Pahlavi to Arabic may constitute the earliest scientific texts in Arabic.[12] Sassanid astrology was by itself syncretistic, allowing for a blend of various elements including Greek and Indian, a fact that contributed in shaping many factors of Islamic astronomy, such as the final form of the Anwa system.[13]

Before expanding the gathered knowledge by early scientists of the ninth century, such as Al-Huwarismi and the Banu Musa brothers, the first stage was to translate the texts gathered to the lingua franca of the time, which was Arabic. The importance of the translators can be seen from their fee that could reach 500 golden dinars per month (a currency that had common value as the Byzantine solidus).[14] An interesting aspect of the translation movement was the methodology followed, which focused on overcoming the difficulty of expressing complicated terms, as the Arabic language did not yet contain the necessary vocabulary. Complicated by the fact that many of the scientists and translators working in Arabic were not native speakers.[15] The search for adequate expression shows similarities with the same process that took place in other cultures. For example, in Rome Latinised Greek words were used to express philosophical concepts

[9] Gutas, *Greek Thought, Arabic Culture*, pp. 75–85.
[10] D. Hill, *Islamic Science and Engineering*, (Edinburgh University, 1993), p. 4.
[11] Gutas, *Greek Thought, Arabic Culture*, pp. 64–68.
[12] A. Beinorius, 'On the Intercourse between Indian and the Arabic/Persian Astrologies', in F. Pimenta, N. Ribeiro, F. Silva, N. Campion, A. Joaquinito, L. Tirapicos, eds., *Stars and Stones: Voyages in Archaeoastronomy and Cultural Astronomy*, Proceedings of the 2011 SEAC Conference (UK: BAR, 2015), p. 133.
[13] Beinorius, 'On the Intercourse between Indian and the Arabic/Persian Astrologies', p. 134.
[14] Gutas, *Greek Thought, Arabic Culture*, p. 197.
[15] Gutas, *Greek Thought, Arabic Culture*, pp. 193–94.

whereas others, like Cicero, preferred using modified Latin words.[16] Similarly in Baghdad different solutions where followed in the translations performed by different schools that flourished in the ninth century such as the Hunayn Ibn Ishaq school, the Al-Kindi school, and the so called Harran school. Of those, the Harran school was associated strongly with mathematics and astronomy, both in translation and in research. Amongst others Thabit bin Qurra commented on the translation of Ptolemy's Almagest and the Conics of Apollonius.[17] Regarding astronomy, words like 'astrolabe' were transliterated, whereas other words such as the constellation names were, as will be demonstrated, descriptive.

Of great renown to the West are the translation movements of later periods, such as those in the post Mongol-invasions era (after the thirteenth century). Indeed, these revisited works seemed to be more creative and with a tendency towards critical perception and innovation, while the early Abbasid period was greatly reliant on the translation of texts, sometimes with no effort for critical analysis of those translated texts. But it is in this early stage that the Arabic academic language first emerged as a language capable of dealing with philosophical and scientific terms, as it tackled for the first time scientific and philosophical vocabulary and expression. Indeed a great effort was put into determining the appropriate Arabic terms for expressing new terms and expressions. Indeed, a translation of Ptolemy's Almagest in 829 shows a high level of sophistication in the translation method.[18]

Another interesting aspect of the literature of this period is the gradual acceptance of foreign systems that replaced pre-existing Arabic traditions. This will be shown in the case of astronomy, as Greek Iconography of the asterisms prevailed and replaced the pre-existing Arabic names that derived from their pre-Islamic period. But first the role of astronomy in general must be addressed.

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[16] Baltussen H. 'Cicero's Translation of Greek Philosophy: Personal Mission or Public Service?', in S. McElduff & E. Sciarrino, eds., *A Sea of Languages: Rethinking the History of Western Translation* (Manchester: St Jerome Publishing, 2011), pp. 37–47.

[17] G. Endress, 'The Circle of al-Kindi', in G. Endress and R. Kruk, eds., *The Ancient Tradition in Christian and Islamic Hellenism*, Leiden: Research School CNWS, 1997), pp. 43–76.

[18] George Saliva, *Islamic Science and the Making of the European Renaissance*, (Cambridge, MA: MIT Press, 2007), p. 83.

Why astronomy

The research of astronomical issues and later developing the most advanced astronomical records and instruments of that time such as astrolabes, had a practical background related to religion and state policy. The determination of the exact date of the new moon, was an important and prestigious state function, linked predominantly with religious functions such as the determination of specific calendar dates, such as the starting date of Ramadan.[19] Also, finding the exact direction towards Mecca was necessary for prayer or when building a new mosque.

The position of the astrologers, was often an important one even for high ranking officials, showing a persistence of the pagan practices of the Sassanid empire and their policy that were noticeable in the Muslim Iranian Dynasties.[20] The father of the inventors, Banu Musa, was an astrologer of the Khalif, and the city of the Harran, home to the translators and mathematicians of Harran school, (the so called Sabeans) practiced planet and star worship openly up until the ninth century, if we follow al-Mas'udi description.[21] Finally, the Arabic maritime developed by Khalif Muawiya for war purposes, made astronomical navigation essential.[22]

From Arabic to Greek Uranography

In this period there was a shift towards the Greek system of sky tradition. There was a gradual abandoning of the pre-Islamic Arabic names and sky perception in favour of the concept of the zodiac.[23] Namely the constellations were re-identified and receive their names based on the Greek iconography, which could be studied thanks to the translation movement. The zodiac was also associated with other traditions, but as al-Marzuqi states, the knowledge of the Greeks in matters of astronomy

[19] D. A. King, *In Synchrony with the Heavens, Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization: Instruments of Mass Calculation* (Leiden: Brill, 2005), p. 17.
[20] Khanbaghi, *The Fire, the Star and the Cross*, pp. 27–29.
[21] Al-Mas'udi, *Kitab muruj-al-Dhahab* (*Meadows of Gold and Mines of Gems*), see chapter, 'On the Earth Surface and Planets'.
[22] G. Ostrogorsky, *History of the Byzantine State* (New Brunswick, NJ: Rutgers University Press, 1969), p. 116.
[23] Daniel M. Varisco, 'The Origin of the Anwa' in Arab Tradition', *Studia Islamica* 74 (1991): p. 7.

surpassed the others.[24] Secondly the solar aspect of astrology, and the importance of the zodiac replaced partially the importance of the 'Lunar Mansions' (Manazil al-Qamar) and the Anwa. These were the pre-Islamic constellations that are on or near the ecliptic, delineating the moon's path. This transition was also linked with contemporary political tendencies, most notably the vision of the Abbasids to continue the Sassanid astrological ideology that had close relations with the Greek system.[25]

As presented, astrology was an important aspect of this tradition which the Abbasids tried to incorporate to the new faith.[26] An example of this is the work of the astronomer and translator of the Kindi School Muhammad al-Tajjib al-Sarahsi (d. 899) who found himself in the circle of Khalif al-Mu'tadid. He investigated elements of Ptolemaic geography in the Quran, in a manner similar to what the Mu'tazilits tried to do in their teachings with the allegorical interpretation of the Quran.[27] In this way the truth of the Ptolemaic system was seen as absolute and could therefore be found in the holy texts.

The Anwa System

Various bright stars were used in the culture of pre-Islamic Arabia as markers of the periods of the tropical year. An example of this is when the heliacal rising or setting of a star would coincide with a rain or a wind season. These stars were mostly located near the ecliptic (such as Aldebaran and Antares) but could be far from it, (such as Vega and Canopus). However in later periods, the stars of the Anwa would be often replaced by those of Lunar Mansions. This rendering for determining the time periods is usually called the Anwa system.

There were religious reasons for putting aside the Arabic star system, associated with the Anwa, as these were deeply rooted in the folk culture of the desert nomads, and with a history of their veneration, which linked them with heathen and therefore unwanted practices. This was recognized by the astronomers of the Abbasid era, such as al Sufi. The polemic against

[24] Al-Marzuqi, 'Kitab al-Azmina wa-l-amkina', in Fuat Sezgin, ed., *Natural Sciences in Islam* 53, (Frankfurt am Main: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 2001), p. 171.
[25] Gutas, *Greek thought, Arabic Culture*, pp. 49–64.
[26] Gutas, *Greek thought, Arabic Culture*, pp. 106–17.
[27] Fuat Sezgin, ed., *Abu Yusuf Ya'qub ibn Ishaq al-Kindi (256/870): Texts and Studies* (Frankfurt am Main: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 1999), pp. 206–10.

the star worship and the Anwa stems from the Islamic religious texts. This is linked with a broader phenomenon, of investigating pre-Islamic beliefs, which will be presented later in this paper.

As for the emergence of the Anwa cult, one can find statements in the early Abbasid era, not only by astronomers but also by scholars emphasizing the existing knowledge in Arabia. As stated by the scholar al-Jahiz who in the ninth century was trying to promote the value of the Arab culture:

> the Arabs knew the Anwa and the stars for orientation […] because no matter the situation the sky is always visible, and a man can see the planets and their relation to the fixed stars.[28]

The nomads of the desert recognised the brightest of the stars and gave them names based on their everyday lives. They noticed that some annual changes related to weather or agriculture coincided with the heliacal rising or setting of some of these stars. They further noticed that these stars formed pairs, since a rising star in the morning in the east is considered coupled with a setting star in the west.[29] The rising one is called the observer (Raqib) as it observes the setting star which is named (Naw), i.e., the Falling one, or the leaning star.[30] The plural of Naw is Anwa' which gives the term by which the astronomical system of the Arabs is known, although even amongst the early Arabic scientists there was a controversy regarding the etymology of the term.[31]

It is important to note that the system of Anwa, was not directly connected to the Lunar Mansions, as some of the Anwa were associated with stars which fall outside the Moon's path, such as the significant and anticipated Naw' (heliacal setting) of Sirius and Canopus.[32] These 'constellations' did not have the same width in the pre-Islamic era, as the

[28] Al-Jahiz, *Kitabul-Haywan*, part 6.
[29] Ibn Qutaiba*, Kitab al-Anwa*, in M. Mamidullah and C. Pellat, eds., *Natural Sciences in Islam* vol. 52, (Frankfurt am Main, Germany: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 2001) , p.8.
[30] Ibn Qutaiba*, Kitab al-Anwa*, p. 10.
[31] Daniel M. Varisco, 'The Rain Periods in Pre-Islamic Arabia', *Arabica* 34, no. 2 (1987): pp. 251–52; Al-Marzuqi, *Kitab al-Azminawa-l-amkina,* p. 310.
[32] C. Nallino, *Ilm al-falak: ta'rikhuhu 'inda l-'Arab fi l-qurun al-wusta*, edited by Fuat Sezgin (Frankfurt am Main: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 1999), p.117.

people at that time did not make use of astronomical equipment.[33] The system of the Lunar Mansions seems to have been imported from India at a later time and mingled with the existing Anwa system before Islam.[34] Initially, a number of 27 Mansions was used instead of 28, with the arc of each Mansion measured on the ecliptic being 13 1/3°, or 2¼ zodiacal signs.[35] But later with the addition of the Naw' of Zubana (α,β Librae) the 28 mansions were not of the same width leading to some confusion amongst the scientists of the Abbasid era.[36] This led to the existence of a second Anwa list, such as the one preserved by Abu Zayd Sa'id al-Ansari, which did not correspond to the 28 Lunar Mansions. This list appears to represent 'an indigenous Arab rendering'.[37]

The astrologers however, in their effort to evenly distribute the 28 Lunar Mansions in the ecliptic, and to match them with the zodiacal signs, divided 360° by 28, yielding 12° 51.4' for each Lunar Mansion and $2\frac{1}{3}$ Mansions per zodiac.[38] The number of $2\frac{1}{3}$ Mansions per zodiac became the most referenced analogy, as seen in the texts, for example, of al-Marzuqi.[39]

Religious texts as testimonies for astral worship in pre-Islamic Arabia

Up to the present time the pagan sources were scarce, the religious texts were used to retrieve information for the pre-Islamic period. In the religious texts, various legends that existed in the time of Mohamed were either dismissed as pagan or they were adopted from the new religion. In the Quran there is a typical formula for this kind of statements, indicating that his contemporaries were asking him on various legends. If the person or thing they asked Mohamed about was condemned, it is very hard to find other material regarding it, as reproducing or discussing it would be considered heretic.

An example of this scenario was the condemnation of the worship of the star Sirius (Shiara) which led to the conclusion that this star was

[33] Nallino, *Ilm al-falak: ta'rikhuhu 'inda l-'Arab fi l-qurun al-wusta*, p. 117.
[34] Ibn Qutaiba, *Kitab al-Anwa*, pp.29–31.; A. Beinorius, 'On the Intercourse between Indian and the Arabic/Persian Astrologies', p. 133.
[35] Nallino, *Ilm al-falak: ta'rikhuhu 'inda l-'Arab fi l-qurun al-wusta*, pp. 117–18.
[36] Ibn Qutaiba, *Kitab al-Anwa*, p. 12; Nallino, *Ilm al-falak: ta'rikhuhu 'inda l-'Arab fi l-qurun al-wusta*, pp. 117–18.
[37] Varisco, 'The Rain Periods in pre-Islamic Arabia', p. 254.
[38] Nallino, *Ilm al-falak: ta'rikhuhu 'inda l-'Arab fi l-qurun al-wusta*, pp. 117–18.
[39] Al-Marzuqi, *Kitab al-Azminawa-l-amkina*, p. 215.

worshiped.[40] An indirect example is the mentioning of the temporary worship of Abraham towards the planet Venus. The Lunar mansions were mentioned in the Hadith as part of heathen practices, but in the Quran only twice, and with no specific emphasis.[41] As al-Sufi mentioned, this was a method of putting aside the behaviour of worshipping the lunar mansions.[42] On the other hand four times the name Buruj, corresponding to the Solar/Greek constellations, appeared.[43] They held prominent position. For example, Allah swore by them at the beginning of a Surah.[44]

In the Quran and the Hadith there are many references to the stars, indicating their significance. Sometimes the stars appear with no connection to the subject of the next verses, for example the evocation "I swear by the position of the stars" which is indicative of the importance of the fixed position of the stars, referring here possibly to the constellations (Buruj).[45] This mentioning could be perceived as contrary to the popularity of the pagan Arabia Anwa system for time measurement.

However, the term Naw' or Anwa is never mentioned in the Quran, although they are mentioned in the Hadith as an example of 'false idols'.[46] Since stars rise helically at the same time within the solar year, they served as indicators of weather and seasonal changes.[47] This was common in many cultures of the past, as is seen for example in Hesiod's 'Works and Days' where the heliacal rising or heliacal setting of stars or star groups like the Pleiades, Orion or the star Spica helped people to coordinate various agricultural activities, or to anticipate the cold season.[48] Sometimes it was common to attribute the observable phenomenon to the stars that indicated them, as is known for example from Egypt where the star Sirius was venerated as it was considered connected with the flooding of the Nile.[49]

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[40] Quran, Surah *Alnajm*, 49.
[41] Varisco, 'The Origin of the Anwa' in Arab Tradition', p. 7; Quran, Surah 10, 5; Surah 36, 39.
[42] 'Abd al-Rahman al-Sufi, *The Book of Constellations-Kitab suwar al-kawakib*, ed. Fuat Sezgin (Frankfurt am Main: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 1986), pp.11–12.
[43] Ibn Qutaiba, *Kitab al-Anwa*, p. 9.
[44] Quran, Surah 85, 1.
[45] Quran, Surah 56, 75.
[46] Ibn Qutaiba, *Kitab al-Anwa*, p.10.
[47] Al-Marzuqi, *Kitab al-Azminawa-l-amkina*, Book 9.
[48] Hesiod, *Works and Days*, pp. 599–622.
[49] E. C. Krupp, 'Astronomers, Pyramids, and Priests', in E. C. Krupp, ed., *In Search of Ancient Astronomies* (London: Chatto and Windus, 1979), p. 189.

In a similar fashion, the Arabic tribes used to associate the annual weather periods, like the wind or the rain seasons, with the heliacal rising or setting of stars that coincided with them.[50] For example the hot rain period of Hammim in summer was thought to be caused by the rise of Aldebaran.[51] This would not be acceptable from the new view of the world, where all weather changes are attributed to God.[52]

This tendency was considered heretic to the new religion as is apparent from the Hadith. In one Hadith Mohammed says:

> Whoever claims that the rain is caused by the good will of Allah and his benevolence, then he is a believer in me and does not believe (worships) the star. But whoever claims that the rain is caused by a certain Naw' (Heliacal Rise or Setting of a star) he is an infidel and a believer (worshiper) of the star.[53]

The rain cult was predominant before Islam, as in the Kaaba idols were erected specifically to pray for rain.[54] Distancing from the rain cult was important, and this is evident in the absence of the term 'Anwa' from the Quran. In the light of the above it is clear why the writers that make reference to the Anwa tend to make their position clear on their adoration. Thus, the writer al-Marzuqi tried to justify the ignorance of the people of Arabia before Islam, and their worship of the Anwa stars, as he believed that the Arabs did not have enough information on them.[55] Ibn-Qutaiba distinguishes between those who use the Anwa as season indicators and those who believe that the season change is bought by the Anwa (stars) and he condemns them as unbelievers.[56]

Furthermore, the Lunar Mansions seem to have had a relation to the Indian Naxatra system, which also contributed in putting them out of favour. It is interesting that these reasons where identified by the Islamic Astronomers, such as al-Sufi, in the tenth century.[57]

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[50] Al-Marzuqi, *Kitab al-Azminawa-l-amkina*, Book 9.
[51] Varisco, 'The rain periods in pre-Islamic Arabia', pp. 256–57.
[52] Al-Marzuqi, *Kitab al-Azminawa-l-amkina*, pp. 167–68.
[53] Hadith, *Sahih Muslim, Book of Faith*, 74 (author's translation).
[54] Varisco, 'The Rain Periods in Pre-Islamic Arabia', p. 252.
[55] Al-Marzuqi, *Kitab al-Azminawa-l-amkina*, p. 167.
[56] Ibn Qutaiba, *Kitab al-Anwa*, pp. 13–14.
[57] Ibn Qutaiba, *Kitab al-Anwa*, pp. 9–10; Al-Sufi, *The Book of Constellations–Kitab suwar al-kawakib*, pp.11–12.

Lastly, the non-Arabic descent population, including the people of Persian and especially those of Aramaic descent, would favour a system that they were accustomed with and that signified their cultural independency from the Arab conquerors.

Legacy

Indeed the cultural conflict of conquered and conquerors was depicted in the adoption or not of Greek philosophers and scientists, who were linked with the Abbasid policy presented above. The anti-Greek fraction was best represented by the scholar Al-Jahiz, who emphasized the superiority of Arabic thought nevertheless the Abbasid dynasty put effort in advancing the adoption of the foreign way of thinking. In the case of the lunar Mansions both sides agreed: the Arabic Islamic academia for religious reason as well as the nonArab side for political reasons agreed on putting them aside. This created a vacuum that was occupied by the Greek Astronomical System.

This is a part of this period's legacy for todays' astronomy. There is an interesting aspect in analysing how the Arabic names were finalised and then how they were transferred some centuries later to western Europe. The way they were transliterated caused distortion of the names, producing inconsistencies in the modern sky map. For example, some common words such as head, tail or leg appear in different ways in the Latin transliteration. The word for leg which is Rijel denotes Rigel in beta Orionis and Rigilkent in alpha Centauri, meaning the leg of the centaur. Even within the same constellation inconsistences may appear. In the Draco constellation the words Thu'ban (big snake) and Tannin (dragon), which were two different descriptions of the constellation, both appear in the constellation's star names: Thuban (alpha Draconis), Rastaban (beta Draconis) meaning head of the snake and Eltanin (Gamma Draconis) meaning the Tannin-dragon. Additionally, in the first two stars of Draco, the same Arabic word Thu'ban, appears differently as Thuban and Taban respectively.

The Arabic names were also often description of the Greek images, rather than translation of the names, with no evident knowledge of the original mythological meaning of the depictions. For example, Orion is described as the Giant – Al-Jabar. The star Algol (beta Persei) in the Greek depiction was illustrated as the head of the Medusa. So the star was named 'Head of the monster', Ras-al-Goul from which the modern name Algol derives. Similarly, Andromeda was described as a tied woman, Al-musalsala. Sometimes the pre-Islamic Arabic names survive in separate

stars within a constellation, while the other star names of the same constellations are description of the Greek image. Such is the case with the house or armpit of the Jauza (a pre-Islamic deity and constellation in the area of Orion) which survives in the name of the star Betelgeuse in Orion. Similarly the star Vega in Lyra, whose name is derived from the pre-Islamic Arabic constellation of the falling falcon.

As stated previously religious and political reasons favoured the abandoning of the Anwa system whose study has of itself great interest as it shows the occupation with astronomy in the pre-Islamic times, is a gate to the folklore and also hints to influences of other cultures, most importantly the Indian influence.

The Anwa went out of favour of the academia but remained in folk tradition for a long time. Indeed, in the non-formal rural life, poems and proverbs survived linking a Lunar Mansion with weather changes, not as a lore but more as a practical guide. An analogy with Works and Days of Hesiod can be made. These poems survived largely due to the documentation of the early Islamic astronomers such as Ibn Qutaiba.

Ibn Qutaiba

Ibn Qutaiba is a notable figure in this translation period, who lived and wrote in the ninth century (died 889 CE). He wrote one of the oldest surviving astronomical treatises in Arabic. Indeed from twenty-four writers of books on the subject of the Anwa before the eleventh century CE, the only surviving work is the one by Ibn Qutaiba.[58] His work was influential for the most known Arabic manuscripts in the West, as the works of Al-Sufi and al-Marzuqi. In regard to the many works on the Lunar Mansions, Al-Sufi recognized as valuable only the works of Ibn Qutaiba, as the others are literature and philology oriented with little astronomical understanding.[59] Furthermore Ibn Qutaiba contributed in documenting the Arabic pre-Islamic folklore of Anwa' that were preserved in the rhymed prose (Saja') associated with this phenomenon[60]. This form of Saja' was used by the Arabs to orally immortalise traditions and practices, often providing information on the folklore.

A further importance of Ibn Qutaiba was his testimony of the transition period in which he lived. Firstly, the style of Ibn Qutaiba was influenced

[58] Ibn Qutaiba, *Kitab al-Anwa*, p. 19.
[59] Al-Sufi, *The book of Constellations–Kitab suwar al-kawakib*, pp. 1–2.
[60] Varisco, 'The Rain Periods in Pre-Islamic Arabia', p. 251.

by both the traditional Arabic as well as by the Greek astronomical rendering, as he wrote within one generation or less after the translation of the Ptolemy's Almagest. Despite the short period from this translation, he showed great familiarity with the Greek names. At the same time, he was still attached to the Anwa and the Lunar Mansions. Indeed, he dedicated a whole book to them called Kitabu-l Anwa, where he incorporated the Anwa to the Greek astronomical approach.

For example, the fact that the first Lunar Mansion is Sharatan, which is in Aries, reflects a correlation to the Hellenistic model of the zodiac, starting the list of the Anwa at the spring equinox.[61] Ibn Qutaiba mentioned that 'The two stars of Sharatan (β,γ Arietis) are the first stars of Spring'.[62]

Another example of this point is the comparison of the presentation of Orion in the books of Ibn Qutaiba and al-Sufi. Ibn Qutaiba refered to Orion primarily as the Jauza stars, although providing at the same time the Greek depiction as Orion. Namely, he states:

> The Jauza is amongst the southern constellations. She is called 'The Giant' (Al-Jabar) due to similarity with the king. Because she is depicted as a crowned man on a chair.[63]

It is clear that Orion for Ibn Qutaiba is essentially identified with the pre-Islamic female figure 'Jauza', rather than the 'Giant, al-Jabar' which is a depiction used for her stars. Interestingly, the feminine pronoun is used even when the subject in the sentence is the King or the Jabar. Furthermore, the name of the related chapter is 'On the stars of Jauza' and he further identified the stars based heavily on the Jauza depiction, as the name Jauza occurs nine times in the first introductory paragraph.[64]

Al-Sufi on the other hand, almost a century later, introduces the constellation of Orion as follows:

> Constellation of Jabar, and he is the Jauza: His stars that form his depiction are 38, and it is a picture of a man standing south of the Sun's path and he looks like a human...[65]

Al-Sufi uses the masculine pronoun, and the name Jauza appears less prominent than in the text by Ibn Qutaiba. This is an example of the pre-

[61] Varisco, 'The Rain Periods in Pre-Islamic Arabia', p. 253.
[62] Ibn Qutaiba, *Kitab al-Anwa*, p. 18.
[63] Ibn Qutaiba, *Kitab al-Anwa*, p. 45.
[64] Ibn Qutaiba, *Kitab al-Anwa*, p. 45.
[65] Al-Sufi, *The Book of Constellations–Kitab suwar al-kawakib*, p. 321.

Islamic depiction that becomes a secondary alternative name or in other cases even omitted.

Secondly, stylistic analysis of his writings and content offers a precious gateway into understanding the developments of this period. He makes use of the newly emerged academic Arabic language, while still keeping a relaxed style in his writing, which imitates a friendly discussion rather than austere academic style, as is seen in other works of later periods, such as in Averroes. Most notably, he speaks directly to the reader, as is seen in the excerpt below.

Some of the observations above can be understood through Ibn Qutaiba's original text. In the translated section from the third chapter from Ibn Qutaiba's book on the Anwa. An effort is made to illustrate the spirit and writing style of the original. Of interest is the fact that he uses the term Lunar Mansions and speaks of their role as Anwa, depicting the merge that has taken place by his time.

> About the mechanism of Rising and Setting: The sun reaches at a certain dawn one of the Lunar Mansions, and it covers (with its light) the Lunar Mansion that it has reached and it also covers the previous Lunar Mansion. Now in this morning you can see the Mansion that lies before these two. This visible one is called 'the one who comes out/rises'. And this is the Mansion the people mean when they say 'if this Mansion comes out, this happens' [....] The sun stays in one Mansion for a period of 13 days before it moves to the next one. Therefore each Mansion that receives the sun will come out/rise and will be visible again at dawn after 26 days. This is the period of time between the sun's arrival to it and its exit from it. I will provide now for you, O reader, an example of what I said to help your understanding: When the sun arrives to Thurayya (Pleiads) at dawn, it therefore covers Thurayya (Pleiads) and Butain (Aries ε,δ,π,ρ) which lies behind it. Therefore the rising Lunar Mansion is Sharatan (Aries α,β,γ). [.] The sun stays at Thurayya (Pleiads) for 13 days before moving to Aldebaran and covering it, while still covering Thurayya (Pleiads), since the sun covers the Mansion where it resides and the previous one, as I taught you. So the sun stays for 13 days at Aldebaran and then moves to Haq'a (λ,φ1,φ2 Orionis) causing the Pleiades to be visible again after 26 days .[66]

Conclusions

When today Arabic or Islamic astronomy is discussed the focus is the star catalogues or the innovations of the middle or late Abbasid period, up to

[66] Ibn Qutaiba*, Kitab al-Anwa*, pp. 9–10.

the Turkish Era, from the ninth up to the fourteenth century. For example, the names of prominent scientists are in the centre of interest, as well as the influence of the Arabic astronomy in the West. In this paper however, the scope is rather an earlier stage, at the beginning of the Abbasid era in the mid-eighth to mid-ninth century, and the focus is the examination of the reasons behind the developments that shaped the astronomical landscape of that period.

It can be said that reaching for knowledge by pushing forward the translation movement was a part of state policy and thus to a large extent an intentional move. The first steps had included gathering of information via translation and adapting them, giving attention to verbiage and style, to serve the various needs of the political and religious dialogue.

The impact of these translations on the astronomy of the time, was a gradual transition from the pre-Islamic to the Greek and Persian perception of the sky. This affected many aspects of the sky Uranography, primarily the embedding of the Greek depictions of the constellations and the accepting of the importance of the zodiac. The interaction of the pre-Islamic Anwa and the Lunar Mansions are central in this process. In this scope, the work of Ibn Qutaiba relating to the Anwa was emphasized, as a fine example of this transition period, and a valuable source of ethnographic and scientific information.

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