# THE WÂJIDIYYA MADRASA OF KÜTAHYA

## A Turkish Medieval Observatory ? [1]

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According to local tradition, the Wâjidiyya Madrasa (or Demir Kapı Medresesi [2]) of Kütahya, Turkey, was the scene of astronomical work and observation in old times. One old gentleman who was consulted on this matter said he has heard of the existence of an "observation well„ under the central dome, but he knew nothing else about it and was not willing to dwell upon this detail. People say they have heard that this madrasa was an observatory once, or that it had something to do with astronomy, but nobody seems to have any further detailed and clear information upon this matter. No one says it was a *muwaqqitkhâna*. As this building, which is supposed to have been the scene of astronomical activity, is a madrasa, the possibility of instruction in astronomy comes to mind, but there is no mention of astronomical instruction in the local tradition [3].

[1] The present article is the result of an investigation trip made on behalf of the Turkish Historical Society, to Kütahya, in February 1948.

I heard of the existence of the Wâjidiyya Madrasa and about the claim that it was connected with astronomy first from Dr. A. Süheyl Ünver, Professor of the History of Medicine in the University of Istanbul, and it gives me great pleasure to express my indebtedness to him. I am also greatful to Profeasor Fatin Gökmen, Deputy of Konya, and to Mr. Aziz Berker, General Director of Libraries, Ministry of Education, for the valuable information they gave me concerning the Wâjidîya Madrasa. My studies in Kütahya were greatly facilitated by the help accorded to me by the following gentlemen : Mustafa Yeşil, the Kütahya City Librarian, Ahmet Çalışel, Celal Dede, İbrahim Konuk, and Giyas Sağer.

[2] This is the name by which the Madrasa is more popularly known in Kütahya today. It means «the madrasa with the iron door».

[3] According to Mr. Saim Ülgen, architect of the Directory of Antiquities,

The name of ʿAbd al-Wâjid is seen to be involved in this legend. Most people who have some recollections of the story in circulation think it was he who had made astronomicol observation in this madrasa. It is not surprising that ʿAbd al-Wâjid has not been forgotten. For one thing, the institution bears his name. Moreover, he had connections with the *mawlawî* fraternity, according to Thâqib, and it was this fraternity which had attracted ʿAbd al-Wâjid to Anatolia and made him leave his motherland to adopt a new home [4]. And Kütahya was and continued to be an important center of this fraternity. This factor too seems to have contributed to his fame in Kütahya quarters [5].

ʿAbd al-Wâjid ibn Muḥammed was born in Mashhad, Khurasan, whence he immigrated into Anatolia, probably during the reign of Sulaymân Shâh, Germiyan ruler (1368-87),[6] and settled down in Kütahya. Here he was appointed *mudarris* (head-professor) to the Madrasa which has eversince borne his name. Abd al-Wâjid died in 1434, apparently after a long period of instruction in this institution. All his known works were written during this period. He was very learned both in the Islamic and the *awâ'il* sciences, i. e., in the theological and secular fields of science and learning. He was also a distinguished poet and calligrapher. He wrote a book on jurisprudence, entitled the *Sharḥ al-niqâya* which he completed in the Wâjidiyya Madrasa in 1403 (806 H.) [7].

Ministry of Education, there is a written record concerning this observatory. It has not yet been possible, however, to verify the existence of such a record.

[4] See, Thâqib, *Safîna-i mawlawîyân*, Cairo 1283 H., vol. 1, p. 83-4.

[5] It had been so from the very early stages of the development of this fraternity. See, Aflâkî, *Manâqib al-ʿÂrifîn*, fr. transl. (Cl. Huart, *Les Saints des Derviches Tourneurs*), Paris 1922, vol 2, p. 359, 391, 396. There was also a marriage tie between the *mawlawî* heads and the Germiyan family. See, İ. H. Uçunçarşılı, *Kütahya Şehri*, Istanbul 1932, p. 51.

[6] Uzunçarşılı, p. 212, note 2, p. 47.

[7] Only a few sources contain information about Abd al-Wâjid. They are the following : Tashkuprulu Zâde, *Shaqâiq-i Nuʿmânîya*, Turkish tr. by Mecdi Efendi, Istanbul 1296 H., vol, 1, p. 66 ; Thâqib, loc. cit. : Mustaqîm zâde Sulayman Saʿdeddin, *Tuḥfa-i khaṭṭâṭîn*, ed. Maḥmud Kemal, Istanbul 1928; p. 682-3. Apparently none of ʿAbd al Wâjid's works has been listed in the *Kashf al-Ẓunûn* of Hâjî Khalîfa.

In the field of astronomy he wrote several books, some of which are in Eurapean libraries. A commentary to the *Sî fasl* of Nâṣir al-Dîn al-Tûsî is among them[8]. He also wrote a book on the astrolab, which was in verse and which was, according to Tashkuprulu Zâde[9], dedicated to Muḥammed Shâh (d. 830 H.), the son of Molla Fanârî[10]. A copy of the above-mentioned *Sharḥ al-niqâya* with the author's own handwriting is in the Fatih Library of Istanbul[11].

An astronomical work by ʿAbd-al Wâjid, a commentary on the *Mulakhkhaṣ* of Chaghmînî[12], a Turkish astronomer from the region of Khwârazm, is in the Kütahya City Library[13]. In the introductory remarks of this book he says that he has been eagerly interested in astronomy eversince his childhood. This book is dedicated to Murad II, the Ottoman king (1421-51). It must be dated, therefore, not prior to 1428. For the peaceful annexation of the Germiyan territory by the Ottomans began in that year[14].

Other Turkish libraries may reveal the existence of some hitherto unknown books by ʿAbd al-Wâjid. I have heard that an astronomical book of his is in the personal possession of someone in Kütahya, but it has not been possible for me to find such a book during my brief stay in that city. It is important to note that apparently none of his works which we know at the present is the result of astronomical observations made by him personally.

Later works in which ʿAbd al-Wâjid has been mentioned are : Şams al-Dîn Sâmî, *Qâmûs al Aʿlâm*, vol. 4, Istanbul 1311 H., p. 3112; Bursalı M. Ṭâhir, *Osmanlı Müellifleri*, vol. 1, 1333 H., p. 279; H. Suter, *Math. und Astron. Araber*, p. 172 - 3; Brockelmann, *Gesch. der Arab. Lit.*, vol. 1, p. 455; Uzunçarşılı, loc. cit.

[8] Suter, loc. cit.

[9] Loc. cit.

[10] For Muḥammed Shâh, see M. Ṭâhir, vol. 1, p. 15.

[11] M. Ṭâhir, vol. 1, p.279· Uzunçarşılı, p. 212. The catalogue of the Fatih Library reveals the existance of two copies of this book listed under the numbers 2007 and 2008 (*Defter, Fatih Kütüphanesi*, İstanbul, p. 116).

[12] For Chaghmînî, see, e. g., the *Encylopaedie of Islam*, art. «Djaghmînî».

[13] MS No. 958.

[14] Yaqûb Bey, the last Germiyan ruler, had no son, and in his will he left his kingdom to Murad II. See, Uzunçarşılı, *Kütahya*, p. 58-60; Uzunçarşılı, *Osmanlı Tarihi* (A publication of the Turkish Historical Society, series 13, No. 16), Ankara 1947, p. 15.

Suter calls him "ʿAbd al-Wâḥid al-Juzjânî„[15]. Our source information and the Kütahya manuscript, as well as the name of the Madrasa and the local information in Kütahya, are almost[16] unanimous, however, in the name "ʿAbd al-Wâjid„, although this is apparently not a very famailiar personal name[17]. Suter mentions also Abû ʿUbayd ʿAbd al-Wâḥid, who was a student of Ibn Sînâ according to Hâjî Khalîfa, and considers it probable that the two men might be the same[18].

ʿAbd al-Wâjid's full name was Badr al-Dîn al-Thâbitî ibn Muḥammad, according to Mr. Sadık Açar, a descendent of ʿAbd al-wâjid and head of the House of Correction in Sultan Ahmed, Istanbul[19]. Mr. Sadık Açar's information must be ultimately traceable to and derived from the waqf document and other official documents concerning the instruction and the administration of the Wâjidiyya Madrasa. For this institution remained in charge of his family up to a generation ago. Abû ʿUbayd ʿAbd al-Wâḥid, a student of Ibn Sînâ, as Hâjî Khalîfa states[20], is therefore an entirely different person. Giving ʿAbd al-Wâjid the title "Al Juzjânî„ must, likewise, be a mistake; for it is apparently the result of confusing these two persons[21]. Abû ʿUbayd ʿAbd al Wâḥid had this title, but I have found no evidence that it also belonged to ʿAbd al-Wâjid ibn Muḥammad.

None of the official documents connected with the Madrasa or with ʿAbd al-Wâjid have survived. ʿAbd al-Wâjid was pro-

[15] Loc. cit.

[16] I have seen only one library record where the name appears as ʿAbd al Wâḥid, and this is apparently due to the omission of a dot.

[17] Wâjid means «capable (Qâdir) (See, Butruṣ al-Bustânî, *Muḥîṭ al-Muḥîṭ*, Beyrut 1870, vol. 2, p. 2222), and, therefore, ʿAbd al-Wâjid is the equivalent of ʿAbd al-Qâdir, although Wâjid does not seem to appear among the names given to God (*asmâ al ḥusnâ*).

[18] Loc. cit.

[19] Information given in a letter dated February 27, 1948.

[20] Hajî Khalîfe, *Kasf al-Ẓunûn*, ed. Flügel, vol. 6, p. 303 (according to Suter).

[21] Brockelmann too fails to distinguish clearly between ʿAbd al Wâjid ibn Muḥammad and the earlier ʿAbd al-Wâḥid who was a student of Ibn Sînâ (*Gesch. Arab. Lit.*, vol. 1, p. 453, 455, Supl. I, p. 812, 821, 828); both are listed as a single person in the index under ʿAbd al-Wâhid al-Juzjânî. See, Supl. III, p. 351.

bably both *mudarris* (head-professor) and *mutawallī* (administrative director or, more strictly, administrator of waqf revenues) at the Wâjidiyya Madrasa [22].

The Wâjidiyya Madrasa has been built with a local stone, called "köfeki„ in Turkish, cut into regular blocks with rectangular faces; the blocks show a rather wide range of variation of color. The Madrasa is located on the point where the Sultan Bağı Valley, between the hills called Hızırlık Tepesi and Acem Dağı on the north and the Kale (i. e., the hill on which the old fort is located) on the south, joins the plain on which the city now stands. It should be noted, therefore, since it is supposed to have served as an observatory, that it is not located on a height dominating its vicinity. On the contrary, its view of the horizon is blocked both on the south and on the west.

In its present state, the Madrasa building is in great need of repair [23]. It was active as a madrasa probably until obout fifty years ago; the older men of the city remember ist later life as school. The foundation incription of the Madrasa shows that it was built in 1308 A. D [24].

The Madrasa building appears to have interesting features from the view-point of art and architecture, but it is beyond my scope to enter into these matters. The building presets one interesting feature, however, to which at least a brief reference is necessary. It has apparently been designed so as to contain two distinct sections, each under a small half-dome, i. e., a dome with a large circular opening on is top (see fig. 1,2). This architecture, of which other examples are found im Anatolia [25], reminds

[22] The ancestors of Mr. Sadık Açar bore both these titles jointly (letter mentioned above).

[23] It has given me great plesure te hear that it is being planned to repair this building and use it as the city museum.

[24] The text is:
عمر هذه المدرسة المباركة المولى المعظم ملك الامرا والكبرا مبارزالدين امور بن ساوجى من جزية الاشهر سنة اربع عشر و سبعماية (See, fig. 7 and Uzunçarşılı, *Kütahya*, p. 72). In English: The great *mawlâ*, the prince of the *amîr* and of the personalities of high office, Mubâriz al Dîn Umûr ibn Sawjî founded this holy madrasa, with the capitation of Alaşehir, in the year seven hundred and fourteen.

[25] E. g., the Qârâtây and the Sirchâli Madrasas in Konya and the Madrasa

one of the possibility of the existence of two independent class-roms, corresponding to two distinct chairs. Examples of medieval madrasas with four chairs and four corresponding head-professors are known. These had one *mudarris* for each orthodox rite, and the architectural plan of these institutions revealed this subdivision clearly [26].

It may be conjectured that the subdivision into two of the Wâjidiyya Madrasa represents the existence of two chairs, one for the *awâ'il* and one for the Islamic sciences [27]. From the thirteenth century on we find a tendency of allowing the secular sciences also to be included in the madrasa curriculum. A very clear example of this is seen in the Mustanşiriyya Madrasa of Bagdad (founded in 1232 A. D.) [28]. The Tabriz madrasas too clearly point to the existence of such a tendency [29].

The central yard of the Madrasa (see fig. 3) must have been used for common activities, its arched southerly projection, where the *miḥrâb* is located, serving as the place where the members of the staff and the students performed the community prayers. The above-mentioned two rooms with open domes must have been class-rooms. For rooms with such large openings on top to secure illumination were never built as living and sleeping quarters, for obvious reasons.

A few decades ago there was an octagonal fountain at the center of the Madrasa yard. Its traces are still distinguishable today, but it is impossible to say whether this fountain constituted an original feature of the yard or not. It may have been a later addition.

of Ibrahin Bey in Aksaray. See, Glück and Diez, *Die Kunst des Islâm*, Berlin 1925, p. 107; Friedrich Sarre, *Reise in Kleinasien*, Berlin 1896, p.49, 173, 94.

[26] K. A. C. Creswell, *Origin of the Cruciform Plan of Cairene Madrasas*, *Bulletin Institut Français d'Archeol. Orientale*, vol. 21, 1923.

[27] The waqf document of another *Kütahya* madrasa contains the stipulation that the *mudarris* should be learned both in the Islamic and the *awâ'il* sciences. This document is in possession of Mr. Giyas Sağer (cf. footnote 1).

[28] A. Talas, *La madrasa Nizâmîyâ*, Paris 1939, p. 53; R. S. Mackensen, *Four Great Libraries of Medieval Baghdâd*, The Library Quarterly, vol. 2, 1932, p. 299.

[29] Donald N. Wilbur and M. Minovi, *Notes on the Rabᶜ-i-Rashîdî*, *Bulletin of the American Institute for Iranian Art and Archeology*, vol. 5, No. 3, 1938, p. 249.

It is reported by hearsay that there was a half-dome over the central yard ; this was demolished in an earthquake, and a wooden half-dome was built in its place. It is impossible to determine with certainty the original shape of the covering over the yard. Apparently it was not a fully closed dome, however, as the illumination of a large section of the building seems to have depended on it. Since the building has two other half-domes, we may assume that thare was a circular hole on top of the yard too. There may have been no dome. The stones forming the periphery of this circular opening have carefully finished serfaces. It is likely, therefore, that originally there was no dome at all in this section of the building. The present circular opening has a diameter of about 10.5 meters.

ʿAbd al-Wâjid's connection with the Madrasa, even to the extent of giving his name to it, constitutes one strong evidence in favor of the rumor that this madrasa was the scene of astronomical activity. As mentioned above, however, I have not been able to find any record of his personal astronomical observations which would of course be a more direct evidence that he had an observatory at his disposal.

Mr. Saim Ülgen [30] says that on the roof over the entrance there is a section which may have served for housing astronomical instruments. As the Madrasa is now covered with a tiled roof, I have not been able to examine this section. It may be conjectured too that the central yard may have been used for housing a large astronomical instrument. It would not be reasonable to claim that the yard was designed to house astronomical instruments. For this would mean that the connection of this madrasa with astronomy antedated ʿAd al-Wâjid's professorhip. It is likely, however, that ʿAbd al-Wâjid may have taken advantage of certain suitable features the Madrasa yard presented and installed an astronomical instrument there.

In the yard there is a marble cylindrical stone which has a hole going all the way throught it. This hole has a diameter of about five centimeters. At one of the ends of the cylindrical stone there is a protruding section as if made to fit into a

[30] See footnote 3.

socket (fig. 4). An octagonal stone, on the other hand, which is now in the center of the yard, has a socket in its middle just the size of the protrusion on the cylindrical stone (see fig. 5, 6).

The octagonal stone placed on top of the cylindrical one standing upright in the center of the fountain would form an upraised basin. The water conveyed by pipes through the central hole of the cylindrical stone would form a jet filling the upraised basin and then overflowing into the octagonal pool of the fountain. This is a very usual type of fountain, the upraised basin serving, according to its Turkish name (*kuş suluğu*), as a place where birds can safely alight and drink water.

On the other hand, one may venture the guess that this octagonal stone, together with the cylindrical one placed on top of it, could have constituted a firm foundation for a pivot, the end of which would be housed into the longitudinal bore of the cylinder. And such a pivot, extended into a bearing held on a suitable frame on the open dome, could form part of an astronomical instrument.

No remains of graduated wooden or metallic sections of instruments are to be found in the Madrasa. Nor have any records of ʿAbd al Wâjid's personal observations or measurments come to my attention. In the absence of any direct evidence, therefore, it is useless to go into any detailed guesses about an imaginary instrument used by that astronomer. It my be considered worthwhile, however, to try to correlate a few vague and indirect items of evidence.

There exists another example of an Anatolian madrasa with an open dome which is claimed, by local tradition, to have served as an observatory, namely, the Caca Bey Madrasa of Kırşehir[31]. In connection with the Ghâzân Khan Observatory,which was founded about 1300 A. D. in the vicinity of Tabriz, there is mention of a dome built for the purpose of astronomical observation, and it is specified that the dome itself served as part of an astronomical instrument. It is stated too that this instrument was an invention

[31] Aydın Sayılı and Walter Ruben, *Preliminary Report on the Results of the Excavation Made Under the Auspices of the Turkish Historical Society in the Caca Bey Madrasa of Kırşehir, Turkey*, Belleten, No. 44, 1947, p. 682 ff.

made by Ghâzân Khan himself[32]. It is likely, however, that Ghâzân Khan's invention consisted of slightly altering one of the existing instruments. For, although he was interested in astronomical study, he was not an astronomer himself.

One of the insruments of the Tophâne Observatory in Istanbul, built in 1579 by the astronomer Taqî al-Dîn[33], had a circular foundation in the form of a cylindrical tower[34]. This instrument with a circular masonry foundation (see fig. 8) seems to have been a turquet. The Turquet ("or, the Turkish instrument„) was introduced into the Latin West toward the end of the Middle Ages; it became very popular there during the fifteenth and sixteenth centuries[35]. Its European name suggests that it was very popular in Turkey at least in the fourteenth and fifteenth centuries i.e., during the lifetime of ʿAbd al Wâjid.

According to the text accompanying the illustration of Taqî al-Dîn's instrument (fig. 9), this instrument was called *dhât al samt wa'l irtifâʿ*[36]. This name indicates clearly that this instrument could measure both azimuths and altitudes simultaneously, and this was one important characteristic of the turquet[37]. Taqî al Dîn's instrument and the turquet agree with one another in other particulars too.

The invention of the turquet has been ascribed to Jâbir ibn Aflaḥ, Spanish-Moslem astronomer of the first half of the twelfth

[32] Rashîd al-Dîn, *Dâstân-ı Ghâzân Khan, E. J. W. Gibb Memorial Series*, vol. 14, 1940, p. 171, 174, 131; Aydın Sayılı, *Gâzân Han Rasathânesi, Belleten*, No. 40. p. 626-7.

[33] For this observatory, see, e.g., Mordtmann, *Das Observatorium des Taqî ed-dîn zu Pera, Der Islam* 1923, vol. 13, Heft 1-2, p. 82-96.

[34] An illustration of this instrument of Tapî al Dîn (see fig. 8) exists in a MS by a certain Cihangîri (Jihângîri), apparently from Cihangir, a quarter of Istanbul. He flourished in the second half of the twelfth century of Hijra. The MS is in a collection in the Kütahya City Library (No. 932). It is entitled, «*Âlât-i raṣadiyya li zîj-i shahinshâhiyya*». The text is based on Taqî al-Dîn's own work, and except for the introduction, it is apparently much the same as the text of Tapî al Dîn. In the Library it is registered as a work of Taqî al-Dîn.

[35] Sarton, *Introduction to the History of Science*, vol. 2, p. 1005.

[36] According to Zinner, the turquet had no special name in Islam. (E. Zinner, *Geschichte der Sternkunde*, Berlin 1931, p. 394).

[37] Sarton, ibid.; Zinner, ibid.

century and also to Nâşir al-Dîn al-Tûsî. Franco of Liège (second half of the eleventh century) is also mentioned as the inventor of this instrument[38]. According to Taqî al-Dîn[39], the *dhât al-samt wa'l-irtifâ*ᶜ was invented by the Damascus astronomers (apparently those of Al Ma'mûn, Abbasid caliph from 813 to 833 A. D., who worked in the Qâsîyûn Observatory); it was used in the Marâgha Observatory by Nâşir al Dîn and was later employed by Ibn Shâţir[40]. This instrument should probably be considered as an important step preparing the later invention of the theodolite in Europe[41].

The cylindrical stone and the octagonal one may have served originally as a foundation for a pivot. The *dhât al-samt wa'l -irtifâ*ᶜ of Taqî al-Dîn had such a pivot, as can be seen in his illustration.

If one is inclined to accept the existence of an instrument of this general description in the Wâjidîya Madrasa as likely, the following details may also be taken into consideration. The diameter of the present circular opening over the Madrasa yard is about 10.5 meters, and the vertical distance from the paved floor of the yard to the circular opening is about 8 meters. This would mean that the measurments of the angular distances on such an instrument would be made on arcs having radii of about 5 metres. Considering other medieval examples, these dimensions would be quite normal and usual[42].

A few other items indicating an interest toward astronomy in Kütahya may also be mentioned here. A stone sun-clock dated 1212 H., which belonged to the Alo Paşa Madrasa of Kütahya, is now in the City Museum. An astrolab found in Kütahya was bought by Mr. Fatin Gökmen, deputy of Konya, some ten years ago.

[38] Sarton, ibid.

[39] As transmitted by Jihângîrî.

[40] Abû'l Ḥasan ᶜAlî ibn Ibrâhîm Muḥammed ibn Shâţir, distinguished astronomer and instrument maker who flourished in the beginning of the fourteenth century of the Christian era, (See Suter, p. 168, 173).

[41] The theodolite was invented by Leonard Digges in 1571 (Zinner, p. 565).

[42] See, e. g., Carra de Vaux, *Penseurs de l'Islam*, vol. 2, p. 211, 239.

The city of Kütahya has a *Muwaqqitkhâna*, i. e., a special building housing the instruments with which the *muwaqqit* determined the times of prayer and other times significant for the Moslems. This *Muwaqqitkhâna* is of rather recent date and is equipped with modern instruments [43]. Kütahya had a second *muwaqqitkhâna* too which does not exist now. Both were founded in the nineteenth century, but their dates of foundation merely represent the beginning of their independent existence with special buildings. Both existed from old times, although they were not housed in special buildigs; formerly, each was attached to a mosque in the city and occupied a section of that mosque.

The Kütahya City Library (Wahid Paşa Library) is quite rich in books on astronomy. Among them there is a book by Mashâllâh, one by Sijzî, one by Nâşir al-Dîn al-Tûsî, and one by ʿAlî Qushjî. There are several commentaries on Chaghmînî. There are also a good number of astronomical books or collections of articles bound together on astronomy or related subjects which are in Tukish, and this probably reveals the existence of a need for such books for the purpose of instruction. Most of these books bear the seal of the Wahid Paşa Library which was founded in 1813, and there is no indication that any of them originated from the Wâjidiyya Madrasa. Moreover, Wahid Pasha states that there existed many distinguished scholars, as well as men seeking after knowledge, but that he observed a scarcity of books in Kütahya; this was what prompted him to found a library [44]. It seems clear, nevertheless, that the interest in astronomy was quite lively and long-lived in Kütahya.

It would seem, therefore, that there exist various items of evidence, which make it reasonably certain that the local tradition concerning the Wâjidiyya Madrasa is not devoid of truth. The fact that it can be linked with the person of an astronomer constitutes of course the strongest evidence of this nature. Furthermore, the last mentioned items would seem to make it likely that the Madrasa's interest in astronomy was not limited to the lifetime of ʿAbd al-Wâjid

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[43] Uzunçarşılı, *Kütahya*, p. 135 - 6.
[44] Uzunçarşılı, *ibid.*, p. 133.