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# The Role of Ancient Egyptian Civilization in the Islamic Astronomical Revolution of the Abbasid Era

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**Abstract :** *This study investigates the important role of Ancient Egyptian civilization in the development of science during the Abbasid era. Through a literature review, this study outlines the history of Ancient Egypt and its contribution to falak, explains the Abbasid era as a historical context, and analyzes the development of falak during the Abbasid period. Research methodology includes methods of resource analysis, collection of data from various sources, and application of relevant analytical techniques. The results showed that Ancient Egyptian civilization had a major role in the development of Abbasid Era science. This is seen in the transfer of knowledge, astronomical advances, translations of classical works, improvements to the Hijri calendar, and the impact on navigation. Innovation, recognition of cultural and knowledge diversity, and advances in science are driven by integration. The results suggest that the integration of culture and knowledge can enable the development of scientific knowledge. In the current context of global openness of science, this has relevance. This study enhances science and increases our understanding of how different civilizations affect science. This study concludes that Ancient Egyptian civilization had an important role in the progress of science in the Abbasid era, thus encouraging progress, foundation formation, and influence of science to this day.*
**Keywords:** *Ancient Egypt, Islamic Astronomy, Abbasids, Revolution, Role*

**Abstrak :** Penelitian ini menginvestigasi pentingnya peran peradaban Mesir Kuno dalam perkembangan ilmu falak selama era Abbasiyah. Melalui tinjauan pustaka, penelitian ini menguraikan sejarah Mesir Kuno dan kontribusinya terhadap ilmu falak, menjelaskan era Abbasiyah sebagai konteks sejarah, serta menganalisis perkembangan ilmu falak selama periode Abbasiyah. Metodologi penelitian mencakup metode analisis sumber daya, pengumpulan data dari berbagai sumber, dan penerapan teknik analisis yang relevan. Hasil penelitian menunjukkan bahwa peradaban Mesir Kuno memiliki peran besar terhadap perkembangan Ilmu falak Era Abbasiyah. Ini terlihat dalam transfer pengetahuan, kemajuan astronomi, terjemahan karya klasik, perbaikan kalender Hijriyah, dan dampak pada navigasi. Inovasi, pengakuan terhadap keberagaman budaya dan pengetahuan, dan kemajuan ilmu falak didorong oleh integrasi. Hasilnya menunjukkan bahwa integrasi budaya dan pengetahuan dapat memungkinkan perkembangan pengetahuan ilmiah. Dalam konteks keterbukaan ilmu pengetahuan global saat ini, ini memiliki relevansi. Studi ini meningkatkan ilmu falak dan meningkatkan pemahaman kita tentang bagaimana peradaban berbeda berpengaruh terhadap ilmu pengetahuan. Penelitian ini menyimpulkan bahwa peradaban Mesir Kuno memiliki peran penting dalam kemajuan ilmu falak di era Abbasiyah, sehingga mendorong kemajuan, pembentukan fondasi, dan pengaruh ilmu falak hingga saat ini.
**Kata kunci:** *Mesir Kuno, Ilmu Falak, Abbasiyah, Revolusi, Peran*

## A. Introduction

Ancient Egyptian civilization had a significant role in the development of astronomy during the Abbasid period. Although Ancient Egyptian civilization had ended long before the Abbasids came to power, much of the astronomical knowledge and practices of Ancient Egypt were learned and passed down by Abbasid Muslim scholars.[1] Especially related to the movement of celestial bodies, the creation of calendars, and the monitoring of solar and lunar eclipses. Ancient Egyptian astronomers used their observatories, such as Giza, to study the movements

[1] Ahmad Luthfi, "MENGENAL SEJARAH DAN PERKEMBANGAN ILMU FALAK," *Al-Mizan: Jurnal Eknomi Syariah* 5, no. 2 (2022): 18–27.

of celestial objects. This knowledge became an important basis for the development of science in the Islamic world.[2]

The Abbasid era was a golden age in Islamic history characterized by the profound development of science, intellect, and culture. One of the disciplines that played a key role in this development was astronomy.[3] In this paper, we will explore the role of science in the Abbasid era, with emphasis on the contributions of leading scholars as well as their influence on Islamic civilization. We will also refer to relevant primary and secondary sources to support this analysis.

The purpose of this study was to increase the knowledge of Ancient Egypt which influenced the development of science in the Abbasid era. Such as about making accurate and efficient calendars used by Muslim scientists. They improved and modernized the existing Arabic calendar, which came to be known as the Hijri Calendar.[4] As well as leading scientists in the science of the Abbasid period, such as Al-Haytham, Al-Battani, and Al-Sufi, made significant contributions in developing astronomical knowledge.[5]

This study argues that the influence of Ancient Egyptian civilization in the development of Abbasid era science can be seen in the use of knowledge of Egyptian heritage, translation of classical works, development of calendars, establishment of observatories, and contributions of Muslim scientists in science. All this helped create an important basis for the development of the advanced Islamic science of the time. Thus, the role of Ancient Egypt in the development of the Abbasid era is an important foundation for our understanding of the development of falak in Islamic civilization and its influence to the present day.

## B. Method

This study uses a historical approach with comparative analysis, namely comparing findings from Ancient Egypt with the development of Abbasid science to identify integration points, contextual analysis, namely understanding findings in the context of historical, cultural, and social development of each period, and qualitative analysis, which uses a qualitative approach to evaluate the impact of this integration on the development of falak, understanding and explaining integration Ancient Egyptian civilization with the development of the science of the Abbasid era.

The primary data sources used come from historical texts and manuscripts of science related to Ancient Egypt and Abbasids. The secondary sources used refer to previous research articles and journals on the same topic and relevant historical theories.

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[2] David Kelley and Eugene F Milone, *Exploring Ancient Skies An Encyclopedic Survey of Archaeoastronomy* (New York: Springer, 2005), 251.

[3] Philip K Hitti, *History of the Arabs* (London: MACMILLAN EDUCATION LTD, 1970), 384. https://doi.org/10.1111/j.1478-1913.1937.tb00371.x.

[4] E S Kennedy, "A Survey of Islamic Astronomical Tables.(Transactions of the American Philosophical Society, NS, Vol. 46, Part 2.)," *American Philosophical Society*, 2013, 77–123.

[5] Samsul Bahri, "PERKEMBANGAN ILMU ASTRONOMI DI DUNIA ISLAM DAN TOKOH-TOKOHNYA PADA ABAD 8 M – 10 M," *Jurnal Ilmiah* 1, no. 1 (2019).

Data Collection Techniques in this study were obtained by accessing and analyzing ancient manuscripts and archival documents related to Ancient Egypt and the Abbasid era, then using text analysis methods to identify and extract relevant information from written sources, and comparing the development of science in Ancient Egypt and the Abbasid era to identify patterns and changes.

## C. Results and Discussion

### 1. Ancient Egyptian Civilization as the Basis of Islmaic Astronomy Science

One of the largest and most famous ancient cultures in the world is Ancient Egypt. This civilization lasted for a very long time, beginning around 3150 BC and ending with the conquest of Egypt by the Romans in 30 BC. This civilization lasted for several important periods.[6]

a. The Predynastic period (before 3150 BC - around 2686 BC) was the earliest period in which small kingdoms in Egypt appeared.
b. The old royal period (around 2686 BC - 2181 BC) was the golden age during which the first pyramids were built and a hieroglyphic writing system developed.
c. The Intermediary Period (2181 BC - 2040 BC) was a time of division and minor rivalry among kingdoms.
d. The period of the Middle Kingdom (2040 BC - 1640 BC), that is, the era of stability after competition, was followed by a period of division again.[7]
e. The New Kingdom period (Around 1550 BC - 1070 BC), a time during which Egyptian power reappeared and expanded its territory.
f. The Second Intermediary Period (1070 BC - 712 BC) and was marked by political conflicts and crises.
g. The Imperial period (712 BC–30 BC) was marked by many foreign empires, including Persians, Greeks, and Romans who ruled Egypt.[8]

Ancient Egyptian civilization had a significant role in the formation of the basis of science or astronomy. Ancient Egyptians had developed a deep understanding of the heavens and stars over thousands of years, and this knowledge became the basis for the further development of science. Daily life is closely intertwined with Ancient Egyptian astronomy.[9] For example, they used their observations of solar and lunar eclipses to predict important events in their agrarian calendar, with the use of an accurate calendar system and careful observation of the heavens, Ancient Egyptian civilization played an important role in the early development of science.[10]

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[6] Mustofa Umar, "MESOPOTAMIA DAN MESIR KUNO: Awal Peradaban Dunia," *Jurnal El-Harakah* 11, no. 3 (2009): 198–215, https://doi.org/10.22373/adabiya.v22i1.7452.
[7] Muhammad Fadli Nasrudin Alkof, "Sejarah Peradaban Mesir Kuno: Periodesasi Kerajaan & Peninggalannya," tirto.id, 2022, https://tirto.id/sejarah-peradaban-mesir-kuno-periodesasi-kerajaan-peninggalannya-gtXb.
[8] Emory S Bogardus, *The Development of Social Thought* (Bombay: Allied Pacific Private LTD., 1964).
[9] Pepep Puad Muslim, Tatang Farhanul Hakim, and Suparman Jassin, "Dinamika Dan Perkembangan Ilmu Falak Dari Era Pra Islam Hingga Era Kontemporer," *Al-Tsaqafa : Jurnal Ilmiah Peradaban Islam* 20, no. 1 (2023): 14–28, https://doi.org/10.15575/al-tsaqafa.v20i1.27243.
[10] Paul T Keyser and John Scarborough, *The Oxford Handbook of Science and Medicine in the Classical Word* (New York: Oxford University Press, 2018),

The timing of planting and harvesting is set based on this knowledge and is also used in religious celebrations such as the festival of the sun. Ancient Egyptian architecture shows the importance of astronomy. The pyramids, one of the most prominent structures in Ancient Egypt, were meticulously constructed in astronomical terms.[11] One example is its north-facing orientation with the star Polaris as a guide. This science became the basis for future scientists and astronomers to dig deeper into the secrets of the universe.

**2. Major Achievements in Ancient Egyptian Astronomy**

Astronomy has played an important role in the Ancient Egyptian civilization, which is one of the oldest civilizations in the world. Here are some of the major achievements in Ancient Egyptian science:

a. Ancient Egyptian Calendar.

One of the major achievements in Ancient Egyptian science was the development of their calendar. The Egyptian calendar was based on natural cycles, such as the rise of the Nile and the movement of stars. This calendar is used to regulate the timing of planting and harvesting as well as religious celebrations. Ancient Egyptians had three seasons each year with the duration of each season 4 months.[12]

The first season in the Egyptian calendar is "*Akhet*", which means the flood season. This happens from June to September, the farmers cannot work, so they make money by fishing. The second season is called "*Peret*" or "Exit season", and runs from October to February. This is the best time to grow crops because flooding makes the soil more fertile. The harvest season or "*Shemu*", which occurs in March, April, and May, is the third and final season. Farmers spend a lot of time gathering their crops and have to harvest them quickly before the floods return.[13]

The Ancient Egyptian calendar used both the solar calendar and the lunar calendar. The solar calendar (civil calendar) has 365 days per year, divided into twelve months, with 30 days per month. While the lunar calendar is based on the phases of the moon and is used for religious and ritualistic purposes, at the end of the calendar year 5 additional days are added referred to as "epagomenal days" to harmonize the solar year. This lunar calendar is older than the solar calendar and is shorter by about 10 or 11 days than the solar year. They add a 13th month at regular intervals to compensate for this difference. The ancient Egyptians used this calendar to organize agricultural activities, religious ceremonies, and the construction of monuments related to star cycles.[14]

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https://books.google.co.id/books?id=TCxhDwAAQBAJ&lpg=PA61&ots=FxNVq4mImz&dq=ancient egypt astronomy&lr&pg=PR4#v=onepage&q=ancient egypt astronomy&f=false.

[11] Kim Williams, "Architecture, Astronomy and Sacred Landscape in Ancient Egypt by Giulio Magli," *Nexus Network Journal* 16, no. 3 (2014): 825–28, https://doi.org/10.1007/s00004-014-0201-0.

[12] Ridho Kimura Soderi, "Penanggalan Mesir Kuno," *Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan.* 4, no. 2 (2018): 242–52.

[13] "What Are Ancient Egyptian Farming Practices ?," Twinkl, accessed December 22, 2023, https://www-twinkl-it.translate.goog/teaching-wiki/ancient-egyptian-farming practices?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=tc.

[14] Leo Depuydt, "The Calendars and the Year-Counts of Ancient Egypt," *Chronique d'Egypte* 92, no. 184 (2017): 271–94, https://doi.org/10.1484/J.CDE.5.115207.

b. Eclipse Investigation

Ancient Egyptians had an understanding of solar and lunar eclipses. They were able to forecast this eclipse with a fairly good degree of accuracy. Knowledge of this eclipse was also used in the context of Ancient Egyptian religion and mythology. Historical references that may provide insight into the investigation of eclipses by ancient Egyptians include:

1. Cairo Calendar No. 86637[15]

The binary star now known as Algol was known to the Ancient Egyptians for its periodic eclipses. This rare hieratic papyrus was sold by an antiquities dealer in 1943 to the Egyptian Museum in Cairo. A calendar on papyrus number 86637, created twenty-three years later by Egyptian astronomer Abd el-Mohsen Bakir, is considered the first historical record of the appearance of the double star Algol.[16] Papyrus documents describe him as a puppet of Horus, a god who held the title of king. In addition, it is said that the daily alternating eclipses of these twin stars signify good and bad luck.

The document consists of three parts: Book I, Book II, and Book III. The largest section, Book II, consists of 365 sections, one each for each day of the Egyptian year, totaling 360 days, plus five extra days. These passages seem to pertain to religious celebrations, mythological events, good or bad days, divination, and anniversaries.

Researchers Lauri Jetsu and Sebastian Porceddu from the University of Helsinki conducted a statistical analysis of the text of this document and concluded that the mythological text of the Cairo Calendar contains astrophysical information about Algol. According to their analysis, the actions of the gods in this calendar were significantly governed by the periods of the variable star Algol (2.85 days) and the moon (29.6 days).[17]

2. Papirus Carlsberg

The Carlsberg Papyrus Collection was founded in the 1930s by Prof. H. O. Lange with funding from the Carlsberg Foundation. Major purchases were made between 1931 and 1938, and with the approval of the rector and the Ministry of Education of the University of Copenhagen, the Carlsberg Foundation presented the collection to the Institute of Egyptology at the University of Copenhagen in 1939.[18]

Also known as the Schoyen Papyrus, this document is one of the most important sources that provide insight into the ancient Egyptian understanding of astronomy and eclipse observations. It includes records of solar and lunar eclipses observed by ancient Egyptians.

c. Understanding of Star Movement

The Ancient Egyptians had a deep understanding of the movement of stars, on which their astronomical knowledge was based. They regularly observe the sky to understand how

[15] Abd Mohsen Bakir, *The Cairo Calendar No. 86637* (Kairo: General Organisation for Govt. Print. Offices, 1966).
[16] Sergio Prostak, "3,200-Year-Old Papyrus Contains Astrophysical Information about Variable Star Algol," sci.news, 2015, https://www.sci.news/astronomy/papyrus-cairo-calendar-astrophysical-information-variable-star-algol-03533.html.
[17] Lauri Jetsu and Sebastian Porceddu, "Shifting Milestones of Natural Sciences: The Ancient Egyptian Discovery of Algol's Period Confirmed," *PLoS ONE* 10, no. 12 (2015): 1–23, https://doi.org/10.1371/journal.pone.0144140.
[18] "The Papyrus Carlsberg Collection," University of Copenhagen, accessed December 24, 2023, https://pcarlsberg.ku.dk/.

stars move, and this understanding allows them to create highly accurate calendars and determine the right time for daily activities and agriculture.

To create their calendar, the Egyptians observed the movement patterns of fixed stars such as Orion, Sirius, and Ursa Major that appeared regularly in the night sky. They track the positions and changes in the positions of these stars over various periods of the year. Certain stars are also important in religion and everyday life. For example, the Nile flood season, which was very important to Ancient Egyptian agriculture, was associated with Sirius, the brightest star in the night sky. Observing Sirius' movements helped them predict the arrival of the flood season and determine the best time to plant.[19]

Many aspects of their daily lives, from agriculture to religion, have been influenced by their understanding of the movement of stars, which shows their level of intelligence in astronomy.

d. Archaeastronomy of the era of Ancient Egyptian Civilization

Archaeastronomy is a field that studies knowledge about the sky in ancient times reflected in landscapes and architecture.[20] The study studies how ancient societies understood, used, and integrated astronomical phenomena in their daily lives, such as determining calendars, creating architecture, adhering to religion, and navigation. The field of archaeastronomy includes the study of archaeological artifacts related to celestial observation, such as monuments, temples, and ancient observatories built with a specific astronomical orientation. By looking at Egyptian monuments from this point of view, we can read the buildings, and of course the entire landscape based on Egyptian knowledge, not just looking at their customs.[21]

Most people know that most of the Egyptian pyramids were built facing the Pole Star because of the precession of the equinoxes. This shows the incredible technical ability the Egyptians had to see the dome of the sky in the third millennium BC.[22]

The perpendicular sun phenomenon at Karnak Temple occurs on December 22 every year. At that time, sunlight would enter through the cracks in the columns in the hypostyle chamber of the Karnak temple and shine on the statue of the god Amon-Re on the altar. The fact that the temple of Karnak was built with the right orientation towards the direction in which the sunlight came on December 22 shows that the Ancient Egyptians had a deep knowledge and understanding of astronomy.[23]

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[19] Arwin Juli Rakhmadi Butar-Butar, "Sirius Dalam Mitologi Mesir Kuno," Langitselatan, 2016, https://langitselatan.com/2016/10/23/sirius-dalam-mitologi-mesir-kuno/.

[20] Giulio Magli, *Architecture, Astronomy and Sacred Landscape in Ancient Egypt* (Cambridge University Press, 2013), 2.

[21] Williams, "Architecture, Astronomy and Sacred Landscape in Ancient Egypt by Giulio Magli."

[22] Clive LN Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmologies and Myth* (Bloomsbury Publishing USA, 2005).

[23] Anthony F Aveni, "1 - Archaeoastronomy," in *Advances in Archaeological Method and Theory*, ed. MICHAEL B B T - Advances in Archaeological Method and Theory SCHIFFER (San Diego: Academic Press, 1981), 1–77, https://doi.org/https://doi.org/10.1016/B978-0-12-003104-7.50006-5.

Monument obelisks were erected to honor gods and commemorate a person or event. It was a rectangular-shaped stone pillar with a narrowed top that formed a pyramid. This form was created by the ancient Egyptians at some point in the Early Dynastic Period (circa 3150–2613 BC), after they completed their work in mud-brick mastaba tombs and before the construction of the Pyramid of Djoser (circa 2670 BC).[24]

However, the obelisk can also serve as a sundial. Sundials like obelisks work on a simple principle. The shadow of the obelisk changes daily according to the movement of the Sun. Ancient Egyptians could calculate how long the day was by measuring the length of the obelisk's shadow.[25]

Obelisks as sundials were first used during the Old Kingdom of Ancient Egypt (2686-2181 BC). The most famous obelisk is the Karnak Obelisk, built by Pharaoh Thutmose III. The obelisk is 29 meters high and weighs 220 tons. Obelisks as sundials continued to be used in Ancient Egypt until the time of the New Kingdom of Ancient Egypt (1550-1070 BC). After that, the obelisk began to be used as a religious and political symbol, and its function as a sundial began to be replaced by a water clock and an hourglass.

Figure 1. Obelisk Monument located in Karnak Temple, Luxor City, Egypt.

## 3. Abbasid Era as Historical Context

In 750 AD, Abu al-Abbas al-Saffah led a revolt that overthrew the Umayyad caliphate and established the Abbasid dynasty. The Caliphate was established in Baghdad, a new city that became the center of Islamic government and culture throughout the world during the Abbasid era, the heyday of Islamic science. The Abbasid government supported education and research, especially in mathematics, astronomy, medicine, and philosophy. Bait al-Hikmah (House of Wisdom), founded in Baghdad as a center of science. It collected and translated Greek, Indian, and Persian classics into Arabic.[26]

[24] Joshua J Mark, "Egyptian Obelisk," World History Encyclopedia, 2016, https://www.worldhistory.org/Egyptian_Obelisk/.
[25] Mary Bellis, "History of the First Clocks Sun Clocks, Water Clocks, and Obelisks," ThoughtCo., 2019, https://www.thoughtco.com/history-of-sun-clocks-4078627.
[26] Hitti, *History of the Arabs*, 358.

Various cultural elements from Persia, Greece, India, and many other countries flourished and spread during the Abbasid era. The result was the flourishing of a rich and diverse Islamic civilization and culture. The Western world was greatly influenced by the scientific and cultural progress of the Abbasids.[27] Many Greek classics and Arabic inventions were translated into Latin, and these translations served as the basis for the advancement of science in Europe. Madrasas, also known as Islamic schools, were established throughout the Islamic world and provided access to higher education in various fields of science. The oldest university in the world is Al-Qarawiyyin University in Fez, Morocco, which was founded in 859 AD.

One of the important events in Islamic history was the collapse of the Abbasid Dynasty in the 13th century. This ended a centuries-long period of Abbasid rule.[28] The conquest by the Mongols, led by Hulagu Khan, grandson of Genghis Khan, was one of the main factors in the collapse of the Abbasid Dynasty. In 1258 AD, Mongol forces besieged and conquered Baghdad, the capital of the Abbasid Dynasty, after a bloody siege. This event killed Al-Musta'sim, the last Abbasid caliph. The fall of Baghdad marked the end of the Abbasid caliphate.[29]

## 4. The Development of Islamic Astronomy in the Abbasid era

The Abbasid period was an important period in the development of falak (Islamic astronomy). During this period, there were major advances in astronomical observations, calculations, and theories about the universe. Here are some key points in the development of science during the Abbasid period.

a. Translation of Classical Works

In terms of the "early sciences", translation was one of the first and foremost ways for Muslims to recognize the richness of pre-Islamic scholarship.[30] Translations of scientific works from foreign languages (Greek and Syriac) into Arabic first appeared during the time of the Umawid State. Caliph Khalid bin Yazid was the one who started this movement.[31]

Early translation traditions seemed slow, except after the Abbasid era. Abu Ja'far al-Manshur as the second Abbasid caliph, was the first to pay attention to science. He was respected for his expertise in philosophy and loved those who pursued it. In addition, it is recorded that Caliph Harun al-Rashid developed the Indian and Greek scholarly traditions by gathering intellectuals in a *halakah*.[32]

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[27] Andy Riski Pratama et al., "Bayt Al-Hikmah : Pusat Kebijaksanaan Dan Warisan Ilmu Pengetahuan Islam Dalam Peradaban Abad Pertengahan," *Jurnal Riset Rumpun Agama Dan Filsafat (JURRAFI)* 2, no. 2 (2023), https://doi.org/10.55606/jurrafi.v2i2.2122.

[28] Muhammad Suhail Thoqqusy, *Tarikh Ad-Daulah Al-Abbasiyyah*, Cet. 7 (Beirut: Dar al-Nafa'is, 2009).

[29] Ainur Riska Amalia, "SEJARAH PERADABAN ISLAM : PERKEMBANGAN ILMU PENGETAHUAN PADA MASA PEMERINTAHAN DINASTI BANI ABBASIYAH," *Rihlah* 10, no. 01 (2022): 53–64.

[30] "ULÛM AL-AWÂIL : ILMU-ILMU KUNO," Fahmina, 2015, https://fahmina.or.id/ulum-al-awail-ilmu-ilmu-kuno/.

[31] Budiyati and Anisa Dwi Makrufi, "PERADABAN ISLAM PERIODE DAULAH ABBASIYAH DALAM MENINGKATKAN MINAT MEMBACA MASYARAKAT," *VICRATINA: Jurnal Pendidikan Islam* 3, no. 2 (2018).

[32] Arfah Ibrahin, "KOTA BAGHDAD SEBAGAI CENTRAL PERADABAN ISLAM," *LENTERA: Indonesian Journal of Multidisciplinary Islamic Studies* 3, no. 1 (2021): 43–54.

Founded by Caliph Al-Ma'mun, *Bait al-Hikmah* (also called the "House of Wisdom") is the pinnacle of scholarly translation. He named Yohana from Syria as the leader of the translation team. *Bait al-Hikmah* began as a small library called *Khizānah al-Hikmah*, which had been operating since the period of Caliph Harun al-Rashid and eventually developed into a sizable academy.[33] Al-Ma'mun improved the institute's operations by introducing initiatives to teach and translate philosophical texts and foreign knowledge in various languages. The greatest translators of the time were aggressively recruited by Al-Ma'mun to serve this organization. Al-Ma'mun also had a strong interest in collecting masterpieces in other languages, which would then be studied and transcribed into Arabic so that everyone could read them. Even Al-Ma'mun was able to send several envoys to pursue important manuscripts to Byzantine-controlled lands. After that, they returned to Baghdad to attend *Bait al-Hikmah*.[34]

The translation of the "Almagest"[35] by Claudius Ptolemy is an example of the translation of classical works into Arabic written by figures of the Abbasid era. Translation of Ptolemy's monumental work, the Almagest, which deals with planetary motion, determining the position of stars, and predicting celestial phenomena. Among the first famous falak scholars, Al-Hajjaj ibn Matar translated Claudius Ptolemaeus' "Almagest" (Ptolemy) into Arabic in Baghdad with the help of the Greek Sergius Son of Elias. He was one of the scientists who played a major role in the transformation of Greco-Roman astronomy into Arabic language and Islamic culture. His translated work became one of the starting points in the understanding and development of astronomy in the Islamic world at that time. However, keep in mind that translations such as "Almagest" are often made by many translators and scientists. One example is the nineteenth-century translation of Ishaq ibn Hunayn which was later amended by Thabit ibn Qurra'.[36]

b. Instruments of Falak

During the Abbasid period, the development of astronomy included a significant range of instruments. Here are some science instruments and observation methods used at that time.

1. Astrolabe

It is a traditional astronomical instrument often used to display the positions of the Sun and stars at specific times and locations. The Greek words "*aster*" (meaning "star") and "*labien*" (meaning "peek" or "measure") are the origin of the word "astrolabe".[37] The astrolabe, which is basically a tool for hobbyists and stargazers, was created when the two terms were combined. The Greek word "*usturlāb*" (*miqyās al-nujūm*) translates as

[33] Ziauddin Sardar, *Tantangan Dunia Islam Abad 21: Menjangkau Informasi*, Cet. 7 (Bandung: Mizan, 1996), 46.
[34] Lathiful Khuluq, *"Intellectual Development during the Region of the 'Abbasid Caliph Al Ma'Mun (813-833)" Dalam The Dynamics of Islamic Civilization, Satu Dasawarsa Program Pembibitan (1988-1998)* (Yogyakarta: Titian Ilahi Press, 1997), 67-69.
[35] Claudius Ptolemaeus, *Almagest*, terj. Al-Farghani, n.d.
[36] Paul Kunitzsch, "The Arabic Translations of Ptolemy's Almagest'," Qatar Digital Library, 2018, https://www-qdl-qa.translate.goog/en/arabic-translations-ptolemys-
[37] James E. Morrison, *The Astrolabe* (Rehoboth Beach: Janus, 2007).

"instrument for measuring stars" in classical Arabic literature, which is how the astrolabe is known. Some claim that the word usturlāb comes from two words: *lāb*, the name of a man, i.e. the son of Prophet Idris, and *ustur*, the plural form of *satr*, meaning line.[38]

Although components of the Astrolabe were discovered before the second century BC, historians are not sure who invented the device initially. The astrolabe is an old tool that originated in Greek civilization, according to certain literature on the subject. Hippochus is credited with discovering the first Astrolabe.[39] Although their physical form did not develop until the 4th century BC, the theory of the Astrolabe dates back to the 2nd century BC. This device became widely used in the 7th century BC. According to some, the Astrolabe made its physical appearance around 26 BC, as recorded in the writings of Marcus Vitruvius Pilo. Behind the wire frame, he depicts the clock of Alexandria with a rotating field of stars.

The astrolabe brought to the Islamic world in the eighth and ninth centuries AD was most likely made possible by translations of ancient writings from the Abbasid era, particularly during the reigns of Harun ar-Rashid (786-809 CE) and his son, al-Ma'mun (813-833 CE). Ptolemy' Almagest and other astronomical publications, including those on the Astrolabe, are among the books that have been translated. Persian philosopher Abu Ishāq al-Fazari flourished on the orders of Caliph Abu Ja'far al-Mansur during the Abbasid dynasty, dying in 180 AH/796 A.D. He was the first Muslim scientist in the Middle East to create the Astrolabe. Al-Fazari created a circular astrolabe that served as a measuring instrument similar to a flat astrolabe and had seven metal circles placed in motion. He also made some notes on the astrolabe, such as *Tuhfah al-Nāzir*, and *Bahjah al-Afkār*.[40]

2. Quadrant

This instrument is in the form of a circle divided into 90 degrees or a quarter circle and has an angular measurement scale at the corner that helps observers measure the height of celestial bodies above the horizon.[41] Quadrants have been used in science since ancient times and are found in a variety of cultures. It is used to measure the angular height of some celestial bodies such as the sun, planets, stars, or moon at a certain time, and observers can calculate the position and movement of celestial bodies by measuring angles above the horizon. One of the very useful tools for understanding the movement of celestial bodies and navigation.

Al-Ma'mun, a caliph and scientist who came to power in the nineteenth century, contributed greatly to the development of the quadrant instrument. He founded the "*Bait al-Hikmah*" (House of Wisdom) in Baghdad, which became an important center for scientific

[38] Abu Abdillah Muhammad Al-Khawarizmi, *Mafatih Al-'Ulum*, Cet. 1 (Beirut: Dar al-Manahil, 2008), 205.
[39] Arwin Juli Rakhmadi Butar-Butar, *Khazanah Astronomi Islam Abad Pertengahan* (Purwokerto: UM Purwokerto Press, 2016), 338.
[40] Haji Khalifah, *Kasyf Al-Dzunun 'an Asami Al-Kutub Wa Al-Funun* (Beirut: Dar Ihya' al-Turast al-'Arabi, 1999), 107.
[41] Toke Knudsen, "Bridging the Gap Between Theory and Practice: Astronomical Instruments - A Quadrant," Mathematical Association of America, accessed December 26, 2023, https://maa.org/press/periodicals/convergence/bridging-the-gap-between-theory-and-practice-astronomical-instruments-a-quadrant.

and astronomical research. Al-Ma'mun and other scientists under his leadership improved and developed astronomical instruments such as quadrants to allow accurate observation of celestial bodies. Al-Mas'udi (also known as Abu al-Hasan Ali ibn al-Husayn al-Mas'udi) was an Arab scholar of the 10th century best known for his work in science and geography. He used quadrant instruments to make accurate astronomical measurements and observations. One of his most famous works, "*Muruj adh-Dhahab wa Ma'adin al-Jawhar*",[42] presented his findings on astronomy, geography, and the science of falak. Al-Masudi was one of the foremost falak researchers of his day, and his work had a profound impact on the advancement of this discipline.

c. Observatorium

In classical Islamic literature, observatories use the names *ar-rashd*, *dār ar-rashd*, and *bait ar-rashd*.[43] Serves as a structure used to make observations and documentation of celestial bodies. The observatory has many instruments and a strategic location. The observatory is an important legacy and contribution to modern Islamic civilization.

Mosques often make observations because they are related to the time of the worship system, especially prayer times. Indeed, occasionally, more thorough observations are made, as shown by the writings of Ibn Yunus (d. 399/1008) and Ibn Shathir (d. 777/1375).[44]

Observatories during the Abbasid period were important facilities used to observe stars, planets, and other celestial phenomena, and were an important part of the advancement of astronomy and astronomy in the Islamic world during the Abbasid era. The observatory was built during the Abbasids, especially during the reign of Caliph Al-Ma'mun (813–833 AD). These observatories, which are often located in cities such as Baghdad, Damascus, and Marw, famously incorporate information from various ancient cultures, such as Greece, India, and Ancient Egypt.

The observatory has many advanced observation equipment. These include measuring devices such as astrolabes and quadrants, which allow astronomers to measure the positions of planets and stars very accurately. Observatories are used for science and astronomy. At the Abbasid Observatory, scientists observed the motion of the heavens, recorded the movements of objects in the sky, and developed theories about the universe. One of the main purposes of the observatory is to assist in the determination of timing, especially the dating and prayer times. The development of calendars and more accurate timing can be achieved by looking at the sky.

The following are some examples of popular observatories in the Abbasid era. Al-Ma'mun Observatory came first. There are two locations for al-Ma'mun Observatory: Baghdad and Damascus. Known as the earliest observatory in Islamic history, it operated

[42] Ali ibn al-Husain Al-Mas'udi, *Muruj Al-Dhahab Wa Ma'adin Al-Jawhar*, Cet. 1 (Beirut: Al-Maktabah al-'Ashriyah, 2005).
[43] Abdul Amir Mu'min, *Qāmūs Dār 'Ilm Al-Falakī*, Cet. 1 (Beirut: Dār al-'Ilm li al-Malāyīn, 2006), 452.
[44] Muhammad Qorib, "Aspek Sosial-Intelektual Observatorium Dalam Islam," *AL-MARSHAD: JURNAL ASTRONOMI ISLAM DAN ILMU-ILMU BERKAITAN* 5, no. 1 (2019): 111–21, https://doi.org/10.30596/jam.v5i1.3127.

during the time of Abbasid Caliph al-Ma'mun (d. 218/833). From 216 AH to 217 AH, the observatory studied the Sun and Moon in particular in great detail. Using Greek-made astronomical instruments, Khalid bin Abdul Mulk al Marwarrudziy was one of the astronomers working there.[45]

Banu Musa Observatory is the second. Musa ibn Shakir's three sons, Muhammad, Ahmad, and Hasan, were responsible for running the Observatory. They are famous in mathematics, physics, and astronomy. The observatory is located in their Baghdad residence.[46] To observe celestial bodies, the three brothers built an observatory. Since the death of al-Ma'mun in 218 AH/833 CE, or the third century AH/9 AD, this observatory has been operating.

Third, Isfahan Observatory. An astronomer named Abu Haneefa Ahmad ibn Dawud ad-Dinawari (d. 282/895) built it in the city of Dinawari. The observatory was built in the 3rd century A.H.,[47] and observing objects in the sky was the focus of its activity. Researchers and historians do not have enough information about the tools used in this observatory. Ad-Dinawari recorded several discoveries in the "*Kitāb ar-Rashad*" and several other discoveries in the "*Zij Abu Haneefah*".

## 5. The Role of Ancient Egyptian Civilization in the Abbasid Era Revolution

The role of Ancient Egyptian civilization in the revolution of science in the Abbasid era was very important and varied, covering various aspects that contributed to the advancement of astronomy and mathematics in the Islamic world. With its long history, Ancient Egyptian civilization had created the foundations that Abbasid scientists later used and developed. Astronomical texts and artifacts that show a deep knowledge of celestial and celestial bodies are evidence of this role. Their observations of the movements of stars, planets, and other celestial phenomena are documented in numerous manuscripts and archaeological artifacts that still exist today. Muslim scientists used this paper as an important reference for developing new theories using more careful research and more sophisticated tools.

Abbasid scholars also used the Ancient Egyptian calendar and sundial system to make the calendar more precise. This calendar was later altered and refined by Abbasid scholars to make the calendar more precise. In addition, the sundials used by the Egyptians became the basis for the development of more complex timekeeping devices in the Abbasid era. The Ancient Egyptians also developed various simple but effective technologies for astronomical observations, such as the use of angle gauges and star maps. Abbasid scientists developed and integrated this method with more sophisticated mathematics, as demonstrated by Al-Khawarizmi and other scientists.

The development of observatories in the Islamic world, the integration of science with other disciplines, such as mathematics, and the spread of astronomical knowledge from Ancient Egypt to Europe and the Islamic world were some of the effects of Ancient Egyptian influence.

[45] Mu'min, *Qāmūs Dār 'Ilm Al-Falakī*, 456-457.
[46] Hitti, *History of the Arabs*.
[47] Ali Hasan Musa, *'Ilm Al-Falak Fī at-Turāts Al-'Arabī*, Cet. 1 (Damaskus: Dār al-Fikr, 2001), 242.

Observatories like the one in Baghdad became centers of astronomical research and places where Muslim scientists could make more accurate observations and make new theories about the universe. Innovations in observation and calculation tools are driven by technology and methodologies that originated in Ancient Egypt. This includes the creation of astrolabes and various other measuring instruments, which allow for more complex observations and calculations. Overall, Ancient Egyptian civilization built a strong foundation for the Abbasid revolution, which aided the advancement of science throughout the Islamic world.

## D. Conclusin

This research highlights the important role of Ancient Egyptian civilization in the development of science which became the foundation for the revolution of science in the Abbasid era. Ancient Egypt, with its advanced astronomical knowledge, provided a theoretical and practical foundation that was translated and further developed by scientists in the Abbasid period. The application of Ancient Egyptian science in timing, calendaring, and navigation greatly influenced the scientific approach in the Abbasid era. Through the synthesis of knowledge from various civilizations, Abbasid scientists were able to achieve significant achievements in astronomy that subsequently influenced the development of science throughout the world. The Role of Ancient Egyptian Civilization in the Abbasid Era Revolution.

Researchers are further advised to study the main sources of Ancient Egypt, such as astronomical texts and artifacts. A comparative study of Ancient Egyptian and Abbasid astronomical methods may also offer a new understanding of modifications and innovations made by Abbasid scholars. Combining astronomy with other fields such as history, archaeology, and linguistics can make more comprehensive analyses and conclusions easier. In addition, to provide stronger empirical evidence and reconstruct ancient astronomical methods, modern technologies such as digital star mapping and computer simulations can be used. Studying how Ancient Egyptian civilization interacted with other civilizations that helped develop science, such as Greece and Persia, will help you understand the broader flow of knowledge.

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