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A Fifteenth-Century Mamluk Astronomer in the Ottoman Realm: ʿUmar al-Dimashqī and his ʿilm al-mīqāt corpus the Hamidiye 1453*

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Abstract: The fifteenth-century emergence of Ottoman scientific endeavours occurred at a fortunate time when scientific knowledge in the Islamic world was already advanced. Since the Ottomans had no intention of reinventing the wheel, they began accumulating this already advanced knowledge via copying manuscripts, providing safe haven for scholars fleeing political instability in the East, establishing madrasas, and other methods. Most of the mathematical sciences such as algebra, arithmetic, and *ʿilm al-hayʾa*, were transmitted from the successive schools of Maragha, Tabriz, and Samarqand. The science of timekeeping, however, had a unique source: the Mamluks. During the thirteenth-fifteenth centuries, Mamluk astronomers worked exclusively on timekeeping and produced arguably the best treatises in this discipline. It was, therefore, no surprise that the Ottoman reception of timekeeping was based on these works. This paper will discuss the exact starting point of this transmission and introduce ʿUmar al-Dimashqī, a Mamluk astronomer from Damascus who lived in Istanbul and Edirne, as the responsible party. The texts in his timekeeping compendium, the Hamidiye 1453, will be examined in detail and its role as a bridge between Mamluk, Samarqand, and Istanbul knowledge traditions will be discussed.

Keywords: ʿUmar al-Dimashqī, Mamluk astronomy, Ottoman astronomy, timekeeping, astronomical instruments, Hamidiye 1453.

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Introduction

Unlike the other principalities of its time, the Ottoman principality was not founded on a region that carried the cultural heritage of the Anatolian Seljuks.[1] Therefore, they had to create their own environment for knowledge, a requirement that produced a new and unique scholarly tradition that would last for centuries. The Ottoman reception of mathematical and natural sciences has been dated to the fifteenth century.[2] Due to an efficient process for transmitting knowledge in the Islamic world, the Ottoman scientific tradition was able to feed off other knowledge centres.

Two important aspects of this transmission are significant for understanding the development of mathematics and astronomy in the Ottoman realm. The first is the level of scientific knowledge in question in the other knowledge centres. *ʿIlm al-hay'a*[3] (i.e., theoretical astronomy, cosmology, *zīj*es, and observations) flourished in Maragha and Shanb-i Ghāzān in the thirteenth century and matured in Ulugh Beg's Samarqand observatory in the fifteenth century. On the other hand, knowledge of timekeeping (*ʿilm al-mīqāt*) was a subject of special attention in the Mamluk realm, which stretched from Egypt to Palestine and Syria between the same periods.[4]

The second one is the favourable conditions for scientific development in the Ottoman realm. Under Sultan Meḥmed II (1444-46, 1451-81), the region became a safe haven for scholars, the number of madrasas rose significantly, and scholarly works began to attract the court's attention.[5] Scholars from all over the Islamic

1 See Taha Yasin Arslan, "On Altıncı Yüzyıl Osmanlı Astronomisi ve Memluk Etkisi" (D. Phil. dissertation, Istanbul University, 2015), 86-89.

2 For more information on the reception's beginning, see İhsan Fazlıoğlu, "Osmanlılar: Düşünce Hayatı ve Bilim," *TDV İslam Ansiklopedisi (DİA)*, volume 33 (2007), 548-56.

3 For the classification of astronomy, see Aḥmad b. Muṣṭafā Tāshkoprizāda, *Miftāḥ al-saʿāda wa miṣbāḥ al-siyāda fī mawḍūʿāt al-ʿulūm*, 3 vols. (Beyrut: Dār al-Kutub al-ʿIlmiyya, 1985), 1: 348-49, 357-67.

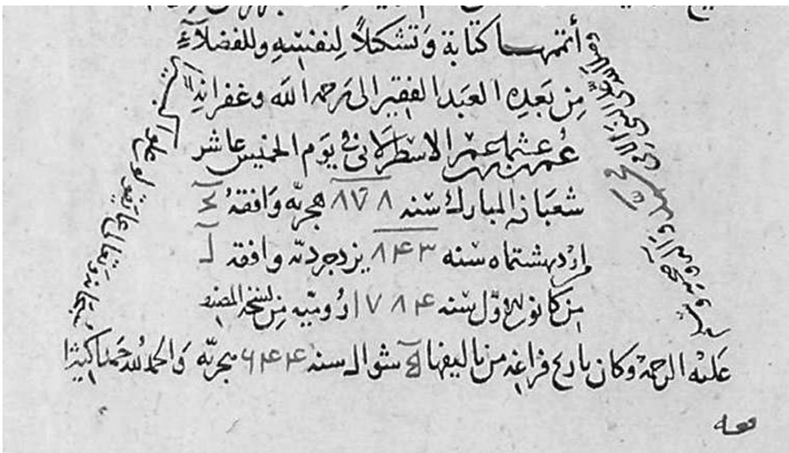
4 We would like to point out that these knowledge centres taught all branches of astronomy and even astrology. However, it seems that astronomers from the same regions intended to focus more on the same branches, a preference that allows us to identify a knowledge centre with a specific area. For instance, almost all Mamluk astronomers worked on timekeeping. That said, some prominent ones such as Ibn al-Shāṭir also worked on theoretical astronomy and prepared *zīj*es. For the most comprehensive study on Mamluk astronomy, see David A. King, *In Synchrony with the Heavens: Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization: Volume 1, The Call of the Muezzin* (Leiden: Brill, 2004); *Volume 2, Instruments of Mass Calculation* (Leiden: Brill, 2005). For the author's study on this topic, see Arslan, "Osmanlı Astronomisi," 40-85. For Ibn al-Shāṭir's astronomical works, see E. S. Kennedy and Imad Ghanem, ed., *The Life and Work of Ibn al-Shātir: An Arab Astronomer of the Fourteenth Century* (Aleppo: Aleppo University Publications, 1976); George Saliba, *Islamic Science and the Making of the Renaissance* (Cambridge, MA: The MIT Press, 2007).

5 For a detailed study, see Abdurrahman Atçıl, "Mobility of Scholars and Formation of a Self-Sustaining Scholarly System in the Lands of Rūm," *Islamic Literature and Intellectual Life in Fourteenth- and Fifteenth-Century Anatolia*, eds. A. C. S. Peacock and Sara Nur Yıldız (Würzburg: Ergon Verlag 2016): 315-32.

world, especially those living in the Seljuk cities (i.e. Sivas and Konya) migrated to the newly conquered Constantinople (i.e., Istanbul). Consequently, the number of original and copied scholarly works rose exponentially. These conditions, which allowed scholarly attraction to gain momentum, were neither random nor surprising, but were the results of a long-term policy for the systematic reception of knowledge from other Islamic centres.

The Ottoman Reception of Timekeeping

The influence of Maragha precedes all others in the process of receiving scientific knowledge. This *ʻilm al-hayʼa*-centred influence was consolidated by that of Samarqand, especially after Abū al-Qāsim ʻAlāʼ al-Dīn ʻAlī b. Muḥammad Qushji-zāda[6], known as ʻAlī Qūshjī, arrived in Istanbul and was appointed as a teacher to the Ṣaḥn-i Thamān and Ayasofya madrasas, respectively. Despite this reception, which relied heavily on theoretical astronomy, the Ottomans knew that astronomy was not solely theoretical and thus pursued knowledge of all of its branches. The reception of timekeeping was an outcome of this pursuit in the second half of the 15th century. Their interest in it is a good indicator of their unique multi-focused comprehensive approach toward science, since there is no trace of any work or even the slightest interest in it in pre-Ottoman Anatolia.



Picture 1. The scribe's signature in the end of *Taḥrīr al-Majastī* that was copied by Dimashqī (Süleymaniye Library, Râgıp Paşa 913).

6 Fazlıoğlu, "Qūshjī: Abū al-Qāsim ʻAlāʼ al-Dīn ʻAlī ibn Muḥammad Qushči-zāde," *The Biographical Encyclopedia of Astronomers (BEA)*, 946-48.

Their thirst for useful knowledge allowed them to rapidly absorb information on the mathematical sciences. The learning process of timekeeping, which was no different from the rest of astronomical knowledge, began via external sources. At this point, ʿUmar al-Dimashqī and a compendium (*majmuʿa*), now in the Süleymaniye Library's Hamidiye collection number 1453, stand out the most. This Arabic-language compendium, which comprises nineteen treatises and thirteen sets of astronomical tables, was produced over a twelve-year period. This article seeks to shed light on the journey of both Dimashqī and his compendium, as well as to learn more about them.

Dimashqī

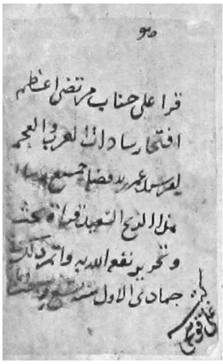
ʿUmar b. ʿUthmān b. ʿUmar al-Ḥusaynī al-Dimashqī al-Asṭurlābī is a fifteenth-century Mamluk astronomer and scribe. What little is known about him is extracted from his name and works. His al-Ḥusaynī *nisba*[7] indicates that he was a descendant of the prophet of the Islam, the al-Dimashqī *nisba* reveals that he was from Damascus, and the al-Asṭurlābī *nisba* denotes that he was an instrument maker.[8] His works reveal that he was a pupil of ʿAlī Qūshjī and lived in Istanbul and Edirne. He may also have lived in Samarqand or Herat for a short time. The Hamidiye 1453 contains four treatises that are attributed to him and fifteen of the seventeen treatises that he copied. The remaining copies are Naṣīr al-Dīn al-Ṭūsī's (d. 1274) *Taḥrīr al-Majastī*[9] and *Zīj-i Ulugh Beg*, also known as *Zīj-i Gurgānī* and *Zīj-i Jadīd-i Sulṭānī*. The copying date of the *Taḥrīr* is given as 15 Shaʿbān 878 (5 January 1474). Regarding the *Zīj-i Ulugh Beg*'s copying date, a note in ʿAlī Qūshjī's own handwriting that is attached to the inner face of the book's cover[10] indicates that Dimashqī prepared this copy and read it to ʿAlī Qūshjī for error-checking. The process was completed in Jumādā al-awwal 879 (September-October 1474). It reads:

7 *Nisba* is an adjective indicating a person's place of origin, religious or tribal affiliations, or profession.

8 No extant instrument bears Dimashqī's signature.

9 Süleymaniye Library Ragıp Paşa 913.

10 Kandilli Observatory 262. This note was most likely adhered to the book by Dimashqī.



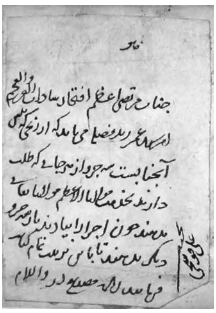
هو
قرا علي جناب المرتضى اعظم افتخار سادات العرب والعجم امير سيد عمر زيد فضله جميع رسائل هذا الزيج السعيد قراة ببحث وتحرير نفع الله به واتم ذلك في جمادي الاول سنة تسع وسبعين وثمانمائة
كتبه علي قوشجي

Janāb-i Murtaḍā Aʿẓam, iftikhāru sādāt al-'arab wa al-'ajam, Amīr Sayyīd 'Umar, may [Allah] increase his virtue, read all chapters of this *zīj* to me in the method of *baḥṣ* and *taḥrīr*. It was completed in Jumādā al-awwal of 879.

Signed by 'Alī Qūshjī

The Hamidiye 1453

The compendium covers almost all of the problems associated with timekeeping in nineteen treatises and thirteen sets of tables (Table 1). The same style is used throughout the book, except for the second treatise. Only three of the treatises are dated (858/1454, 859/1454-1455, and 869/1464-65), and one of the tables indicates a preparation date (870/1465-66). Two treatises have records of place, one for Istanbul and the other for Edirne. A note attached to folio 23r reveals why this compendium was compiled. Written in Persian and bearing the signature of 'Alī Qūshjī, it reads:

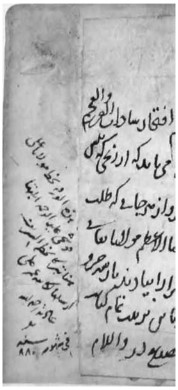


هو
جناب مرتضى اعظم، افتخار سادات العرب والعجم امير سيد عمر زيد فضله مي بايد كه از زيجى كه پيش آنجنابست سه جزؤ از هر جايي كه طلب دارند بخدمت مولانا الاعظم مولانا بقائى (؟) بدهند. چون اجزا را بيارند باز سه جزؤ ديگر بدهند يا باين ترتيب تمام كتابت فرمايند.
كتب علي قوشجي.

Janāb-i Murtaḍā Aʿẓam, iftikhāru sādāt al-'arab wa al-'ajam, Amīr Sayyīd 'Umar, may [Allah] increase his virtue, should give (write) three sections from the *zīj* he has for Mawlānā el-aʿẓam mawlānā Baqā'ī to use. When those three are returned, he should give (write) three more. He should complete the writing in this order.

Signed by 'Alī Qūshjī

To the left of this note is another one by Dimashqī. It reads:



هذه الورقة بخطّ مولانا علي قوشجي عليه الرحمة ابتلها هنا تبركا بخط الشريف ارسلها لكاتبه عمر على عادته رحمه الله في شهور سنة ٨٨٠

This note is written by my master ʿAlī Qūshjī, may Allah rest his soul. As a good omen, I have attached here the note that he has sent, as his custom, to ʿUmar, the author [of this compendium]. The year 880[/1475-76]

As far as we understand, this Baqāʾī person, quite likely a prominent scholar, had requested ʿAlī Qūshjī to give/compile an introductory work on timekeeping. He then obviously passed this request on to Dimashqī, whom he respectfully refers to as "Sayyid[11] ʿUmar," and instructed him to compile it section by section. Although Dimashqī's note is dated 880/1475-76, we do not know when ʿAlī Qūshjī wrote and sent his. The earliest date on the compendium, 858/1454, may indicate that the note was written before it. However, a compendium might be created by bounding several treatises written independently in different dates or by compiling/copying them on an already bound book with empty folios. Therefore, we cannot confirm when he began compiling or bound this compendium.

Our inspection of the work allows us to assume that 858/1454 may indeed be the earliest date for the compendium. Most of the treatises are written consecutively, and some end and begin on the same page without any empty space between them. Therefore, we believe that this compendium was compiled in the same order as it has come down to us. Regardless of their dates, ʿAlī Qūshjī's and Dimashqī's notes reveal the compilation's purpose but introduces several new problems:

1. Why did ʿAlī Qūshjī refer to a *zīj* for preparing a compendium on timekeeping?
2. Who is Baqāʾī?
3. Where was ʿAlī Qūshjī when he received Baqāʾī's request?
4. When, where, and how did ʿAlī Qūshjī and Dimashqī meet?

The first question may be answered with ʿAlī Qūshjī's limited encounter with timekeeping, since *zīj*es almost never deal with topics related to timekeeping. ʿAlī

11 *Sayyid* is an epithet used for the Prophet's descendants.

Qūshjī is a mathematician and astronomer who studied and followed the *ʿilm al-hay'a* tradition of Maragha and Samarqand. We have no information regarding his interest in timekeeping other than a geometrical formula[12] for determining the *qibla* and a vertical sundial[13], that is attributed to him, on the wall of the Fatih Mosque. Therefore, one may assume that he was not overly familiar with timekeeping terminology. It is also possible that he was using the *zīj* as a rather general concept.[14] Whatever the reason was, it seems that ʿAlī Qūshjī considered Dimashqī competent enough to compile such a work and thus entrusted it to him.

The second and third questions are directly related to each other. If, as we assume, Dimashqī began compiling this work before 858/1454, then Baqā'ī must have known ʿAlī Qūshjī before this date. However, the identity of Baqā'ī and his whereabouts, as well the whereabouts of ʿAlī Qūshjī, around 1450s are obscure. We know that the latter worked in Samarqand at least until Ulugh Beg's death in 1449. He went to Herat at an unknown date before moving to Tabriz in 1469.[15] Unfortunately, no account indicates whether he was in Samarqand or Herat around 1454, which only makes it harder to identify him because all we know about him is his *nisba*. We hope that future studies will reveal more information on both of these individuals.

The fourth question can partially be answered by using clues on the notes. For instance, the fact that ʿAlī Qūshjī has sent his request via a third party may indicate that they were not living in the same city. Moreover, he addresses Dimashqī as a third person and instructs him on how to compile the work, instead of kindly requesting him to do so. This could mean that they had a close relationship (i.e., master-pupil). Considering that Dimashqī kept the note, which was probably written before 858/1454, until 880/1475-76, for the sake of respect, there is a good chance that they were master and pupil. Based on these clues, we argue that Dimashqī was tutored by ʿAlī Qūshjī sometime before 858/1454, although we have no idea of where and in what capacity this occurred. One can only assume that Dimashqī moved to Samarqand or Herat to be tutored and left there afterwards. Clearly, they remained in touch via notes, since Dimashqī states that sending him notes was one of his master's habits.

12 This formula, which can be found in the *Risāla al-Fatḥiyya* in Süleymaniye Library Ayasofya 2733, could both be a topic of timekeeping or merely a geometrical problem.

13 A. Süheyl Ünver, "Osmanlı Türkleri İlim Tarihinde Muvakkithaneler," *Atatürk Konferansları 1971-72* (Ankara: Türk Tarih Kurumu, 1975), 241.

14 One may assume that this note may not be a request for this work, since Dimashqī copied a *zīj*, namely, the *Zīj-i Ulugh Beg*. However, this would not explain neither why he attached the note in this compendium rather than the *zīj* nor ʿAlī Qushjī's instructions for compiling it "section by section," which could lead us to an impasse. Therefore, we prefer to assume this note was written for this compendium until clearer evidence is presented.

15 Fazlıoğu, "Qūshjī."

There are no records of Dimashqī before 858/1454. Four dates in the compendium (858/1454, 859/1454-55, 869/1464-65, and 870/1465-66) provide some clues. For instance, the fifteenth treatise's records of date and place put him in Istanbul in 859/1454-1455, almost twenty years earlier than ʿAlī Qūshjī's arrival. The last treatise, completed in Edirne in 869/1464-65, could be interpreted as showing that he was active in the Ottoman realm for a long time.

Table 1.
The content of the Hamidiye 1453.

	The Author	**The Title**	**The Date and Place**
1	Jaghmīnī	*Mulakhkhaṣ fī al-hay'a*	no date/place
2	Nīsābūrī	*Sharh Sī faṣl*	no date/place
3	Dīrīnī	*al-Yawāqīt fī ʿilm al-mawāqīt*	858/1454/ no place
4	Hāshimī	No title	no date/place
5	Qusṭā b. Lūqā	*Risāla fī ʿamal bi-l-kura dhāt al-kursī*	no date/place
6	Mizzī	*Risāla fī ʿamal bi-l-asṭurlāb*	no date/place
7	Dimashqī	No title	no date/place
8	Ibn al-Shāṭir	*al-Risāla li-l-rubʿ al-tāmm*	no date/place
9	Mizzī	*Kashf al-rayb fī ʿamal bi-l-jayb*	no date/place
10	Dimashqī	*Risāla fī al-ʿamal bi-l-jayb mukhtaṣar*	no date/place
11	Mizzî	*al-Ravḍāt al-mazharāt fī ʿamal bi-l-rubʿ al-muqanṭarāt*	no date/place
12	Bilbaysī	*Risāla fī ʿamal bi-l-rubʿ al-muqanṭarāt al-shimāliyya*	no date/place
13	Ibn al-Athīr	*Shāfiyya kāfiyya mukhtaṣar li-maʿrifa al-ʿamal bi-vajh al-rubʿ al-mawduʿ fīhi muqanṭarāt al-asṭurlāb*	no date/place
14	Ibn al-Sarrāj	*Risāla fī al-ʿamal bi-rubʿ al-muqanṭarāt al-maḳtuʿ ʿan madār al-ḥaml wa al-mīzān*	no date/place
15	Ibn al-Sarrāj	No title	859/1454-55/ Istanbul
16	Dimashqī	No title	no date/place
17	Dimashqī	*Taḥrīr al-maqāla fī maʿrifa al-awqāt bi-ghayr ālāt*	no date/place
18	Miṣrī	*Ikhtiṣār al-maqāla fī maʿrifa al-awqāt bi-ghayr ālāt*	no date/place
19	Khalīlī	No title	869/1464-65/ Edirne
20	Khalīlī	Timekeeping Tables	870/1465-66/ no place

The Content of the Hamidiye 1453

Dimashqī may not have delivered the compendium to Baqāʾī, but this did not stop him from completing his work, which covers almost all of the problems related to timekeeping applications. His careful choice of topics and authors, as well as his methodological sorting of the treatises, caused the emergence of an impressive textbook on timekeeping that begins with an introduction to astronomy and is followed by manuals on how to use the most appropriate astronomical instruments. The last treatises deal with undertaking mathematical calculations without using an instrument. The compendium ends with various sets of timekeeping tables (See Table 1 for the content).

Four of the treatises (vii., x., xvi., and xvii.) are by unidentified authors, which is quite curious. Dimashqī might have copied them from works without any records or compiled them specifically for this compendium. The style of language in the introductions (vii., xvi., and xvii.), distinctive content as regards similar works on the same topic (vii. and xvi.), and dealing with an extremely rare subject with which he may be quite familiar as an instrument maker (xvi.) may indicate, albeit without certainty, that he authored these treatises. We hope that future discussions and studies will reveal more about their origins and whether they belong to him.

The first treatise, *Mulakhkhaṣ fī al-hayʾa*[16] [1v-22r], was written by Sharaf al-Dīn Maḥmūd b. Muḥammad b. ʿUmar al-Jaghmīnī who lived in Transoxiana in the thirteenth century. One of the most comprehensive and easy-to-understand books on general classical astronomy, it mainly deals with the structure and principles of the heavens at a level that is intelligible even for non-astronomers. Dimashqī's choice of this work as the introduction clearly indicates that he intended this compendium for more general audiences.

The second treatise, the *Sharh Sī faṣl* [23r-84v] by the fourteenth-century astronomer al-Ḥasan b. Muḥammad b. al-Ḥusayn Niẓām al-Dīn al-Aʿraj al-Nīsābūrī, is a commentary of the Maragha astronomer Naṣīr al-Dīn al-Ṭūsī's (d. 1274) work on calendars, *Sī faṣl*[17]. This thirty-chapter commentary deals with Islamic, Rūmī (Syriac),[18] and Persian calendars as well as the Sun, the Moon, the five naked-eye planets, the zodiac, the lunar mansions, the appearance and disappearance of stars, and the calculations of days, weeks, months, years, and calendars.

16 Sally P. Ragep edited and translated this work into English. See Sally P. Ragep, *Jaghmīnī's Mulakhkhaṣ* (New York: Springer, 2016).

17 This is the most popular work on calendars in the Islamic world. Aḥmad b. Ibrāhīm b. Muḥammad al-Dāʿī al-Garmiyānī's translation of it is one of the earliest astronomical works in Ottoman Turkish.

18 Although it is referred as Rūmī (رومي, meaning Roman) in Ottoman literature, this is the solar calendar that was used by Assyrians. It begins with the reconquest of Alexandria by the Seleucids following the death of Alexander the Great in 311 BCE. We prefer to use "Syriac calendar" to prevent confusion with the other Rūmī calendar used by the Ottomans after the nineteenth century.

These two treatises are followed by another two introductory treaties on timekeeping. The first one was *al-Yawāqīt fī ʿilm al-mawāqīt* [85v-102v], written by the Sufi scholar ʿAbd al-Azīz b. Aḥmad al-Dīrīnī[19] (d. 1295), who was active in Egypt. Most of the text is in verse with occasional prose passages for some descriptions and examples. It provides information on calendars, lunar mansions, the motions of the Sun and the Moon, the shadow lengths, and hours. Several tables correspond with lunar mansions, the solar altitude, and the shadow lengths.[20] The fourth treatise, also written in verse but untitled [102v-103r], was compiled by Hāshimī, who is mentioned only with this *nisba*. It briefly deals with same problems as does the previous treatise.

We believe that Dimashqī intends to prepare the readers to understand timekeeping knowledge by first presenting these four introductory-level treatises and then discuss the astronomical instruments themselves. This is not surprising, given that timekeeping, which is mainly an applied knowledge, relies heavily on observational and computational instruments. The Mamluks' establishment of the office of timekeeper (*muwaqqit*) around the end of the thirteenth century and their subsequent employment of astronomers in the major mosques had a huge impact on the development of instrumentation. One can argue that the vast number and variety of astronomical instruments in the Islamic world is a manifestation of the tireless pursuit of precision and simplification in timekeeping applications. Naturally, Dimashqī also introduces several instruments in this compendium.

The fifth treatise, *Risāla fī ʿamal bi-l-kura dhāt al-kursī* [103b-123a], is the astronomer Qusṭā b. Lūqā's (d. c. 913) manual on celestial globes (*al-kura dhāt al-kursī* [the globe with the stand]). A solid sphere made of metal, wood, or *papier-mâché,* this instrument bears astronomically significant circles, such as the celestial equator, the ecliptic, and colures, as well as a number of stars. The sphere is usually fitted inside two rings that are fixed perpendicularly to each other. As the rings, which represent the meridian and the horizon, sit on columns, this instrument became known as "the globe with the stand." Some 200 of these celestial globes are extant. Its construction is very hard, but also very rewarding due to its vast range of applications. Even so, only a few scholars attempted to compile a manual on its use. In his *Jāmīʿ al-mabādī wa al-ghāyāt fī ʿilm al-mīqāt*, Abū al-Ḥasan al-Marrākushī, one of the most prominent Mamluk astronomers, states that he saw five different works on its use and that Qusṭā's treatise was the best of them.[21] This work, arguably the most popular work on globes in the history of astronomy, was translated into Medieval Spanish with an additional chapter on globe construction, It constitutes the second

19 Mehmet Şener, "Dîrînî," *DİA*, volume 9, 1994, 373-74.

20 For technical details, see King, *In Synchrony with the Heavens*, vol. 1, 223-25, 511.

21 MS Marsh 154, ff.72v-73r, Nuruosmaniye 2901, 186r.

book of the compendium commissioned by Alfonso X of Castile in the thirteenth century, known as *Libros del saber de astronomía*.[22] The Hamidiye 1453 copy consists of sixty-seven chapters.[23] The first five chapters deal with basic information on the heavens' structure and describe the instrument. The remaining chapters introduce various applications of the globe for observations and computations.

The globe treatise is followed by two manuals on the astrolabe,[24] which is arguably the most popular astronomical instrument in pre-modern astronomy. The first one (the sixth in the compendium), *Risāla fī 'amal bi-l-asṭurlāb* [123v-129v], belongs to the Mamluk astronomer Shams al-Din Abū 'Abdullāh Muḥammad b. Aḥmad al-Mizzī[25] (d. 1349), a timekeeper in the Umayyad Mosque in Damascus and an accomplished instrument maker. His astrolabes, astrolabe quadrants, and sine quadrants were quite popular and sold at high prices. He also wrote manuals for each kind of instrument that he made. His astrolabe manual, *Risāla fī 'amal bi-l-asṭurlāb*, consists of ten chapters and an epilogue. The chapters first introduce the instrument's components and then deal with several applications, such as measuring the altitude and azimuth of celestial objects, finding an instantaneous time, determining the times of the five daily prayers, finding the *qibla*, finding the co-ascensions of the sign of the zodiac, and so on. The epilogue describes non-astronomical uses of the astrolabe, such as measuring the height of a hill or a wall and the depth of a well.

The second treatise on the use of the astrolabe (the seventh in the compendium) has no title or authorship record [129b-145a]. As mentioned above, we believe that this sixty-chapter treatise may belong to Dimashqī. Unusually, it begins with the use of sine-graph on the back (chapters 1-8) and continues with the instrument's various applications (chapters 9-60). The chapters often introduce more than one method to achieve results. One can find almost all applications of a standard astrolabe, such as determining the latitude, the solar declination, the meridian altitude of the Sun and stars, semidiurnal and nocturnal arcs, the hour angle, the right ascensions of the signs of the zodiac, the *qibla* direction, the shadow lengths at the beginning of the noon and the afternoon prayers, the sighting of the new Moon, and calendar conversions.

22 For the content of the treatise, see Julio Samso, "Qusṭa ibn Lūqā and Alfonso X on the Celestial Globe," *Suhayl* 5 (2005), s.63-79, and W. H. Worrell, "Qusta Ibn Luqa on the Use of the Celestial Globe," *Isis*, vol. 35, no. 4 (1944), 285-93.

23 Some of the copies that we managed to examine (MS Oxford Arab e. 94, MS Oxford Huntington 584...) consist of sixty-five chapters. Dimashqī seems to have completed the text in sixty-five chapters, but then added two chapters in the margins after emphasizing the corrections with a word "صح", meaning that it was corrected by checking the original. Since we could not see all of the copies or the original one, it is hard to comment on these two chapters' originality.

24 Also known as the "plane astrolabe."

25 François Charette, "Mizzī: Zayn al-Dīn [Shams al-Din] Abū 'Abd Allāh Muḥammad ibn Aḥmad ibn 'Abd al-Raḥīm al-Mizzī al-Ḥanafī," *BEA*, 792-93.

The eighth treatise, the forty-six chapter *al-Risāla li-l-rub' al-tāmm* [145a-162b], belongs to the Mamluk astronomer 'Alā' al-Dīn 'Alī b. Ibrāhīm (d. c. 1375), famously known as Ibn al-Shāṭir[26]. It is a manual for his own invention, the complete quadrant (*al-rub' al-tāmm*), which apparently was named "complete" because it can be used as both an astrolabe quadrant and a sine quadrant without having to draw on two different sets. In the prologue of this treatise, Ibn al-Shāṭir describes the instrument's details. The quadrant carries intersecting longitude and latitude lines on the *obverse*, instead of having almucantars and azimuths on the *obverse* and sine graphs on the reverse. The quadrant's rim has a 90-degree scale, whereas the diameters carry a 60-degree and a 90-degree scale each (Figure 1). The chapters deal with how to use the instrument for making trigonometrical calculations, measuring the altitude of celestial objects, finding the hour angle, determining the time that passed or remained calculating the altitude of a celestial object below the horizon, finding the *qibla*, and determining the time of the five daily prayers via observations and/or calculations, respectively.

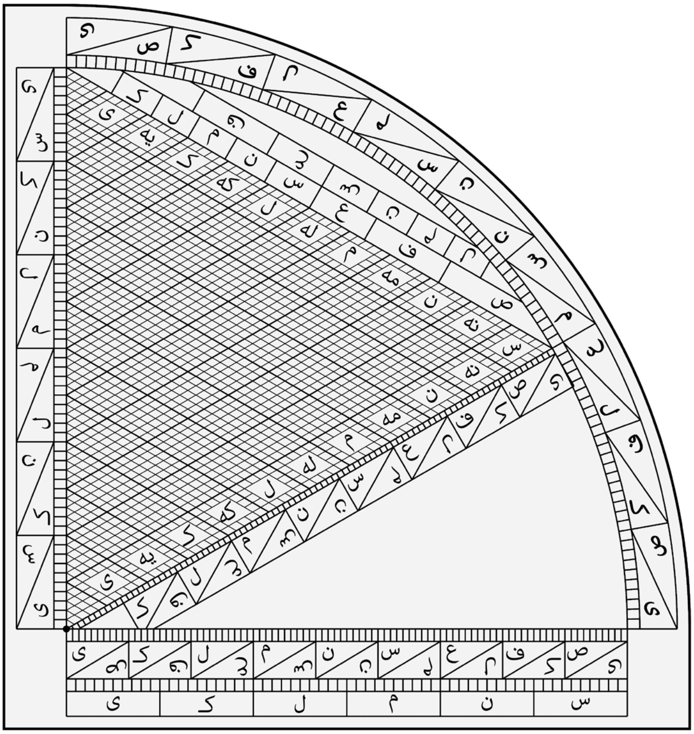


Figure 1. Author's illustration of the complete quadrant (*al-rub' al-tāmm*) based on Ibn al-Shāṭir's instructions.

26 David A. King, "Ibn al-Shāṭir: 'Alā' al-Dīn 'Alī ibn Ibrāhīm," *BEA*, 569-70.

The ninth and tenth treatises deal with another popular instrument: the sine quadrant. The first one, Mizzī's *Kashf al-rayb fī ʿamal bi-l-jayb*, consists of a prologue and sixty-seven chapters [162v-180v]. The prologue introduces the terminology used throughout the treatise, and the chapters deal with solar longitude and declination, the distances between stars and the meridian, the meridian altitude of celestial objects, the equation of half-daylight and with other topics, often with examples. This extensive treatise is followed by the short *Risāla fī al-ʿamal bi-l-jayb mukhtaṣar* [180v-185r], which has no authorship record but may be attributed to Dimashqi. This twenty-chapter treatise briefly deals with how to use a sine quadrant.

After these two treatises, Dimashqī copied four works on the astrolabe quadrant: (i) Mizzī's *al-Ravḍāt al-mazharāt fī ʿamal bi-l-rubʿ al-muqanṭarāt*, a treatise that consists of a prologue and thirty-five chapters [185a-195a], (ii) Zakariyyā b. Yaḥyā al-Makhzūmī al-Qurashī al-Bilbaysī's thirty-chapter *Risāla fī ʿamal bi-l-rubʿ al-muqanṭarāt al-shimāliyya* [195a-201b], (iii) al-Ḥasan b. al-Athīr's thirty-six chapter *Shāfiyya kāfiyya mukhtaṣar li-maʿrifa al-ʿamal bi-vajh al-rubʿ al-mawduʿ fīhi muqanṭarāt al-asṭurlāb* [201b-208a], and (iv) Ibn al-Sarrāj's *Risāla fī al-ʿamal bi-rubʿ al-muqanṭarāt al-maḳtuʿ ʿan madār al-ḥaml wa al-mīzān*, which has no chapter divisions [208a-211b].

Having found no single record of Zakariya Bilbaysī, we can only assume that he was from Bilbays, a town in Egypt, and belonged to the Makhzūmī family, a branch of Makka's Quraysh tribe. In the introduction, Bilbaysī states that this treatise is a shortened version of his *Bughya al-tullāb fī al-ʿamal bi-rubʿ al-asṭurlāb*[27]. The identity of Ḥasan b. al-Athīr is unclear, but he could be Abū al-Ḥasan ʿIzz al-Dīn ʿAlī b. Muḥammad b. Muḥammad al-Shaybānī al-Jazarī[28] (d. 1232-33), one of three brothers, all of whom are known as Ibn al-Athīr and lived in the thirteenth century. However, this Ibn al-Athīr is known as a historian and a scholar of literature and hadith. None of his biographies mention that he worked or wrote on astronomy. Therefore, we may be dealing with another Ibn al-Athīr here. We hope that future inquiries will shed light on this mystery.

The topic of discussion in these four treatises is the astrolabe quadrant. This version of the front of an astrolabe, which is folded over to fit into a quadrant,

27 We have found only one copy of this work in Balıkesir İl Halk Library no. 510. In the introduction, the author's name is given as Zakariyyā b. Yaḥyā b. Zakariyyā b. Yaḥyā Zammām b. Nāfiʿ b. Ṣāliḥ b. ʿAbd al-ʿĀlī b. Hāshim al-Makhzūmī al-Bilbaysī al-Shāfiʿī.

28 Abdülkerim Özaydın, "İBNÜ'l-ESÎR, İzzeddin," *DİA*, vol. 21 (2000), 26-27.

can be used for any application that can be done with the front of the astrolabe. However, whereas the astrolabe can be employed for different latitudes by simply using different plates showing the stereographic projections of different latitudes, the astrolabe quadrant can only be made for a fixed latitude. Even so, given that these instruments were usually made for use in a specific region, or rather in the timekeeper's house (*muwaqqitkhāna*), a fixed latitude did not seem to be a major concern. In fact, it became more popular due to its easy-to-use features that, in contrast to the astrolabe, require no advanced knowledge of astronomy or complex applications.

Following the manuals on four well-known instruments (i.e., the globe, astrolabe, astrolabe quadrant, and sine quadrant), Dimashqī tries to widen the horizon by introducing two somewhat obscure instruments: the hidden sine graph and the spherical astrolabe.

The fifteenth treatise in the Hamidiye 1453, an untitled work by Ibn al-Sarrāj [212r-213r], deals with his own invention: the hidden sine graph (*jayb al-ghā'ib*). This instrument, as its name clearly points out, has no sine graph but is used to calculate trigonometric functions. Ibn al-Sarrāj introduces two versions of it: a semi-circular version and a quadrant (Figures 2 and 3). The semi-circular version carries a 90-unit arc, which stretches along the semi-circle's rim, and a 60-unit scale throughout the diameter. Two intersections of the diameter and the arc are pierced to make holes that fasten two threads to the instrument. One thread carries a plumb at the other end, and the second thread carries a moveable bead that functions as a marker (*murī*). All operations can be done using either one or both of these threads. The quadrant version has a 90-degree arc on its rim and two scales on its radiuses, one for 45-unit and the other for 60-unit. The quadrant's apex and the intersection point between the 60-unit scale and the 90-degree arc are pierced for holes, and the same two threads are fastened to the instrument via these holes. This version functions almost exactly like the semi-circular version.

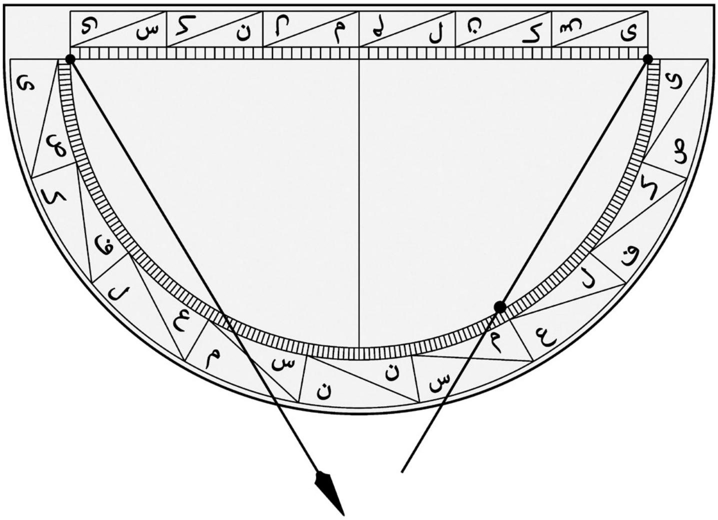


Figure 2. Author's illustration of the semi-circular hidden sine graph (*jayb al*-ghā'ib) based on Ibn al-Sarrāj's instructions.

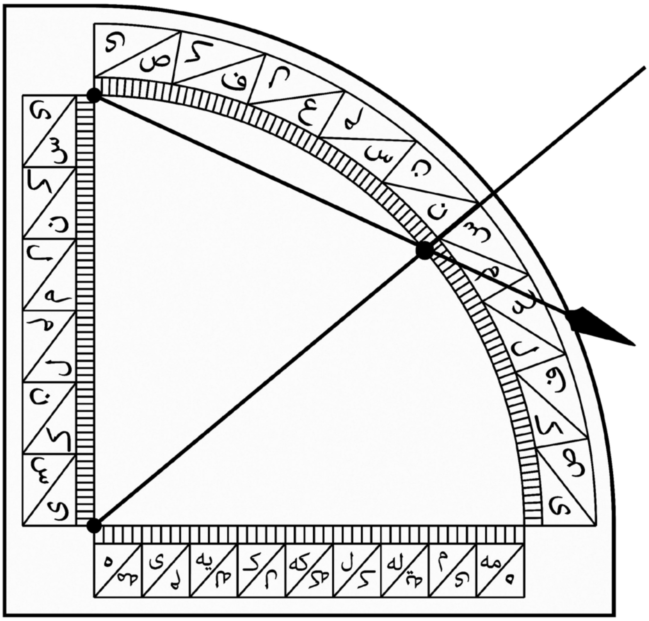


Figure 3. Author's illustration of the quadrant hidden sine graph (*jayb al*-ghā'ib) based on Ibn al-Sarrāj's instructions.

The manual for the instrument was not divided into chapters. The two-folio treatise begins with Ibn al-Sarrāj's accounts of developing his innovative idea and his description of the instrument, and provides examples of how to use it. At the end is Dimashqī's signature as the scribe, which reads:

جمع هذا الكتاب المبارك وكتبه الفقر عمر بن عثمان الحسيني الدمشقي ووافق الفراغ من ذلك سادس عشر شهر ربيع الاخر (جماد الاول) سنة **٨٥٩** بمدينة القنسطنطنية المحروسة خامس عن كانون الثاني سنة **١٧٦٦** للاسكندر غفر الله لمن نظر واستفاد ودعا لكاتبه بالرحمة والمغفرة وللمسلمين.

This valuable work was completed in the sixteenth of *Rabīʿ al-ākhir* in the year 859[/1454-55] [and] the fifth of *Qānūn al-thānī* in the year 1766 of Alexander in the city of Qunsṭanṭiniyya the Protected by the humble ʿUmar b. ʿUthmān al-Ḥusaynī al-Dimashqī.

The compendium's sixteenth treatise, which deals with the spherical astrolabe, carries neither a title nor an authorship record [213v-219r]. We strongly believe that this may be Dimashqī's own handwork. He states in the introduction that he spent ample time learning how to make quality and beautiful instruments and finally mastered the art of globe making. The spherical astrolabe, an astronomical instrument for calculations and demonstrations, consists of two nested globes: an inner solid globe that simulates the sky and carries equidistant almucantar and azimuth circles, and an outer one that is mostly hollow to carry only the meridian, the ecliptic, the local horizon, and a number of star pointers. This rotatable globe can be fixed at any latitude to simulate the daily and yearly motions of the sky for that latitude. Since one does not have to use a projection as in the plane astrolabe, the risk of making a mistake during the making is not as great. As making a well-functioning spherical astrolabe is extremely hard, this might explain why only one complete spherical astrolabe has come down to us.[29] Extant user manuals are also rare, for Dimashqī's treatise is one of only two in the Ottoman astronomical literature.[30]

These two treatises finalize the section on instrumentation. At this point, Dimashqī turns the readers' attention to topics in timekeeping that require no observational instrument. The first of two treatises here is *Taḥrīr al-maqāla fī maʿrifa al-awqāt bi-ghayr ālāt* [219r-228v], which consists of four ten-chapter sections. The sections mainly deal with calendar conversions; calculating solar longitude, declination, instantaneous altitude, and solar altitude at a certain shadow length; finding lunar mansions and time during the night; and determining the cardinal directions, local latitude, depth of a well, and the area of a land.

29 It is in the collection of Museum of the History of Science, Oxford University (inventory no. 49687).

30 The second manual on the use of spherical astrolabe belongs to Hodja ʿAtāullāh b. ʿAbdullāh al-ʿAjamī's (d. 905/1499-1500) Persian-language *Risāla dar maʿrifat-i asṭurlāb-i kurī*. See. Ekmeleddin İhsanoğlu vd. (ed.), *Osmanlı Astronomi Literatürü Tarihi (OALT)*, 2 volumes (İstanbul: IRCICA 1997), 1: 66-67. There is also a record of the use of a spherical astrolabe by Abū ʿAbdullāh Muḥammad b. Sulayman al-Rūdānī (d. 1094/1682-83). However, his instrument has not survived. See *OALT,* vol. 1, 317.

The second treatise, the fourteenth-century Mamluk astronomer Najm al-Dīn Muḥammad b. Muḥammad b. Ibrāhīm al-Miṣrī's[31] *Ikhtiṣār al-maqāla fī maʿrifa al-awqāt bi-ghayr ālāt* [228v-230r], consists of a prologue and twenty-one chapters. In the prologue, Miṣrī gives basic information on the Coptic calendar, the signs of the zodiac, and the right ascensions of the signs. The chapters deal with calculating values for several applications, such as the solar longitude and declination and the solar altitude at the beginning of the afternoon prayer.

Folio 231r, which contains a circular calendar for lunar mansions, introduces these mansions via selective stars at exact dates in the Julian calendar. This type of circular calendar was used in astronomy, astrology, and geography and was particularly important for preparing ephemerides. Dimashqī provides no information on it origin or a text on how to use it. Additionally, the previous and the next folios are left blank. Therefore, it is quite hard to comment further on this calendar.

The nineteenth and the last treatise in the Hamidiye 1453, *Jadwal al-āfāqī* (Table of horizons), belongs to Shams al-Dīn Muḥammad b. Muḥammad al-Khalīlī [232a-233b], a fourteenth-century Mamluk astronomer. In it, he explains how to use the timekeeping tables that he had prepared. The record of date and place at the text's end states that it was completed in 869/1464-65 in Edirne. The treatise is followed by thirteen sets of timekeeping tables, as listed below.

i. Table for finding the *qibla* using latitudes and longitudes. It is titled *Jadwal al-ʿishrīn* (Table of twenty) [233v-234r].

ii. Table for the solar declination for each sign of the zodiac. The obliquity of the ecliptic is given here as 23° 32′ [234v].[32]

iii. Table for three sets of numerical values that result from different formulas[33] that are useful for calculating the solar altitude at the beginning of the afternoon prayer [234v]. The tables have entries for only the first afternoon (*ʿaṣr al-awwal*);

31 François Charette, *Mathematical Instrumentation in Fourteenth-Century Egypt and Syria: The Illustrated Treatise of Najm al-Din al-Misri* (Boston: Brill, 2003), 24-28.

32 This value differs from the values found in the other four compendiums. MS Staatsbibliothek zu Berlin Ahlwardt 5754 and MS Oxford Selden 100 give 23° 31′, MS Oxford Marsh 95 gives 23° 30′, and Süleymaniye Ayasofya 2590 gives 23° 35′ 00′. We would like to point out that Ayasofya 2590 was copied by the fifteenth-century Ottoman timekeeper Muḥammad Qunawī, who was an expert in preparing timekeeping tables. Giving a three-digit value for degree-minute-second and providing two sets of values for the obliquity allows us to think that Qunawī might have calculated these values himself.

33 For the formulas, see King, "Khalīlī: Shams al-Dīn Abū ʿAbdallāh Muḥammad ibn Muḥammad al-Khalīlī," *BEA*, 625-26.

however, other copies of the same tables contain entries for both the first and second afternoon (*ʿaṣr al-thānī*). It seems that Dimashqī preferred to copy only the first afternoon.

iv. The conversion table for the Islamic and Syriac[34] calendars [235r-235v].

v. The power (*uṣ*) value of the Sun for each day of the Syriac calendar [236r].

vi. Table for solar declination for each day of the Syriac calendar [236v-237r].

vii. Table for right ascensions of each degree of the zodiac [237v-238r].

viii. Table for two sets of numerical values[35] that are used to solve numerous problems in timekeeping. Although other versions of this table provide entries for each degree of latitude between 1-55, Dimashqī's copy only has entries for latitudes between 20-49 degrees [238v-254r].

ix. Table for three sets of numerical values for each degree of sine between 1-59 [254v-265v].

x. Table for sine values of each degree of a 90-degree arc [266r].

xi. Table for hour angles of each degree of versed-sine[36] (*sahm*, سهم) between 1-60 [266r].

xii. Table for equation of half daylight for latitudes between 1-60 degrees [266r].

xiii. Table for shadow lengths of a 12-unit gnomon, where each unit is divided into 60 subdivisions, for each degree of solar altitude between 1-90 [266v].

After comparing these thirteen tables with the four other sets[37] of Khalīlī's tables that we are able examine, we can confidently state that all of tables copied here, except for the first one, belong to Khalīlī. The "table of twenty" has no equivalence in the other sets, although one can create it by using his other *qibla* tables. Therefore, we argue that this may also be attributed to him, perhaps as the only extant copy of its kind. Dimashqī's copy of the calendar conversion table (iv) begins at 870/1465-66 (Syriac 1776), which tells us that he copied these tables right after the last treatise and may allow us to assume that the compendium was completed at this date.

34 Please see footnote 18 for Rūmī calendar.

35 See King, "Khalīlī".

36 Although they are no longer used in modern trigonometry, values for versed-sine were widely used in astronomy in the Islamic world. This value can be found by subtracting cosine of an angle from 1.

37 MS Staatsbibliothek zu Berlin Ahlwardt 5754, MS Oxford Selden superius 100, MS Oxford Marsh 95, and Süleymaniye Ayasofya 2590.

The last two folios are fitted with some unfilled tables that were designed differently than the previous one. This clearly indicates that he intended to add another set of tables, but then decided not to, perhaps due to insufficient time or space. Thus, the Hamidiye 1453 ends with these tables.

The importance of Dimashqī and the Hamidiye 1453

Although its initial purpose may have intended to increase the knowledge of another region, the Hamidiye 1453 was completed within the Ottoman realm. It introduced the most advanced timekeeping knowledge of its time in a method that can still be seen in modern textbooks. Along with Marrākushī's masterpiece *Jāmī' al-mabādī wa al-ghāyāt fī 'ilm al-mīqāt*, which entered the palace library catalogue[38] during the reign of Bayezid II, this compendium constitutes the base point for Ottoman timekeeping.[39] The emergence of the office of the timekeeper and the establishment of the first timekeeper house in the annex of Istanbul's Fatih Mosque occurred a few years after (1470) the presumed completion date of this compendium. This could be interpreted as the manifestation of the Hamidiye 1453's influence.

We also argue that Dimashqī and the Hamidiye 1453 may have had a major influence on the Ottoman timekeeper Muḥammad b. Kātib Sīnān al-Qunawī al-Muwaqqit[40] (d. after 1524) who lived in Istanbul and Edirne. In the Arabic prologue of his monumental tables for timekeeping by stars, *Mīzān al-kawākib*, he states (f.2v) that he has learned timekeeping knowledge from the prominent scholars of this discipline. Considering that he may have been a young person around the second half of the fifteenth century and, like Dimashqī, living in Istanbul and Edirne, it is quite possible to assume that he refers to him. Furthermore, Qunawī's choice of topics in his treatises is quite curious, because he usually prefers writing on issues on timekeeping that were left out of the Hamidiye 1453, such as manuals for making instruments and timekeeping tables by using the positions of stars instead of the Sun. We therefore believe that he may have been aware of this compendium and intentionally wrote on these topics to complete the gaps in the timekeeping literature.

38 For more details see. Arslan, "Osmanlı Astronomisi," 132-136.

39 Also see King, "Astronomical Timekeeping in Ottoman Turkey," *Proceedings of the International Symposium on the Observatories in Islam, 19-23 September 1977*, ed. Muammer Dizer (İstanbul: Milli Eğitim Basımevi, 1980), s.245-269; Arslan, unpublished D. Phil. dissertation.

40 Arslan, "Muhammed Konevî," *İslam Düşünce Atlası*, ed. İbrahim Halil Üçer (İstanbul: Konya Büyükşehir Belediyesi Kültür Yayınları, 2007), 798-99.

The successful transmission of the Mamluks' timekeeping tradition into the Ottomans can be observed throughout the Ottoman timekeeping literature, which lasted for five centuries without any major changes being made to its Mamluk roots.[41]

This compendium is also important as a unique source for some of its treatises. For instance, Ibn al-Shāṭir's manual for his own invention the complete quadrant (8) and Ibn al-Sarrāj's manual for his ingenious device the hidden sine graph (15) are the only copies in the Ottoman literature, whereas Dimashqī's manual for the use of spherical astrolabe (16) is the only one of two.

The Hamidiye 1453's influence extended beyond the textual transmission of Mamluk timekeeping and affected Ottoman instrumentation as well. For their timekeeping applications, Mamluk astronomers developed two relatively easy-to-use instruments, the astrolabe quadrant (*rubʿ al-muqanṭarāt*) and the sine quadrant (*rubʿ al-mujayyab*), instead of using the astrolabe, which is a complex instrument. These two instruments were almost always made as couples, each one being drawn on one side of a quadrant (usually made of metal). The combined version, simply referred as the quadrant (*al-rubʿ*), simplified timekeeping applications with the help of manuals for both timekeepers and those who call the people to prayer and perform in-mosque duties, both of whom may not necessarily be experts on astronomy. The appearance of seven treatises in the Hamidiye 1453 on how to use the quadrant became a guiding light for the Ottomans, who had only recently come into contact with this particular discipline. Hereafter, Ottoman timekeeping was identified with the quadrant, of which they created their own style using wood.[42] The most obvious attestation to this fact is the more than 300 extant copies of manuals for astrolabe quadrants and sine quadrants.[43] Almost all of these original works and copies follow the Mamluk tradition in terms of the context, format, and references.

41 The idea of the office of timekeeper gained popularity in the Ottomans, only second to the Mamluks. Established during the reign of Sultan Mehmed II, it continued throughout the Ottoman Empire and in 1924 was adapted into the office of the head of timekeepers in the newly founded Turkish Republic. This new office survived until 20 September 1952.

42 Unlike the Mamluk examples, Ottoman quadrants were usually made of wood instead of metal because wood is easy to shape. As a result, one can draw on it easily with precision. In popular usage, it was usually referred as *rubu tahtasi* (wooden quadrant). Unfortunately, given wood's lack of durability and its degradability when compared to metal, few old Ottoman quadrants have survived. For the Ottoman's use of this instrument, see Arslan, "Vakti Fethetmek: Mîkât İlmi Geleneğinde Rubʿu'l-mukantarât Yapım Kılavuzu Örneği Olarak Muhammed Konevî'nin Hediyyetü'l-mülûk'u," *Nazariyat İslâm Felsefe ve Bilim Tarihi Araştırmaları Dergisi* 2/4 (Nisan 2016): 103-148; M. Şinasi Acar, Atilla Bir, and Mustafa Kaçar, *Rubu Tahtası Yapım Kılavuzu* (İstanbul: Ofset Yapımevi Yayınları, 2014), 24-30.

43 For the list of these works and their copies, see Cevat İzgi, *Osmanlı Medreselerinde İlim*, vol.1, 428-48.

Epilogue

ʿUmar al-Dimashqī's main motivations for preparing the Hamidiye 1453 were mentioned above. However, due to the lack of information on his life, where and when he began writing it remain a mystery. That being said, one can assume that he grew up within the Mamluk tradition, since he was probably born in Damascus and most of his copies and works deal with timekeeping, ʿAlī Qūshjī chose him to compile a book on timekeeping, and his *nisba* shows that he was an instrument maker.[44] Therefore, we identify him as a Mamluk astronomer.

In this case, a question arises: When and where did Dimashqī and ʿAlī Qūshjī meet? Two points need to be considered here. First, ʿAlī Qūshjī most likely lived in Samarqand around the 1450s, and the second, Dimashqī must have already finished his timekeeping education when he met ʿAlī Qūshjī. It is possible to assume that Dimashqī spent his youth in the Mamluk realm; was tutored in timekeeping, instrumentation, and other mathematical sciences; and then moved to Samarqand to improve his skills. If so, his visit should not have lasted too long or at least should have ended before 858/1454. If this is the case, where did he go next? Did he return to his homeland or migrate to Istanbul, as many scholars did immediately after the conquest? From his own records, we know that he was in Istanbul in 859/1454-55, in Edirne in 869/1464-65, and again in Istanbul in 879/1474. What did he do during these years? Why did he shuttle between Istanbul and Edirne? Did he perhaps teach in several *madrasa*s during the period or serve as the first timekeeper in the Fatih Mosque's House of the Timekeeper in 1470? We know that he was with ʿAlī Qūshjī during the last months of his life, which ended on 5 Shaʿbān 879/15 December 1474. How long and where did Dimashqī live after 1474? Did he live long enough to tutor Muḥammad Qunawī?

We cannot comprehend the extent of Ottoman timekeeping until future studies answer these questions. This article is merely an attempt to highlight the importance of Dimashqī and his compendium Hamidiye 1453 as a bridge for the triangle of Mamluk-Samarqand-Istanbul traditions and ʿAlī Qūshjī's influence, albeit indirect, on the development of Ottoman timekeeping.

44 Bkz. Ragıp Paşa 913, vr.175a.

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