

# **Science and Related Institutions within the Ottoman Administration during the Classical Period**

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**Release Date:** April 2004  
**Publication ID:** 4054

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## SCIENCE AND RELATED INSTITUTIONS WITHIN THE OTTOMAN ADMINISTRATION DURING THE CLASSICAL PERIOD

The Ottomans conserved the fundamental features of Islamic civilization in their scientific institutions as they also did in social and cultural areas. Three of the six Ottoman state scientific institutions dealt with here are in the area of astronomy and the other three have to do with medicine. These scientific-based institutions functioning within the state administrative organization were established not for the purpose of governance but rather to provide state support for the pursuit of theoretical and applied scientific activities and allow the central government to monitor these.

Of the scientific institutions within the Ottoman state apparatus, those dealing with medicine are divided into three separate bodies: the Office of Chief Physician (hekimbashilik), the hospitals and the Süleymâniye Medical Madrasa. All three of these institutions came into being at different times. The hospitals, which were institutions concerned with public health, were the first to be established. Because of the increasing number of hospitals, which had come to exist in the empire, both those inherited from the Seljuk's and the newly constructed ones, there arose a need to administer and monitor these as well as both the Palace doctors and those working in the hospitals. An Office of Chief Physician was established at the Palace for this purpose. Based on available information, we know that the Office of Chief Physician emerged during the reign of Bâyezîd II. The Süleymâniye Medical Madrasa was opened at a later time to train physicians and was put under the administrative aegis of the Office of Chief Physician. The fact that the establishment of some of these institutions in Ottoman society took place during a rather late period despite the fact that such bodies were to be found in earlier Islamic societies, can be attributed to the Ottomans' tendency to create new institutions based on a felt need in society.

The scientific institutions, which we shall examine in the field of astronomy, are the chief astronomer's office, the muvakkithânes and the Istanbul Observatory. Though one can find original works and those in translation in the fields of astronomy and astrology from the early period on, the first calendar works were only begun during the time of Sultan Murâd II. Such original studies, translations of works from other languages and the preparation of calendars were on the increase during the reign of Mehmed the Conqueror and became quite widespread during the time of Bâyezîd II. Because the Ottoman state did not possess an observatory, with the exception of Takiyeddin's, the astronomers were only able to pursue their work at Muvakkithanes and in their own homes. The establishment of the chief astronomer's office, an institution which emerged to administer the growing number of Muvakkithanes set up in the Ottoman Empire and especially in Istanbul following the conquest and to manage astronomical and astrological activities at the palace, most probably took place during the reign of Bâyezîd II. The short-lived Istanbul Observatory later established alongside the Muvakkithanes was also under the administrative control of the Chief Astronomer's Office. In contrast to the sultan astronomers of earlier Islamic states, the Chief Astronomer's Office continued to function with a rather large staff and broad responsibilities as a well-organized institution engaged in its particular activities until the late period.<sup>i</sup>

<sup>i</sup> Adnan Adivar. *Osmanlı Türklerinde İlim*, 5th ed. Ed. Aykut Kazancıgil and Sevim Tekeli. Istanbul: Remzi Kitabevi, 1983.

## Office of Chief Physician

As was the case in all Turkish and Islamic states, there was an Ottoman Office of Chief Physician with responsibilities in the first instance for the health of the sultan and that of the personnel of the palace as well as for managing all state health institutions. There is some debate about the first establishment of the Chief Physician's Office and the identity of the first chief physician. There were, from the time of Orhan Gâzî to that of Sultan Bâyezîd II, private physicians in attendance looking after the health of the sultan and his family. For example, during the reign of Murâd II Seyh Sinan, and that of Mehmed the Conqueror Kutbeddin Efendi and Yâkub Celebi, there were no chief physicians, but rather private doctors of those sultans. The first chief physician to take responsibility in a general sense for health services in the country was the chief physician during the reign of Bâyezîd II, Izmitli Mehmed Muhyiddin Efendi (d. 1504-05). The chief physicians, dignitaries in the Outer (Birûn) Service of the palace, were referred to in official documents as raîs al-etibbâ. Because they carried the responsibility for the health of the sultan and the imperial family they were also known by such names as ser etibbâ-yi sultânî, ser etibbâ-yi hassa, and among the public at large as hekimbashi efendi. Among the Ottoman bureaucracy they were referred to variously as: "...the most accomplished chief physician ..., the pride of specialist physicians, the elect of knowledgeable doctors, the Hippocrates of his age, the Galen of his time, the recipient of God's divine gifts...." (One of the Ottoman Chief Physician paint see Figure 1.)



Figure 1 - One of the Ottoman Chief Physician paintings

Chief physicians would be selected from among well-educated individuals of the *ulema* (members of the Muslim learned) class with credentials in the medical sciences.<sup>ii</sup> Beginning in 1836, doctors from outside of the *ulema* class also began to be appointed to the position. The person appointed as chief physician would

<sup>ii</sup> For the appointment of chief physicians see Topkapi Palace Museum Archives (TSMA), no. E. 668; Prime Ministry Archives (BOA), M. Cevdet Tasnifleri, Sihhiye, no. 8; no. 135, Saray, no. 408; no. 7072; Mehmet Süreyya, *Sicilli Osmanî Tezkere-i Mesahir-i Osmaniyye*, 4 vols., (Istanbul 1308-1315 R) 4:721; Ali Seydi Bey, *Tesrifat ve Teskilat-i Kadimemiz*, (Istanbul, n.d.), 119-123; C. Ceyhun, "Hekimbashilar İmparatorluk Devrimizin Sağlık Bakani Yetkili Kisileridir," *Ege Üniversitesi Tıp Fakültesi Mecmuası (EUTFM)* 9, no 3, (Izmir, 1970): 557-559; M. Z. Pakalin, *Osmanlı Tarih Deyimleri ve Terimleri Sözlüğü*, 3 vols., (Istanbul, 1970), 1: 795-796; F. N. Uzluk, *Hekimbasi Mustafa Behcet*, (Ankara 1954), 26.

take part in a ceremony where he was to wear a sable coat. This *hil'at* (wearing of the robe of honor) ceremony, at which time the appointment would be announced, would take place in the presence of the grand vizier during the early period, later in that of the *dârüssaâde agasi* (chief aga of the Harem) and toward the end of the eighteenth century in the presence of the sultan himself. Chief physicians thus appointed would later be registered in the *ruus* ledger. The chief physicians took last place in the order of protocol. From the early years of the empire, if the sultan were to die of natural causes, the chief physician would be fired under the assumption that the sultan died as a result of the neglect or of an error on the part of the physician. If, however, the sultan were deposed or otherwise gave up the throne, the chief physician would continue in his position.<sup>iii</sup>

Chief physicians working in positions such as teacher or *kadi* could rise as high as the rank of chief judge (*kazasker*) of Anatolia or Rumelia. Up until the nineteenth century chief physicians who worked at Topkapi Palace in a place known as the *Baslala Kulesi* used as the physicians office and pharmacy, were under the orders of the *baslala* (chief tutor) and in the retinue of the custodian of the sultan's weapons (*silâhdâr aga*). The medicines used for the sultan and his associates would be prepared at the palace pharmacy by the pharmacist according to the prescription of the chief physician, this being monitored by the Janissary guard assigned to the chief tutor (*baslala kullukcusu*) and another palace guard (*zülüflü baltacı*). After the medicines which had been prepared were put in bowls, cups or boxes and wrapped, instructions for their use would be written on them and they would be sealed by the chief tutor.

The daily wage of the chief physician in the sixteenth century was 80 akces and the monthly salary 2360 akces and was provided by the *Hazîne-i Âmire*. During more recent periods this salary rose as high as 6500 akces and after 1837 began to be paid from the *Mansûre Treasury*. The chief physicians and palace physicians, whose *ruûs* were registered by the *piyâde kalemi*, would receive their wages on a monthly basis. Chief physicians would also receive a payment for winter and summer clothing (*kislik ve bahâriye avâidi*) from the exchequer. The chief physicians would from time to time, upon the orders of the sultan, look after statesmen who were not well and receive payments and various gifts from them. The chief physicians had at their service officers of the court (*muhzirlar*), sultanic ushers (*hünkâr kâpici*), Janissary's keeper of the garments (*Yeniceri cuhadari*), halberdiers (*baltacılar*) and 100 inner palace officials (*ic hademesi*).

The chief physician had various duties both within the palace and outside. His primary duty within the palace was to look after the health of the sultan and the members of the imperial family. He would pay special attention to the preservation of the sultan's health and to keeping him from contracting an illness and he would never leave his side even at meal times. The chief physician would also accompany the sultan wherever he went. If the sultan set out on a military campaign the chief physician would accompany him and as a result would receive travel allowances. The chief physician would also serve as consultant to the sultan on matters of health. In addition to their having medicines prepared for the sultan when he was ill, chief physicians also had the responsibility for preparing various herbal or medicinal potions and mixtures for strengthening the body and increasing appetite. The chief physician was also responsible for the preparation of candles, soaps, perfumes, *nisan suyu*, incenses for the palace and also for the medicated mixes of sugar (*mâcunlar*) prepared in the sweets kitchen (*helvahâne*). Every year on the day of *Nevrûz* (21 March) the chief physician would also have a fragrant red-colored mix known as *nevrûziye* prepared from

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<sup>iii</sup> Ali Haydar Bayat, *Osmanlı Devleti'nde Hekimbâsilik Kurumu Ve Hekimbâsilar*, Ankara : Atatürk Kültür Merkezi, 1999.

an extract of ambergris, opium and numerous fragrant plants, and have this mix placed in porcelain dishes and wrapped with expensive fabrics. He would present the mix to sultan and to all the princes and princesses, the distinguished women of the palace, the grand vizier and other high palace officials at a ceremony. At this ceremony at which the chief oculist (kehhâlbashi), chief surgeon and astronomer would be present, the chief astronomer would present the calendar for the new year and all of these individuals would in return be given furs to wear and receive various gifts.

The chief physician, who was in charge of the palace pharmacies and five hospitals, was also administrative chief of the palace physicians (etibbâ-yi hassa), the palace surgeons (cerrâhîn-i hassa), the Jewish palace physicians (etibbâ-yi Yahudiyân-i hassa), the palace eye-doctors/oculists (kehhâlîn-i hassa) and astronomers, a group totaling 21 persons. The chief physician would be responsible for selecting these individuals, monitoring their activities and appointing and dismissing them. The chief physician was also responsible for managing all health-related matters throughout the country. Because all medical and health-related institutions within the boundaries of the Ottoman Empire were administratively connected to the chief physician, all appointments to hospitals and mental institutions as well as of all surgeons, eye-doctors and pharmacists were his responsibility. All students with diplomas from medical madrasas, medical schools (Mekteb-i Tibbiye) and hospitals would register with the chief physician upon graduation and would then await appointment to a medical institution.<sup>iv</sup> The chief physician would appoint new doctors to vacant posts and would approve the promotion of those recommended for such. In addition, physicians or surgeons who wished to open a private practice, especially in Istanbul, would have to get permission from the chief physician. The chief physician was responsible for all medical education and instruction both within the Palace and outside. Occasionally he would, along with the chief surgeon and chief eye-doctor, inspect and examine Muslim and non-Muslim doctors, surgeons, eye-doctors and herbalists and would close the shops of those without diplomas, licenses, or who were otherwise unqualified to practice their professions and prohibit them from practicing. Those who were qualified would receive a work permit carrying the seal of the chief physician.

A number of chief physicians wrote important works in the field of medicine. A work titled *Enmûzec al-tibb* by Murâd IV's famous physician Emir Celebi (d. 1638-39) who studied medicine in Cairo and served as chief doctor at the Cairo Kalavun Hospital was used as a reference book by Ottoman physicians for quite a long time. The chief physician Sâlih b. Nasrullah (d. 1670-71) served in that position for a very long time and wrote and translated numerous medical works. In particular his book titled *Gâyet al-bayân fî Tedbîr-i Badan al-insân* and his translations of the works of Paracelsus, which initiated the development of a concept of a "new medicine" (tibb-i cedîd), ensured him an important place in the field of medicine. A medical work written in Turkish titled *al-Risâil al-müsfiye fi al Emrâz al-mûskila* by the chief physician Hayâtizâde Mustafa Feyzi Efendi (d. 1691-92) composed of five treatises had a great impact during that period. The chief physician Subhizâde Abdülazîz Efendi (d. 1782) was one of the more important physicians trained during the eighteenth century. He translated the "Aphorisms" of the Dutch Hermann Boerhaave (1668-1738) into Turkish as *Kitaât-i Nekave fî Tercüma-i Kalimât-i Boerhave*, an important contribution to Ottoman medical literature. The chief physician Mustafa Behcet Efendi (d. 1834)<sup>v</sup> is well known for a few short though important treatises as well as for his leadership in getting the modern Medical School opened. His

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<sup>iv</sup> E. Ihsanoglu and M. Kacar, "Ayni Münasebetle İki Nutuk: Sultan II Mahmud'un Mekteb-i Tibbiye Ziyaretinde İrad Ettigi Nutkun Hangisi Doğrudur?" *Tarih ve Toplum* no. 83 (Kasım 1990): 44-48; E. Ihsanoglu and F. Günergun, "Tip Eğitiminin Türkçeleşmesi Meselesinde Bazı Tespitler," *Türk Tıp Tarihi Yilligi= Acta Turcica Historiae Medicinae, I. Uluslararası Tıp Tarihi ve Deontoloji Kongresine Sunulan Tıp Tarihi İle İlgili Bildiriler*, ed. Arslan Terzioğlu, İstanbul, 1994, 127-134.

most important works are Cicek Asisi Risâlesi (A Treatise on Smallpox Vaccination) and Risâle-i Illet-i Efrenc (A Treatise on Syphilis).<sup>vi</sup>

During the Westernization process, which began with the Tanzimat, the office of the chief physician slowly began to lose its function as the body responsible for all health and medical concerns in the country and came to be confined solely to health matters within the palace. With the establishment in 1837 of a Health Office (Sihhiye Dâiresi) within the Ministry of War (Bâb-i Seraskerî/Harbiye Nezâreti) and then in 1850 the founding of the Imperial Medical School (Mekteb-i Tibbiye-i Şâhâne) and the Department of Civilian Medical Affairs (Umûr-i Tibbiye-i Mülkiye Nezâreti) and the passing of laws, rules and regulations pertaining to health matters, the chief physician ceased to have any control over civilian health matters. Henceforth he would serve solely as palace physician. In 1844 the title of the chief physician (hekimbashi) was changed to chief imperial physician (ser-tabîb-i sehriyârî).

The last chief imperial physician was Dr. Resâd Pasha. During the late Ottoman period health matters were under the administration of a general directorship under the aegis of the minister of the interior. This office was done away with in 1923 with the abolition of the sultanate. During the Republican period, a Ministry of Health and Social Assistance was established and has persisted to this day, though now known as the Ministry of Health. Based upon information we have been able to obtain to date, 44 physicians served as chief physician between 1484 and 1844. Some of these served two or three terms in the office.<sup>vii</sup>

### Hospitals (*Şifâhâneler*)

Şifahanes or Dâr al-Shifâs carried out the same functions as hospitals do today. As wakf institutions they were concerned with the public health of all social strata. They also offered medical education organized along apprenticeship lines. Such hospitals first began to be established during the Umayyad period and were at that time largely referred to with the term "bîmaristân." Such hospitals began to excel for the first time during the period of the Abbasid caliphs. Numerous famous hospitals were established during that time. No remaining ruins of any Islamic hospitals have, however, been discovered for the period prior to the time of the Seljuk's. Many hospital buildings constructed during the Seljuk years continued to function during the Ottoman period as they had earlier, without any changes in their charter regulations. In this sense it can be said that the Seljuk hospital and medical tradition had a major impact on the Ottomans.

The first hospital known to have been built in the Islamic world was the bîmaristân constructed in Damascus in 706-707 by the Umayyad caliph Velîd b. Abdûlmelik. At the beginning of the tenth century, during the period of the Abbassid caliphs, numerous hospitals (bîmaristân) were constructed in Baghdad in particular. The oldest Turkish-Islamic hospital that has been identified so far is the bîmaristân built in Damascus by Atabeg Nureddin Zengi in 1154-1155 and known by his name. In addition, the Syrian Seljuk Emir Alemüddin Sencer established a hospital in Kerek, and Dukak, the son of Tutus (d. 1095) had one built in Damascus.

<sup>v</sup> F. N. Uzluç, *Hekimbasi Mustafa Behcet*, Ankara 1954.

<sup>vi</sup> N. Sari and B. Zülfikar, "The Paracelsian Influence on Ottoman Medicine in the Seventeenth and Eighteenth Centuries," in *Transfer of Modern Science & Technology to the Muslim World*, ed. Ekmeleddin Ihsanoglu (Istanbul, 1992), 157-179.

<sup>vii</sup> Osman Sevki, *Bes Bucuk Asirlik Türk Tababeti Tarihi*, Istanbul 1925.

The first hospital founded by the Seljuks was built by Alparslan's (1063-1072) vizier Nizâmülmülk in Nishapur. Subsequent to that the Seljuks built hospitals beginning in 447/1055-1056 in Baghdad, Şiraz, Berdesir, Kasan, Ebher, Zencan, Harran and Mardin. Nothing remains of those hospitals today. The following hospitals have survived to the present day: Nureddin Hospital in Damascus, Gevher Nesîbe Dâr al-Shifâ and Giyâseddin Keyhusrev Madrasa (1205-1206) in Kayseri, Izzeddin Keykâvus I Dâr al-Shifâ (1217-1218) in Sivas, the Alâeddin Keykubad I Dâr al-Shifâ (1220-1237) in Konya, the Konya Kemâleddin Karatay Dâr al-Shifâ (1255), the Dâr al-Shifâ (1228) built by Behramsah's daughter Turan Melek of the Mengüçkiler, the Cankiri Atabeg Ferruh Dâr al-Shifâ (1235-1236), Amasya Dâr al-Shifâ (1308), the Amasya Torumtay Dâr al-Shifâ (1265-1266), the Muîneddin Pervâne Dâr al-Shifâ (1275-1276) in Tokat and the Pervâneoglu Ali Dâr al-Shifâ (1271-1272) in Kastamonu. In addition, the following are hospitals constructed by other states in Anatolia: the Aksehir hospital (thirteenth centuries), the Erzincan Dâr al-Shifâ (date of construction unknown), the Erzurum Dâr al-Shifâ (1147), the Dâr al-Shifâ constructed by the Ilkhanid ruler Olcaytu (1308), the Bîmaristân-i Fârukî constructed in the city of Meyyafarkin (Silvan) in Diyarbakir by Nasîrüddevle of the Sökmenler and the Dâr al-Shifâ built in Mardin by Eminateddin, the brother of Necmeddin Ilgâzî (1108-1122) of the Artukids. All of these are famous hospitals, the names and we know builders of which. Some of these continued to be active as hospitals during the Ottoman period.<sup>viii</sup>

In the Ottoman literature, the buildings where health-related activities were carried out were known variously as Dâr al-Shifâ, dârüssihhâ, sifâhâne, bîmaristân, bîmarhâne and timarhâne.<sup>ix</sup> Beginning in the early nineteenth century under the influence of the new western-style medical institutions, which were emerging, the term hospital began to come into use. The chief physician who was responsible for palace and state health matters undertook the administration of all hospitals among the Ottomans. The chief physicians would maintain a register containing the names and other information pertaining to public service doctors. When there was a need for a doctor anywhere they would appoint one in the appropriate order, that is, based on the availability of physicians of a particular rank and qualification. There was a hierarchy of hospitals. The highest-ranking hospital was the Süleymaniye Dâr al-Shifâ.

Bâyezîd I in Bursa constructed the first hospital built in Anatolia during the Ottoman period. This hospital, which was built on 12 May 1400 in the eastern part of the city at the foot of Mount Olympus adjacent to the mosque, is no longer extant today. Its charter had been written on 12 May 1400 by Molla Fenârî Mehmed b. Hamza, the kadi of Bursa. While at first there was only one section for mental patients, at a later date it became devoted solely to the mentally ill. It continued to function as such until the end of the nineteenth century.<sup>x</sup>

There were a large number of hospitals founded during the Ottoman period, particularly in Istanbul. The first of these was the Dâr al-Shifâ in the Fâtih complex (1470). This hospital containing 70 rooms and 80 domes and had separate sections for female patients. Music was used in the treatment of mentally ill patients. There are few traces left of this hospital which continued to function until 1824.

<sup>viii</sup> Esin Kahya, *Anadolu Selçuklularında Bilim*, Erdem (AKM), 5 (13), 1990, pp. 53-79.

<sup>ix</sup> Arslan Terzioğlu, *Türk-İslam Hastaneleri Ve Tababetinin Avrupada Tibbî Rönesansa Etkileri*, İstanbul: Ciba-Geigy, 1992.

<sup>x</sup> On Dört ve On Besinci Yüzyıllarda Bursa'daki Bilimsel Hayattan Bazi Ornekler, Uluslararası Tarih Kongresi, (Bilkent Üniversitesiyle Uludağ Üniversitesi Birlikte), Bursa 1997, ss. 362-368.

The Bâyezîd Dâr al-Shifâ constructed by Sultan Bâyezîd II in Edirne in 1488 was well known for the treatment of the mentally ill and of diseases of the eye. (For the The Bâyezîd Dâr al-Shifâ of Edirne see Figure 2). The building, which is really an historical monument, is especially notable among Turkish hospitals in an architectural sense. The structure was designed in an especially attractive way and had an impact on the design of European hospital buildings. Evliyâ Celebi in his *Seyahatnâme* (Travels) discusses how mentally ill patients were treated with music. Though it is said that this hospital just treated the mentally ill, there is neither any evidence supporting that assertion either in its charter or in works written at a later time. Perhaps this mistaken impression can be attributed to the special emphasis placed in the various sources on the methods used to treat the mentally ill there.<sup>xi</sup>

Though some have argued that the madrasa connected by a passageway to the courtyard of the hospital was a medical madrasa, there is no evidence either in its charter or in any other sources that medical instruction took place there. However, Evliyâ Celebi does make mention of a medical madrasa located there. He refers to the madrasa as the *Madrassa-i Etibbâ* (Physicians' Madrasa) and indicates that medical students were to be found in the madrasa rooms, that they were becoming specialized in one branch of medical science and that they were reading numerous valuable books in the field. However, he does not provide any information about the educational curriculum of the pupils resident at the *Madrassa-i Etibbâ*. Though at first the hospital was established for the treatment of a variety of illnesses, it later came to specialize in mental illnesses. It was abandoned in 1912-1913 as a result of the Balkan Wars.



Figure 2 - The Bâyezîd Dâr al-Shifâ of Edirne

The hospital (*bîmâristân*) constructed in Manisa in 1522 by Ayse Hafsa Sultan, the mother of Sultan Süleymân the Magnificent and the wife of Sultan Selîm I, continued despite its small size, to care for mentally ill patients until the late nineteenth century. It was one of the hospitals where the mentally ill were treated with music. The building was later abandoned and is now a museum. It has a charter dating from 1523.

The charter of the hospital (1550) located in the western corner of the Süleymâniye complex refers to it as a *mâristân* (var. of *bîmâristân*). This hospital, a large structure that contained two courtyards and 30 rooms, was the highest ranking of all hospitals in the Ottoman system. Students studying at the medical madrasa would receive theoretical instruction four days a week and would get their applied subjects and do

<sup>xi</sup> Evliya Celebi, *Evliya Celebi Seyahatnamesi*, 10 vols. (Istanbul, 1314), p. 468.

their internship at the hospital. There was a separate section in the hospital for mentally ill patients in this institution that treated illness of all types. The hospital was, however, later entirely devoted to the mentally ill and continued to be used as such (as a bîmâristân) until it was shut down in 1861. (For a medical treatment of an Ottoman physician see Figure 3)

The Haseki Dâr al-Shifâ, constructed in 1550 by Haseki Hürrem Sultan, the wife of Süleymân the Magnificent, as a fully-equipped hospital was later devoted solely to women. In 1884 it was assigned only to mentally ill male patients and continued to function in that capacity until 1916. The district in which it was located is named after the hospital that continues to function to this day as Haseki Hospital.

The Vâlîde-i Atîk Dâr al-Shifâ, constructed in Üsküdar by Mimar Sinan for Nûr Bânû Sultan (d. 1583), the mother of Murâd III and the wife of Selîm II as a hospital treating all types of illnesses was, from 1858 to 1927, allocated for the treatment of the mentally ill.

The Sultan Ahmed Dâr al-Shifâ was constructed in 1617. As this hospital, a part of the last mosque complex constructed in Istanbul, was under the administration of the kizlar agasi, it was managed in quite an exceptional way. The building, which was especially devoted to the treatment of mentally ill patients, is no longer extant.



Figure 3 – Dental treatment of an Ottoman physician

The hospital located in the Topkapi Palace and known as the Cârîyeler Hospital functioned as a continuation of the Seljuk Palace hospital tradition. The chief physician administered the hospital, built for the members of the Palace.

Newer types of hospitals were built as the westernization movement began to take hold in the Ottoman Empire. The first European style hospital was opened in 1805 at the Imperial Dockyards (Tersâne-i Âmire) in Kasimpasa.<sup>xii</sup> A medical school was also opened there to train physicians and surgeons. The Tersâne Medical School, which was opened in 1806, was not very long-lived. In contrast to that, the hospital continued to function until 1822. A fire, occurred that time ruined the building. Following that in 1827 an Imperial Medical School (Tibhâne-i Âmire) and an Imperial Surgical School (Cerrahhâne-i Âmire) were opened. Later, in 1836 these two institutions were united. In 1839 an Imperial School of Medicine (Mekteb-i

<sup>xii</sup> A. Ihsan Gencer, *Türk Denizcilik Tarihi Arastirmalari* (Istanbul, 1986), 54-63.

Tibbiye-i Adliye-i Şâhâne) and a school hospital offering modern medical education were opened in Galatasaray. (For the Galatasaray Medical School Building see Figure 4)

Beginning with the Tanzimat, the functions once assumed by clinical hospitals (*Dâr al-Shifâ*) supported by the *wakf* system began to pass to modern hospitals (*hastahâne*) funded from the state budget and established along European lines, a process that was part of the new modernizing approach which was taking over the Ottoman state apparatus and social life.



Figure 4 - The Galatasaray Medical School Building

### **Süleymâniye Medical Madrasa (Süleymâniye Tip Madrasası)**

The fact that the first Ottoman hospital, the Bursa Yildirim Bâyezîd *Dâr al-Shifâ*, recruited its chief physician from Egypt is an indication that there were not many physicians capable of performing that function in Ottoman cities at that time. Those physicians who were available had come from the Seljuk's or from other states. That was because the Ottoman state had just been founded and it did not have any institutions or doctors available for training physicians. In later years we also encounter many doctors who had come from other countries as in the early period. For example, Mehmed the Conqueror made the Iranian Kutbeddin and the convert Yâkub Pasha his private physicians. Süleymân the Magnificent employed the Jewish eye doctor Mûsa b. Hamun as his private physician. There were also many other Jews who worked as doctors in the Palace. That there were also a number of converts or physicians who came from abroad serving as chief palace physician during later years leads one to surmise that insufficient numbers of highly qualified physicians were being trained in Ottoman institutions, especially up until the time when the Süleymâniye Medical *madrasa* was founded.<sup>xiii</sup>

The medical school, which consisted of a section of the Süleymâniye complex built by Süleymân the Magnificent and is described in the charter as "the good *madrasa* which will house the science of medicine" was the first medical *madrasa* built by the Ottoman Turks (1555). This medical *madrasa* which resembled those encountered in certain earlier Islamic states differed from them in being part of a larger mosque complex and in providing education in a more systematic fashion for nearly three hundred years. The medical *madrasa* was established to train specialized physicians and occupies a very important place in the field of Ottoman medical education in terms of medical specialization. That is because medical education, which had previously taken place in hospitals, acquired an independent institutional structure with the founding of this school. The entrance to the medical school, which is located across from the hospital, only the southwestern wing of which has survived to this day, opens out onto Tiryâkiler Market. The

<sup>xiii</sup> For the charter of the Süleymaniye Medical *Medrese*, see *Süleymaniye Vakfiyesi*, ed. K[Emal] E[dib] Kürkcüoğlu (Ankara, 1962), 32-33.

northeastern wing of the structure is located above the arches and shops of the market. According to the charter of the Süleymâniye complex, the medical *madrasa* had a staff of eleven persons. The instructor at the *madrasa* earned 20 *akçes* per day (7300 per year) and there were eight students (*dânismend*) who received two *akçes* each as well as other staff members.<sup>xiv</sup> The first teacher at the Süleymâniye Medical School was Ahmed Celebi who received 60 *akçes* per day.

We still do not have exact or detailed information about the educational system or classes offered at the Süleymâniye Medical School. According to Süheyl Ünver, instruction in anatomy was also offered there.<sup>xv</sup> In addition, it is assumed that basic medical texts such as Ibn Sina's *al-Qanun* were also taught there. The education given at the school differed from that offered at other *madrasas* in that it was associated with applied training. Accordingly, the theoretical part of the medical training was offered at the *madrasa* and the applied part at the hospital.

A student who wished to study at the Süleymâniye Medical *madrasa* would first have to complete his course of education at the primary exterior (*ibtidâ-yi hâric*) and interior (*dâhil*) *madrasas*. Following that, the student wishing to study medicine would enroll in the Süleymâniye preparatory (*tetimme*) schools. Students completing their education there would receive the title of fellow (*mülâzim*). Classes there were held four days a week. It is likely that one of the days not allocated for classes was a holiday, the other two devoted to work as an intern at the hospital. All practicum's required during the course of their training were undertaken at the hospital. Those who completed their internships at the hospital would receive a sealed document called a "sealed title" (*memhûr temessük*) rather than a diploma. The students would be given diplomas (*icâzet*) based on the classes they had taken and the works they produced and, depending on the rank they achieved upon graduation, could become teachers or *kadîs*. The teachers at Süleymâniye would be offered lower order judgeships (*mahrec mevleviyeti*) for periods of one year as a matter of course. They would leave those posts after having served for one year. Every year four people serving in that capacity would be given *pâyes* (posts) in Egypt, Damascus, Bursa and Edirne and one of them would be given the office of *kadi* of Istanbul. Because it was also customary to give the chief judgeship of Anatolia (*Anadolu kazaskerligi*) to the former Istanbul *kadi*, many of the doctors who graduated from the school rose to high political positions within the government, to the position of *seyhülislâm* and even to a grand viziership. Persons who were trained at the Süleymâniye Medical *madrasa* or who had taught there might also serve as chief physicians at the palace or work at other medical institutions. In the final analysis it can be said that with the opening of the Süleymâniye Medical *madrasa* a more systematic kind of medical education had begun in the country. Theoretical medicine had become institutionally separated from applied medicine.

The building where the medical school was located is still extant and is being used as a maternity ward. The school most likely continued to train students until the middle of the nineteenth century, until, that is, sometime after the new medical school (*tibbiye*) opened.

<sup>xiv</sup> Ö. L. Barkan, "Süleymaniye Camii ve Imareti Tesislerine Ait Yillik Bir Muhasebe Bilancosu, 993-994 (1585-1586)", *VD* no. 9 (1971): 109-161.

<sup>xv</sup> Süheyl Ünver makes reference to the importance of the school and states that, "it has been indicated that some of our surgeons who wished to be appointed to positions elsewhere came here to learn anatomy so as to increase their desirability." He does not, however, indicate any source for the statement. S. Ünver, *Tip Tarihi, Tarihten Önceki Zamandan İslâm Tababetine ve İslâm Tababetinden XX. Asra Kadar*, parts 1 and 2, (Istanbul, 1943), 114, 118-119.

### The Office of the Chief Astronomership (*Munajjimbashilik*)

The institution, which dealt with matters of astronomy and astrology as they pertained to the sultan and the state, was referred to as the Office of the Chief Astronomer (*Munajjimbashilik*). The word *munajjim* is derived from the Arabic word *necm* (star) and is used to refer to a person who is occupied with the "science of the stars." (For a constellation star picture, which made by an Ottoman astronomer see Figure 5). The person who held the position of administrative head of those who were occupied with the "science of the stars" or astronomy was called the chief astronomer. This institution, which emerged toward the end of the fifteenth, beginning of the sixteenth centuries is not to be found in earlier Islamic Turkish states. The astronomers found at the palaces of the Abbasid caliphs or affiliated with the Seljuk sultans just prepared calendars and served as advisors on astrologic matters. (For a colour calendar page which made by an Ottoman chief astronomer see Figure 6)

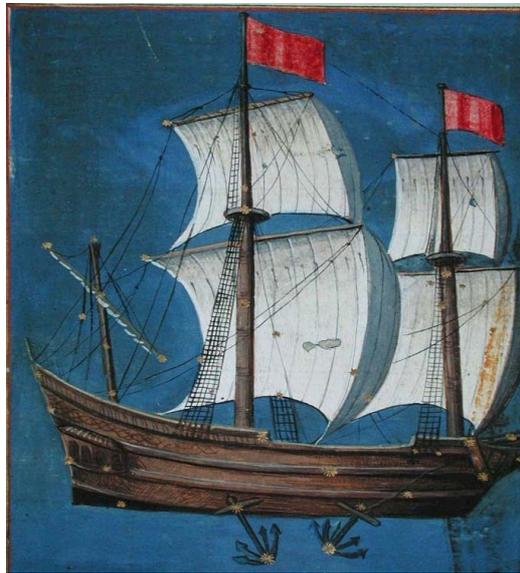


Figure 5 - A constellation star picture constructed by an Ottoman astronomer

Among the Ottomans this institution emerged as a body concerned with the preparation of calendars and with astrologic matters as well as with the administration of the country's *Muvakkithanes*. Both the Istanbul Observatory in the sixteenth century and the School of Astronomical Sciences (*Mekteb-i Fenn-i Nücûm*), which opened in the nineteenth century to train astronomers and timekeepers, were attached to the office of the chief astronomer. The astronomers, who were considered part of the Outer (*birûn*) Service at the Ottoman Palace, were in actuality members of the learned class (*ilmiye sinifi*) selected from among astronomers who had been trained at and graduated from *madrasas*. Affiliated with the head astronomers were those known as second-level astronomers (*munajjim-i sânî*) and four or five astronomers known as "clerks" (*kâtip*). Such astronomers could rise to the positions of second-level astronomer or head astronomer depending upon their efforts and abilities<sup>xvi</sup>.

<sup>xvi</sup> Salim Aydüz, *Osmanlı Devleti'nde Müneccimbashilik ve Müneccimbashılar*. M.A. thesis, Istanbul University, 1993.

The chief astronomers were Palace officials and members of the *ulema* class. As they were affiliated with the chief physician who was administratively connected to the custodian of the sultan's weapons (*silâhdar aga*), their appointments and dismissals were handled by him. In their appointments, in addition to signatures and decrees of the sultan, those of the *seyhülislâm* and the grand vizier were also to be found. The appointments of the chief astronomers would be registered in the *ruûs* registers. The chief astronomers prepared the calendar for the Palace in the sixteenth century for which they were paid a fee of 2000 *akçes*, while the astronomers were paid 1000 *akçes*. In addition, the chief astronomers would receive fifteen *akçes* on a daily basis and the astronomers ten as provender (*ulûfe*). In the seventeenth century the chief astronomers received 1000 *akçes* for the calendars they prepared and in the eighteenth century 6000 *akçes*. The chief astronomer Hüseyin Hüsnü Efendi (d. 1840) requested that this figure be raised to 7500 *akçes* and indeed had the calendar fee increased. The provender's received by the head astronomers and their staff were paid on a monthly basis in contrast to the tri-monthly basis used for other members of the military (*askerî*) class.<sup>xvii</sup>

The most important duty of the chief astronomer was the preparation of calendars.<sup>xviii</sup> Up until 1800 calendars were prepared based on the *Ulug Bey Zîci* (Ulug Bey Astronomical Tables) and henceforth according to the *Jacques Cassini Zîci* (Cassini Astronomical Tables). In addition, the astronomers were, among other things, responsible for determining the hours when the fast was to begin (*imsâkiye*) prior to the beginning of Ramazan and for preparing horoscopes (*zâyice*) or astronomical tables. The astronomers and occasionally the second-level astronomers would be responsible for determining propitious times for various important and unimportant occasions.



Figure 6 - A colour calendar page which made by an Ottoman chief astronomer

The astronomer would interpret the horoscopes of sultan and various men of state. There were, however, sultans such as Abdülhamîd I (1774-1789) and Selîm III (1789-1807) who did not believe in the idea of propitious times or horoscopes. Because the practice of arranging one's actions in terms of propitious times had become such a common practice, these sultans were not able to do away with it despite their disbelief.

<sup>xvii</sup>Salim Ayduz, "Chief-astronomership institute in the Ottoman State", *Journal of Ottoman Science Researches* (editor: F. Günergun), Istanbul 1995, pp. 159-207, English Summary: pp. 370-371.

<sup>xviii</sup>Salim Ayduz, "The Significance of the Munajjim-bashi's Calendars as Historical Resources", *Cogito, Journal of Thought*, Istanbul spring 2000, pp. 132-144.

The astronomers would also follow important astronomical events such as the passing of comets, earthquakes, fires and eclipses of the sun and moon and other extraordinary events and would inform the palace of these along with their interpretations of the events. The astronomers were also responsible for the management of the *Muvakkithanes*. Furthermore, Takiyeddin el-Râsid was responsible for the management of the Istanbul Observatory (1577-1583) while the head astronomers Hüseyin Hüsni and Sâdullah Efendi were responsible for the School of Astronomical Sciences (1839-1845).

There were a total of thirty-seven individuals who served as head astronomers for the Ottoman state. Of these, Takiyeddin el-Râsid (d. 1585) was well known for founding the observatory in Istanbul and the Muneccimbashi Dervish Ahmed Dede (d. 28 February 1702) for the history he wrote in Arabic titled *Camiü'd-düvel*. Hüseyin Efendi was famous for the predictive success of his horoscope readings. Because the head astronomers were members of the learned class they also filled such positions as teacher and *kadi*.

The Office of Chief Astronomer continued in existence until the last head astronomer, Hüseyin Hilmi Efendi, died in 1924. A new head astronomer was not appointed at that time and the position was abolished and replaced in 1927 with the Office of the Chief Time Keeper.

### Time keeping houses (*Muvakkithâneler*)

In Islamic cultures persons who were engaged in the determination of the correct time were referred to as timekeepers (*muvaqqit*). Places devoted to the determination in particular of the appropriate times for prayer were called Time Keeping houses (*Muvakkithanes*). Such centers, the first of which was constructed during the Umayyad period (661-750) at the Umayyad Mosque in Damascus, continued in existence and developed up until the Ottoman period, when they assumed their final form.

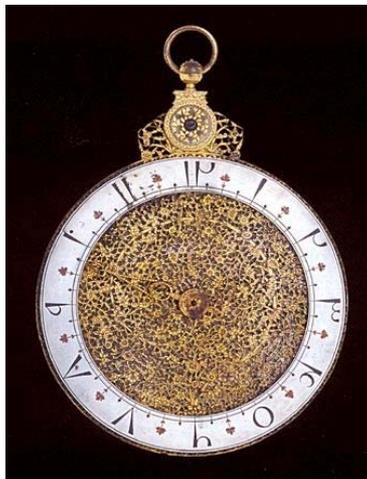


Figure 7 - An Ottoman mechanical clock picture

The earliest available information about the first *Muvakkithane* in Istanbul dates from the reign of Mehmed II (1451-1481). Subsequent to the conquest such centers were constructed adjacent to mosques or as separate buildings in various places in the country though especially in Istanbul. In Ottoman times *Muvakkithanes* could be found in almost every city and town next to a mosque as a one or two room structure. These institutions were administered by the *wakf* of the complex of which they were a part. The

first *Muvakkithane* constructed in Istanbul was at the Fâtih Mosque built in 1470 and numerous others were also constructed there. The most famous of these was the Bâyezîd Mosque *Muvakkithane* built during the sixteenth century. Evliyâ Celebi attributes its fame to the precision of the clocks (For an Ottoman mechanical clock picture see Figure 7). Among the other famous *Muvakkithanes* in Istanbul were those located at the Yavuz Selîm, Fâtih Şehzâdebasi and Eminönü mosques.<sup>xix</sup>

At those *Muvakkithanes* especially founded to determine the appropriate daily prayer times, the task would be undertaken with sundials. In addition, timekeepers would give simple astronomy lessons to interested parties. Some timekeepers would prepare yearly calendars and determine the time of day to begin the Ramazan fast. Almost all of them knew how to use simple astronomical equipment and there were even some who were qualified to write treatises in the field. (As astronomical equipment for Astrolabe see Figure 8)



Figure 8 - An astronomical equipment for Astrolabe

The *Muvakkithanes* were, depending upon the knowledge of the timekeeper, both places where training in astronomy was given and at the same time simple observatories. It is for that reason that some *Muvakkithanes* in Istanbul played an important role in the training of astronomers. Certain timekeepers rose to the position of chief astronomer as a result of their successful work at their *Muvakkithanes*.

Though the administration of these bodies and the salaries of their personnel were the responsibility of the *wakf* with which they were affiliated, the chief astronomer made appointments. The son of a deceased timekeeper could be appointed in his place. If the timekeeper did not have a son, interested parties would be appointed after having taken an examination. Concern was shown to ensure that those appointed, as timekeepers were qualified for the position. This matter was specified in the charter.

The *Muvakkithanes* continued in existence until the very end of the Ottoman Empire despite the widespread use of mechanical clocks in the nineteenth century. Following the founding of the Republic, the *Muvakkithanes* were transferred to a new body known as the *Basmuvakkitlik* (Office of the Chief Time-

<sup>xix</sup> Salim Ayduz, "Small observatories in the Ottoman Empire: Time-keeping houses (*Muvakkithanes*)", *Osmanli* (Ed. Guler

Keeper) (1927) until it was finally shut down on 20 September 1952. Though some *Muvakkithane* buildings are still extant today, most are in serious disrepair or are being used for other purposes.<sup>xx</sup>

### The Istanbul Observatory (*Istanbul Rasathanesi*)

The first Ottoman observatory was established in Istanbul during the reign of Sultan Murâd III (1574-1595) by Takiyeddin el-Râsid<sup>xxi</sup>. Takiyeddin, who was born in Damascus in 1526, worked for a time as a *kadi* and a teacher after completing his education in Damascus and Egypt. During that time he produced some important works in the fields of astronomy and mathematics. In 1570 Takiyeddin came to Istanbul from Cairo, and one year later (1571-1572) was appointed as chief astronomer upon the death of the Chief Astronomer Mustafa b. Ali. Takiyeddin maintained close relations with many important members of the *ulema* and important statesmen, primary of whom was Hoca Sâdeddin, and was presented to Sultan Murad III by the Grand Vizier Sokullu Mehmed Pasha..<sup>xxii</sup>

Takiyeddin informed Sultan Murâd III, who had an interest in astronomy and astrology, that the *Ulug Bey Astronomical Tables* contained certain observational errors and that they had resulted in errors in calculations made on the basis of those tables.<sup>xxiii</sup>

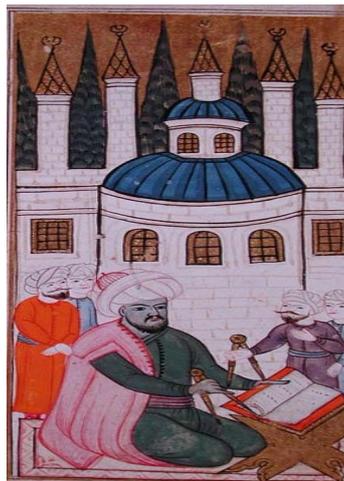


Figure 9 - Istanbul Observatory miniature

Takiyeddin indicated that these errors could be corrected if new observations were made and proposed to the sultan that an observatory be built in Istanbul for that purpose. Sultan Murâd was very pleased to be the patron of the first observatory in Istanbul and asked that construction begin immediately. He also provided all the financial assistance required for the project. In the meantime, Takiyeddin was pursuing his studies at the Galata Tower, which he then continued, in 1577, at the partially completed new observatory

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Eren and others), Ankara 1999, volume VIII, pp. 664-675.

<sup>xx</sup> A. S. Unver, "Osmanli Türkleri Ilim Tarihinde Muvakkithâneler," *Atatürk Konferanslari V, 1971-1972* (offprint) (Ankara, 1971), 34.

<sup>xxi</sup> Sayili, Aydin. *The Observatory in Islam*. Ankara: Publications of the Turkish Historical Society, 1960.

<sup>xxii</sup> Ahmet S. Unver, *Istanbul Rasathanesi*, Ankara 1985.

<sup>xxiii</sup> Salim Ayduz, "Ulug Bey Zic'nin Osmanli Astronomi Calismalarindaki Yeri ve Onemi (the place and significance of *Ulug Bey Zici* in the studies of Ottoman astronomy)", *Bilgi*, Bahar 2003, sayi 25, pp. 139-172.

called *Dâr al-Rasad al-Jadîd* (the New Observatory). (For Takiyeddin al-Rasid and the Istanbul Observatory miniature see Figure 9)

The observatory, consisting of two separate buildings, one large and one small, was constructed at a location in the upper part of Tophane in Istanbul. Takiyeddin had the instruments used in the old Islamic observatories reproduced with great care. In addition, he invented some new instruments, which were used for observational purposes for the first time. There was also a library at the observatory largely consisting of books on astronomy and mathematics. The observatory had a staff of sixteen persons, eight of whom were "observers" (*râsîd*); four were clerks and the other four assistants. For the Istanbul Observatory staffs and observers miniature see Figure 10)

At the same time, Takiyeddin invented new instruments, which were added to the array of those already in use for observation purposes in the Islamic world. Among the instruments used by Takiyeddin in the observatory were the following: 1) an armillary sphere (an ancient instrument consisting of an arrangement of rings all of which are circles of the same sphere, used to show the relative positions of the celestial equator, ecliptic and other circles on the celestial sphere) invented by Ptolemy; 2) a mural quadrant; 3) an azimuthally quadrant, an instrument used for the measurement of azimuths and elevations; 4) a parallactic ruler; 5) a ruler-quadrant or wooden quadrant; 6) an instrument with two holes for the measurement of apparent diameters and eclipses; 7) an instrument with chords for the determination of equinoxes, invented by Takiyeddin and replacing the equinoctial armillary at the observatory; 8) a *mushabbaha bi'l-manatiq*, another new instrument invented by Takiyeddin, the nature and function of which is not clearly explained; 9) a mechanical clock with a train of cogwheels, and 10) a *sunaydî* ruler, apparently a special type of instrument of an auxiliary nature, the function of which was indicated by Alâ al-Din al-Mansur. Takiyeddin used a mechanical clock, which he made himself for his observations and a wooden wall dial, which he set up in the observatory.<sup>xxiv</sup>

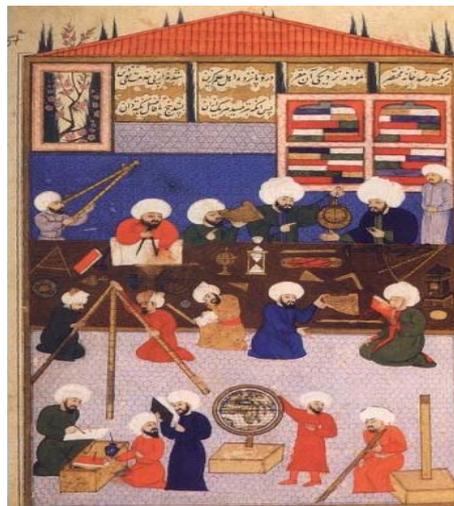


Figure 10 - Istanbul Observatory staffs and observers miniature

He described the clock as follows: "we built a mechanical clock with a dial showing the hours, minutes and seconds and we divided every minute into five seconds." This is a more precise clock than clocks used

<sup>xxiv</sup> Ismet Miroglu, "Istanbul Rasathanesine Ait Belgeler." *Tarih Enstitüsü Dergisi* 3:75-82, 1973.

previously and is, as a result, considered to be one of the more important inventions in the area of applied astronomy developed during the sixteenth century.<sup>xxv</sup>

Takiyeddin integrated the Damascus and Samarkand traditions of astronomy. (For the Samarkand Observatory see Figure 11). His first task at the observatory was to undertake the corrections of the *Ulug Bey Astronomical Tables*. In addition, he also undertook various observations of eclipses of the sun and the moon. The comet, which was present in the skies of Istanbul for one month during September of 1578, was observed ceaselessly day and night and the results of the observations were presented to the sultan. Takiyeddin was, as a result of the new methods he developed and the equipment he invented, able to approach his observations in an innovative way and produce novel solutions to astronomical problems. He also substituted the use of a decimally based system for a sexagesimal one and prepared trigonometric tables based on decimal fractions. He determined the ecliptic degree as  $23^{\circ} 28' 40''$ , which is very close to the current value of  $23^{\circ} 27'$ . He used a new method in calculating solar parameters. He determined that the magnitude of the annual movement of the sun's apogee was 63 seconds. Considering that the value known today is 61 seconds, the method he used appears to have been more precise than that of Copernicus (24 seconds) and Tycho Brahe (45 seconds). Takiyeddin also wrote the first Ottoman book on automatic machines titled *el-Turukü's-Seniyye*.



Figure 11 - The Samarkand Observatory

The observatory was witness to a great deal of activity within what was a rather short period of time. Observations undertaken there were collected in a work titled *Sidratu Muntaha'l-Afkâr fî Malakut al-Falak al-Davvâr*. When compared with those of the contemporary Danish astronomer Tycho Brahe (1546-1601) who also built an observatory, Takiyeddin's observations are more precise. Furthermore, some of the instruments, which he had in his observatory, were of superior quality to Tycho Brahe's. The observatory was torn down on 22 January 1580. Though rooted in certain political conflicts, religious arguments were put forth to justify the action. The *sayh al-Islam* issued a legal opinion (*fetvâ*) and Admiral Kilic Ali Pasha carried out the orders of the sultan to destroy the building.<sup>xxvi</sup>

<sup>xxv</sup> Sevim Tekeli, "Nasirüddin, Takiyüddin ve Tycho Brahe'nin Rasad Aletlerinin Mukayesesi." *Ankara Üniversitesi, Dil ve Tarih-Cografya Fakültesi Dergisi* 16 (3-4): 301-393, 1958.

<sup>xxvi</sup> A. Sayili, *The Observatory in Islam and its Place in the general history of the Observatory* (Ankara, 1960), 289-305; Sayili, "Alauddin Mansur'un Istanbul Rasathanesi Hakkındaki Siirleri," *Belleter* 20, no. 79 (Temmuz 1956): 425; J. H. Mordtmann, "Das Observatorium des Taqi ed-Din zu Pera," *DI* 13, (1923): 82-96.

## BIBLIOGRAPHY

- Adivar, Adnan, *Osmanlı Türklerinde İlim*, 5th ed. Ed. Aykut Kazancıgil and Sevim Tekeli. İstanbul: Remzi Kitabevi, 1983.
- Ali Seydi Bey, *Tesrifat ve Teskilat-i Kadimemiz*, (İstanbul, n.d.), 119-123.
- Ayduz, S., "Chief-astronomy institute in the Ottoman State", *Journal of Ottoman Science Researches* (editor: F. Günergun), İstanbul 1995, pp. 159-207, English Summary: pp. 370-371.
- Ayduz, S., "Small observatories in the Ottoman Empire: Time-keeping houses (Muvakkithanes)", *Osmanlı* (Ed. Guler Eren and others), Ankara 1999, volume VIII, pp. 664-675.
- Ayduz, S., "The Significance of the Munajjim-bashi's Calendars as Historical Resources", *Cogito, Journal of Thought*, İstanbul spring 2000, pp. 132-144.
- Ayduz, S., "Ulug Bey Zic'i'nin Osmanlı Astronomi Çalışmalarındaki Yeri ve Önemi (the place and significance of *Ulug Bey Zici* in the studies of Ottoman astronomy)", *Bilgi*, Bahar 2003, sayı 25, pp. 139-172.
- Ayduz, S., *Osmanlı Devleti'nde Müneccimbaskılık ve Müneccimbaskılar*. M.A. thesis, İstanbul University, 1993.
- Barkan, Ö, L., "Süleymaniye Camii ve İmaret-i Tesislerine Ait Yıllık Bir Muhasebe Bilancosu, 993-994 (1585-1586)", *VD* no. 9 (1971): 109-161.
- Bayat, Ali Haydar, *Osmanlı Devleti'nde Hekimbaskılık Kurumu Ve Hekimbaskılar*, Ankara : Atatürk Kültür Merkezi, 1999.
- Ceyhan, C., "Hekimbaskılar İmparatorluk Devrimimizin Sağlık Bakanı Yetkili Kisileridir," *Ege Üniversitesi Tıp Fakültesi Mecmuası (EUTFM)* 9, no 3, (İzmir, 1970): 557-559.
- Evliya Celebi, *Evliya Celebi Seyahatnamesi*, 10 vols. (İstanbul, 1314), p. 468.
- Gencer, A. İhsan, *Türk Denizcilik Tarihi Araştırmaları* (İstanbul, 1986), 54-63.
- Ihsanoğlu E. and M. Kacar, "Aynı Münasebetle İki Nutuk: Sultan II Mahmud'un Mekteb-i Tibbiye Ziyaretinde İrad Ettiği Nutkun Hangisi Doğrudur?" *Tarih ve Toplum* no. 83 (Kasım 1990): 44-48.
- Ihsanoğlu E., and F. Günergun, "Tıp Eğitiminin Türkçeleşmesi Meselesinde Bazı Tespitler," *Türk Tıp Tarihi Yıllığı= Acta Turcica Historiae Medicinae, I. Uluslararası Tıp Tarihi ve Deontoloji Kongresine Sunulan Tıp Tarihi ile İlgili Bildiriler*, ed. Arslan Terzioğlu, İstanbul, 1994, 127-134.
- Kahya, E. "Anadolu Selçuklularında Bilim", *Erdem (AKM)*, 5 (13), 1990, pp. 53-79.
- Mehmet Süreyya, *Sicilli Osmanî Tezkere-i Mesahir-i Osmanîyye*, 4 vols., (İstanbul 1308-1315 R) 4:721.
- Miroğlu, İsmet, "İstanbul Rasathanesine Ait Belgeler." *Tarih Enstitüsü Dergisi* 3:75-82, 1973.
- Mordtmann, J. H., "Das Observatorium des Taqi ed-Din zu Pera," *DI* 13, (1923): 82-96.
- On Dört ve On Besinci Yüzyıllarda Bursa'daki Bilimsel Hayattan Bazı Örnekler, Uluslararası Tarih Kongresi, (Bilkent Üniversitesiyle Uludağ Üniversitesi Birlikte), Bursa 1997, ss. 362-368.
- Osman Sevki, *Bes Bucuk Asırlık Türk Tababeti Tarihi*, İstanbul 1925.
- Pakalın, M. Z., *Osmanlı Tarih Deyimleri ve Terimleri Sözlüğü*, 3 vols., (İstanbul, 1970), 1: 795-796.
- Sarı, N. and B. Zülfikar, "The Paracelsian Influence on Ottoman Medicine in the Seventeenth and Eighteenth Centuries," in *Transfer of Modern Science & Technology to the Muslim World*, ed. Ekmeleddin İhsanoğlu (İstanbul, 1992), 157-179.
- Sayılı, A., "Alauddin Mansur'un İstanbul Rasathanesi Hakkındaki Siirleri," *Belleten* 20, no. 79 (Temmuz 1956): 425.
- Sayılı, A., *The Observatory in Islam and its Place in the general history of the Observatory* (Ankara, 1960), 289-305.
- Süleymaniye Vakfiyesi*, ed. K[Emal] E[dib] Kürkcüoğlu (Ankara, 1962), 32-33.
- Tekeli, Sevim, "Nasirüddin, Takiyüddin ve Tycho Brahe'nin Rasad Aletlerinin Mukayesesi." *Ankara Üniversitesi, Dil ve Tarih-Cografya Fakültesi Dergisi* 16 (3-4): 301-393, 1958.

Terzioğlu, Arslan, *Türk-Islam Hastaneleri Ve Tababetinin Avrupada Tibbi Rönesansa Etkileri*, İstanbul: Ciba-Geigy, 1992.

Unver, S. "Osmanlı Türkleri İlim Tarihinde Muvakkithâneler," *Atatürk Konferansları V, 1971-1972* (offprint) (Ankara, 1971), 34.

Unver, S. *İstanbul Rasathanesi*, Ankara 1985.

Unver, S., *Tip Tarihi, Tarihten Önceki Zamandan İslâm Tababetine ve İslâm Tababetinden XX. Asra Kadar*, parts 1 and 2, (İstanbul, 1943), 114, 118-119.

Uzluk, F. N., *Hekimbasi Mustafa Behcet*, Ankara 1954.