

Islamic Astronomy of Abbasid Era (750-1258 AD)

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Abstract

Astronomy is a particular field in Islam related to the interests of daily Muslim worship practices, such as determining the beginning of prayer times, qibla direction, and the beginning of the Qamariyah month. During the Abbasid period 750-1258 AD, especially during the reign of Abu Ja'far Al-Mansur, Harun Al-Rashid, and Al-Ma'mun, Islamic astronomy developed significantly. This can be seen from the emergence of astronomers. The love of the three Abbasid caliphs for science significantly influenced the policies related to development in science. The method used in this study is a qualitative method with historical analysis techniques. This study aims to add to the enrichment of historical treasures related to the development of science, especially astronomy, during the Abbasid period. Meanwhile, astronomy during the Abbasid period also had many scientific sources that needed to be studied more comprehensively. That is, many scientific figures in astronomy have never been specifically studied. Therefore, the study of astronomy today in higher education must also seriously focus on learning classical knowledge. This paper discusses the Abbasid state in developing science during its reign by looking at it from the perspective of significant scientific developments during the leadership of its caliph, which was indirectly influenced by socio-religious and intellectual conditions in his time. During the Abbasid era, the progress of science had reached its golden age, especially in Islamic astronomy which had contributed to the development of its science in the field of astronomy in the period after that until now.

Keywords: Abbasid State, Astronomy, Muslim Scientists.

Introduction

The history of Islamic civilization in classical times provides a unique pattern in the reality of its culture and society, especially in the Abbasid era. Some historical literature shows that the Abbasid state that once ruled from 750-1258 AD (Sunanto M., 2003, p. 50) , was the state that stood after the collapse of the Umayyad state. The Abbasid state, in its development, showed glory in the field of culture and civilization. The astonishing achievements can be seen from the periodization of the reign of the caliphs. Some of the progress achieved by the Abbasid state include economics, politics, military, and education (science). The achievements of the Abbasid period can still be enjoyed to this day, especially in the academic field.

The rule of the Abbasid state once reached a golden age. Politically the caliphs were compelling figures who were influential in the center of political power and religion. On the other hand, the prosperity of society reaches the highest level. The first period of the Abbasid period succeeded in preparing the foundation for the development of science in Islam. Islamic civilization and culture grew, developed, and even flourished in the Abbasid period. This rapid development is because the Abbasid Dynasty in the early period emphasized the development of Islamic civilization and culture rather than the expansion of territory. The focus on establishing society is one of the differences between the Umayyad and Abbasid states (Wandi, 2020, p. 72).

Scientifically, the Abbasid era was quite prominent. The prominence of the Abbasid Caliphate can be seen from the developments of science that have been achieved. The extraordinary achievements of Muslims before the Abbasid state were achieved during the Umayyad state. Some of the evidence, among others, such as the conquest of the territories of the Roman and Persian empires. It was followed by even more outstanding achievements in mastery in the field of science in the next century. The study of science that began with the Umayyad became a massive undertaking during the Abbasid era. Conditions at the time of the Abbasid had

made it possible to do this, considering that the Arabic language had reached perfection. (Machfud Syaefudin, 2013, p. 75) Several achievements in the field of knowledge were pioneered by the Abbasid rulers who gave direct support and contributed to its development, including Ja'far Al-Mansur, and Harun Al-Rashid. During the time of Ja'far Al-Mansur, the movement to build knowledge on a large scale began to be intensified (Gurabi, 1959, p. 137) precisely after establishing the city of Baghdad in 762 AD. The discipline of astronomy could not be separated from developments that received special attention from the Abbasid caliphs, especially during the caliphate. Al-Ma'mun.

The study of Islamic astronomy during the Abbasid period has not been discussed explicitly in the contemporary era. However, the development of astronomy in this era still needs to be traced to its historicity. The pattern of the development of astronomy in the Abbasid period became the basis of astronomical studies in the future. ArwinJuliRakmadiButar-Butar, in his article entitled Islamic Astronomy in the Mamalik Dynasty Era, has contributed significantly to tracing the historicity of Islamic astronomy (Butar-butar, 2013). Thus, this paper explores further the ideas Arwin has presented in tracking the development of Islamic astronomy that already existed in the classical period. This paper contributes to enriching intellectual treasures in the classical period from a historical perspective. As for the writing of this article, a qualitative method that is literary (*Library Research*) collects and collects data from various sources such as books, journals, and manuscripts related to this paper. This research can be classified as intellectual history research. The steps taken by the author, among others, are as follows: First, choosing the theme to be studied related to the development of the Abbasid state. Second, examine the socio-religious and intellectual conditions of the Abbasid period. Third, analyze the Abbasid state's contribution to astronomy development. This paper relies on works and figures who influenced the study of astronomy in the Abbasid period. Based on these methods and steps will be obtained as below.

Discussion

The Development of The Abbasid Dynasty

The Abbasid dynasty was the successor to power after the collapse of the Umayyad dynasty. The name of the Abbasid dynasty is derived from the name of one of the Prophet Muhammad's uncles, al-Abbas. The Abbasid dynasty was founded in 132 H/750 AD, by Abdul Abbas al-Saffah as the first caliph. The power of the Abbasid dynasty lasted for a relatively long period, namely for five centuries from 132-656 H / 750-1258 AD. The Abbasid government was a victory in the thoughts that the Bani Hasyim had echoed after the death of the Prophet by saying that those who had the right to rule were the descendants of the Prophet. However, this thought was defeated in the early days of Islam, where sound Islamic thought stipulates that the position of caliph belongs to all Muslims (Machfud Syaefudin, 2013, pp. 91-92).

The Abbasid caliphate lasted much longer than the Umayyad caliphate, which only lasted for approximately 90 years (Fathurrohman, 2017, p. 152); as quoted from Badri Yatim from the book, *Tarikh Al Daulat Al Islamiyah* stated that "Abdullah Ibn Abbas founded the Abbasid State". In general, the emergence of the Abbasid State was motivated by conflicts between ethnic groups and non-Arab Muslim dissatisfaction with the Umayyad State government, which emphasized Arabism. Abbasid propaganda was carried out with a reasonably mature strategy as an underground movement full of caution, centered in Khurasan. This movement was eventually recognized by the last caliph of the Umayyad state, namely Marwan bin Muhammad. Ibrahim was ultimately caught by the forces of the Umayyad State and imprisoned in Haran before finally being executed. In the end, the political dynamics between the Umayyad and Abbasid showed the fall of the Umayyad power and the establishment of the Abbasid state led by its first caliph, Abul Abbas as-Shaffah with the center of power originally in Kufa (Wandi, 2020, p. 68).

At first, the Abbasid supported the caliphate's return to Ali's descendants. After that, during the caliphate of Umar bin Abdul Aziz, the region of East Persia, under the leadership of Ibrahim al-Iman. This area was used as the center of activities of the Abbasid caliphate due to its location far from the capital of the Umayyad State in Damascus. The Abbasid said they did not want to hold the office of the caliphate except to free the people from the shackles of tyranny perpetrated by the Umayyad State. The collapse of the Umayyad State in Damascus, which was backed by internal and external factors, made the Abbasid the heirs of a great empire that made a significant contribution as the basis of Islamic civilization in the Abbasid period (Machfud Syaefudin, 2013, p. 92).

The change of the Umayyad state by the Abbasid in the leadership of the Muslim community is more than just the change of the state. It is the starting point of the revolution in Islamic history, whose urgency is in the French revolution and the Russian revolution in Western history. The caliphate of as-Shaffah lasted only four years and nine months. He died in 136 H, in Abar, a city that had been made the seat of government. The starting point of weakness during Abul Abbas's leadership was marked by government policies based on violence, so he was given the title of as-Shaffah (Wandi, 2020, p. 69).

When the Abbasid caliphate came to power, the pattern of government applied varied according to the social, political, and cultural changes at that time. Based on changes in the design of government in terms of politics, historians divide the reign of the Abbasid caliphate into five periods (Stryzewska, p. 30):

1. The First Period (132 AH/750 AD - 232 AH/847 AD) is the period of Persian influence.
2. The Second Period (232 AH/847 AD - 334 AH/945 AD) is referred to as the first period of Turkish influence.
3. Third period (334 H / 945 AD - 447 H/1055 AD), at this time, the power of the Buwaih dynasty marked in the reign of the Abbasid caliphate.

4. The fourth period (447 H/1055 AD - 590 H/1194 AD) was the rule of the Seljuk dynasty in the reign of the Abbasid caliphate, usually referred to as the second period of Turkish influence.
5. The fifth period (590 H / 1194 AD - 656 H / 1258 AD) was a time when the caliphate was free from the influence of other dynasties, but his power was only adequate around the city of Baghdad (Yatim, 2018, pp. 49-50).

Based on the division of the periodization above, shows the importance of looking at the pattern of leadership and the replacement of the Abbasid caliphate, especially in seeing the style of leadership that shows the development of Islamic culture and civilization. When viewed from the historical side, starting from the administration of the Abbasid caliph al-Saffah (132-136 H / 750-754 AD), it has shown the glory of the Abbasid state, which refers to the very rapid development of culture and science. After that, the leadership relay was continued by Abu Ja'far al-Mansur (136-158 H/745-755 AD), who was given the title al-Mansur because he got many victories in the wars that followed. During his reign, there was a transfer of the state's capital to the city he built in Baghdad, this was done because Ambar was located between Sham and Kufa which was always under threat from the Shiites. Therefore, the relocation of the capital city is intended to make the center of government safer (Karim, 2011, p. 144). In addition, the election of Baghdad as the center of the Abbasid state government was based on political, security, social and geographical considerations. Damascus, Kuffah, and Basra, which had developed earlier, were not chosen because in these cities, there were still political opponents of the Abbasid State (al-Aziz, 2014, p. 197).

For the foundations of the Abbasid caliphate government, it had been laid and built during the time of as-Saffah and Abu Ja'far Al-Mansur. The golden peak of this dynasty was in the seven caliphs afterward, namely: Al-Mahdi (775-785 AD), Al-Hadi (775-786 AD), Harun Al-Rashid (786-809 AD), Al-Ma'mun (813-833 AD), Al-Mu'tashim (833-842 AD), Al-Wasiq (842-847 AD), and Al-Mutawakkil (847-861 AD).

When viewed from the division of historical periodization, the first Abbasid period is the best period starting from Abu Abbas as-Saffah and ending with Al-Watsiq. Three things show the ability of the Abbasid caliphate to develop culture. Civilization in government, among others, are as follows: a) strengthening the foundations of the Abbasid State and crushing all attempts to seize power, b) enforcing Islamic law, which is relatively successful in uniting all elements of society at that time, c) protecting Islam and its civilization (al-'Ilm, 2011, p. 93). However, the popularity of the Abbasid State reached its peak during the caliphate Harun Al-Rashid and his son Al-Ma'mun.

At the time of Al-Mahdi, the economy began to show development, which can be seen from the increase in the agricultural sector and mining products such as silver, gold, copper, and iron. While its popularity peaked at the time of Harun Al-Rashid, many educational institutions and social needs began to be established. It shows social welfare, health, education, culture, and science. After Harun's reign, the leadership relay was held by Al-Ma'mun, who showed significant scientific developments (Yatim, 2018, pp. 52-53).

During the reign of Al-Ma'mun, the translation of foreign works began to be encouraged. Such as the translation of Greek books, as well as the establishment of many schools and his greatest work was the construction of *Bait al-Hikmah*, as a translation center that functioned as a college with a large library. At the time of Al-Ma'mun, Baghdad began to become a center of culture and science (Watt, 1990, p. 68). The next caliph was Al-Mu'tashim; during his reign, the caliph Mu'tashim gave great opportunities to the Turks to enter the government. When viewed from a historical perspective, the Mu'tashim period showed more challenges and political movements that disrupted internal and external stability. However, the military power of the Abbasid state became very strong, as well as its services with the establishment of the city of Samarra. Meanwhile, during the Mutawakkil era, success was obtained and enjoyed by most of the royal power. During Muntasir they can be

in full force (Syalabi, 1993, p. 309). As described above, the peak of Islamic culture and thought development occurred during the reign of Bani Abbas. However, not all of them started from the creativity of the ruler of Bani Abbas himself. But some have been built in the early days of the Islamic revival (Yatim, 2018, p. 54).

Social-Religious and Intellectual Conditions of The Abbasid Time

During the reign of the caliph Al-Mansur, the country's capital, which was initially Al-Hashimiyah, close to Kufa, was moved to Baghdad for more profitable reasons. The vast geographical area of the Islamic world stretches from East to West, indirectly influencing the occurrence of social interactions between residents of each region and others. The interaction process allows for the assimilation of Arab culture with other nations, from the assimilation process that has taken place effectively and has practical value in the development of Islamic civilization. During the reign of Bani Abbas, many non-Arab nations embraced Islam (Yatim, 2018, p. 55). This event was motivated by the development of social interactions, including through mixed marriages and cultural exchanges.

The system of government during the Abbasid caliphate was not much different from the tribal system promoted by the Umayyad caliphate. However, during the Abbasid caliphate, the system of government based on the most basic ethnicity showed its collapse. A poet expresses pride toward the Arabs in verse: "*The children of the concubines are increasing, take me, O Lord, to a land where no accursed people live.*" The poem shows that Arab historians were too concentrated on the issue of the caliphate and political events, so it did not provide an overview of the social life of most people at that time (Hitti, 2018, pp. 414-415).

The Abbasid rulers formed a society based on a sense of equality, the class division in society during the Abbasid era was not very visible. This can be proven by the issue of choosing a wife and mother for the children of the Abbasid's caliphs. The blood of Arab descent was no longer the standard at that time; among the

Abbasid families who were born to independent mothers were Abu al-Abbas, al-Mahdi, and al-Amin. Among the caliphs of the Abbasid State, Al-Mansur's mother was a Berber slave, Al-Ma'mun's mother was a Persian slave, Al-Watsiq and Al-Muhtadi's mother was of Greek origin, Al-Muntashir's mother was a Greco-Abyssinian, and Harun's mother also slaves from other countries, known as al-Khayzuran the first woman who had great influence in the state affairs of the Abbasid State (Hitti, 2018, p. 414). The social system during the Abbasid caliphate had significant changes compared to the Umayyad caliphate. During the Abbasid era, the Mawali group appeared in the government and took part and got an equal place in their social position.

According to Ibn Khaldun, during the Abbasid period there was an increase in the prosperity of Muslims, both in terms of culture and the reality of social life. Wealth in various works and sciences was achieved during the Abbasid period, such as the story of *Alfu Lailah wa Lailah*, which tells of luxurious life at that time (Hasjmi, 1993, p. 48). During the Abbasid rule, Islam expanded and came into direct contact with other civilizations. The existence of cultural and intellectual activity became quite significant in the city of Baghdad under the protection of the caliphs of the Abbasid state. The contact between Islamic culture and other civilizations can be seen in the vigorous translation time (Syuhadak, 2017, pp. 99-100).

Personally, some of the caliphs of the Abbasid state, especially in the early days, such as Al-Manshur, Al-Rashid, and Al-Ma'mun was, a leader who was a nerd and very fond of science it gave a significant influence on his wisdom which was much directed to improve knowledge. From a historical perspective, the leaders of the Abbasid state have a passion for reviving and participating directly in the development of science. In addition, the questions faced by Muslims are growing and more complex. As such, it is necessary to open science in various fields, especially the sciences of *naqli*, such as religion, language, and *manners*. Science *aqli*,

such as medicine, *manthiq* (logic), outer space science, sports science, astronomy, and other sciences related to social problems of Muslims (Karim, 2011, pp. 174-175).

During the reign of Caliph Harun Al-Rashid, much of the wealth was used for social purposes, hospitals, medical, educational institutions, and pharmacies. At the time, there were about 800 doctors. In addition, public baths were also built. If we look at this reality, the period of Aaron's caliphate is a manifestation of prosperity in the Abbasid era by considering various walks of life, including social welfare for its people (Yatim, 2018, p. 52).

By the time the Abbasid caliphate was in power, the strong wave of Muslim conquerors had run out of energy. When the Abbasids experienced a decline in power in Baghdad, it did not reduce the influence of Islam, which had taken root and multiplied its adherents. Meanwhile, in its development, the number of regions subject to Islamic rule increased and reached its peak in the sixteenth and seventeenth centuries. However, some success was offset by the loss of both areas and adherents (Levy, 1986, pp. 28-29).

During the Abbasid era, many Muslim scholars contributed to developing science *science*. Translation activities during the Abbasid period were continued in the transition of leadership from Al-Mansur to Al-Ma'mun. Famous translators were Jurjis (George) ibn Bakhtisyu (771 AD), Bakhtisyu ibn Jurjis (801 AD), and Gibril, a student of Bakhtisyu during the reign of Harun Al-Rashid. During the development of the Abbasid state, it has been mentioned that around the end of the 10th century A.D., the activities of the Muslims were not only oriented towards translation but began to explain and make edits. Scientific activities during the Abbasid period have led the country to progress in the field of knowledge. Such as medicine, mathematics, history, philosophy, geography, Islamic religious sciences, astrology, and astronomy (Karim, 2011, pp. 176-179).

The Contribution of The Abbasid Caliphate to The Development of Astronomic

Ten (X) century A.D. is often referred to as the century of Islamic development where the Islamic world, from Cordoba in Spain to Multan in Pakistan, experienced growth in various fields, especially in the areas of science, technology, and art. The Islamic world at that time was advanced, victorious, and prosperous; on the other hand, the western world was still dark, stupid, and primitive. The Islamic world is already busy conducting investigations in laboratories and observatories, while the western is still preoccupied with incantations and gods. This is because the religion brought by the Prophet Muhammad has given rise to the impetus to grow a new culture, namely Islamic culture (Sunanto M., 2003, p. 54).

The achievements of Muslims were brilliant during the Umayyad period when they were able to conquer the territory of the Roman and Persian kingdoms, which was followed by even more remarkable achievements in the conquest of the field of science in the next century. The study of science began with the Umayyads and became a massive undertaking during the Abbasid period. The conditions during the Abbasid period had made it possible to do this, considering that the Arabic language had reached perfection. Arabic letters, punctuation marks, and vocabulary is complete. The grammar is perfect. As made by China, the paper industry was cultivated during the time of Harun al-Rashid (Sunanto M., 2003, p. 56). The development of paper also spurred developments in other fields. Stability in the political area allowed the economy to develop rapidly, and development in all fields, both defense and industry and trade, increased tremendously so that the increased and abundant funds supported the development of science (Sunanto M., 2003, p. 54).

An oddity, the golden age of this field of science occurred precisely when the political situation of the Abbasid Caliphate began to decline. This causes an uncertain political problem because power has been divided by the emergence of small daulas in the outskirts (Sunanto M., 2003, p. 82). In addition, there are ideological contradictions between Sunni and Shia beliefs, such as the Ghaznawiyah

dynasty in Afghanistan and the Seljuq. They follow Sunnism, while the Fatimid dynasty in Egypt, the founder of the city of Cairo and Al-Azhar University, adheres to Shiaism. However, intellectual and scientific activities were growing when the Islamic world was in decline. The reason is that political life is very dependent on implementing justice and security. While injustice often causes scholars and scientists to leave political practice and run to the field of theory and science (Sunanto M., 2003, p. 83).

Islamic Astronomy Figures and their Work in The Abbasid Caliphate

1. Al-Fazari (D. ± 777 AD)

Al-Fazari has the full name Muhammad ibn Ibrahim al-Fazari (Hitti, 2018, p. 467). He is a figure who has made a significant contribution in Astronomy. This can be seen through his writing, which began with translating the book *Sindhanta* from India into Arabic by Al-Fazari in Baghdad in 771 AD. Then the translation of the Pahlavi lists (zîk) compiled since the Sasanian period continued. After that, the Greek book was translated *Almagest* by Ptolemy (Sunanto M., 2003, p. 103). In further developments, the other two Ptolemy books were translated by al-Hajjaj bin Mathar, written in 212 H / 827-828 AD and by Hunain bin Ishaq, later revised by Thabit bin Qurrah (Hitti, 2018, p. 467).

In the early IX century A.D. an observatory with somewhat more accurate instruments was built at Yunde Sahpur (southwest Persia). By al-Ma'mun, in connection with the interests of the scientific institution Bait al-Hikmah, an astronomical observatory was built near the Shamsiyah gate, Baghdad, under the leadership of a Jew who had just converted to Islam, Sind bin Ali and Yahya bin Abi Mansur (830 AD). Astronomers and these institutions not only made systematic observatories on the movement of celestial bodies in the universe but also proved precisely the fundamental elements contained in the *Almagest*, namely the irregular lines of motion and the orbit of the Sun, the length of the shamsiyah year. Etc. Al-

Ma'mun soon established a branch of this observatory on Mount Qosayun outside the city of Damascus (Sunanto M., 2003, p. 104).

Among the observatory's complementary instruments at that time, among others, consisted of a *quadrant*, an *astrolabe* (a tool for measuring altitude used in the Middle Ages), and a *dial* (a device for measuring time, speed, temperature), and a globe. Al-Fazari was the first to invent the astrolabe. This astrolabe model is probably taken from the Greek, judging from its Arabic name, *Astrulab*. The first published books about the astrolabe were those written by Ali ibn Isa al-Astrhurlabi, who lived in Baghdad and Damascus before 830 AD (Sunanto M., 2003, p. 104).

The astronomers al-Ma'mun demonstrated great accuracy in geodetic operations (measurement of the length of the protractor of elevation and sea level). The purpose of this operation is to determine the size of the earth and the distance around the earth with the assumption that the earth is round. These measurements were made on the Sinjar plain between the Furat river and also near Palmira, which yielded $56 \frac{2}{3}$ Arabian miles as the arc length of a degree meridian, which is a very accurate result that can, in the extreme, determine the proper length and protractor of the place i.e. ± 2877 feet. Based on the results of this calculation, it is calculated that the distance of the earth's circle is 20,400 miles, and its diameter is 6500 miles. Among those who took part in this operation were the sons of Musa ibn Shakir and perhaps also al-Khwarizmi, whose list a century and a half later was revised by Maslamah al-Majrithi of Andalusia and translated into Latin in 1126 by Adelard of Bath who became the basis for the writing of earth science in later times both in the east and in the west. This Arabic astronomical list can replace the lists ever made by India and Greece, and even this Arabic list is used by the Chinese (Sunanto M., 2003, p. 105).

2. Muhammad bin Musa bin Syakir

Muhammad bin Musa bin Shakir was the son of an astronomer during the caliph al-Ma'mun, Musa bin Shakir. When Musa bin Shakir died, al-Ma'mun promised to look after and look after his young children. Then these little children

were handed over to the astronomer Yahya bin Abu Mansur until they reached adulthood. When they reached adulthood, some grew up to become astronomers, namely Muhammad bin Musa bin Shakir. In further developments, al-Ma'mun then cooperated with Muhammad bin Musa bin Shakir to observe the sky's stars. Then, from the binoculars activity, he recorded the results of these activities to find the truth related to Ptolemy's findings in astronomy (As-Sirjani, 2011, p. 317).

3. Al-Farghani (D. 833 AD)

Another prominent astronomer of this period was Abu al-Abbas Ahmad al-Farghani (Al-Fraganus). He is from Fargana Transoxiana. In 861 AD, he was given a mandate by al-Mutawakkil to be a supervisor in the construction of the Nilometer at Fusthath. Al-Farghani's most phenomenal work is "*Al-Mudkhil Ila ilmiHay'ah al-Aflak*" which in 1135 was translated into Latin by John of Seville and Gerard of Cremona (Sunanto M., 2003, p. 105).

4. Al-Battani / Al-Bategnius (877-918 AD)

Al-Battani has the full name of Abu Abdullah Muhammad ibn Jabir al-Battani (Hitti, 2018, p. 471). It is one of the most prominent comparative and diligent research experts. He was a Sabiin devotee of Harran and the greatest Sabaan astronomer of his time. In 887-918 A.D., he held an observation in Raqqah. He corrected some of Ptolemy's views, including correctly calculating the orbits of the Moon and certain planets. He proved the possibility of a ring-shaped solar eclipse and succeeded in putting forward various original theories about the case of appearance of a new Moon. The idea put forward by Al-Battani later gave influence to Copernicus. The book written by Copernicus is "*De Revolutionibus Orbium Coelestium*". This book was written based on Al-Battani's thoughts. Al-Battani also has the work of a book translated into Latin in the 12th century A.D., as printed in Europe in several publications. This book elaborates on the field of astronomy. Another work of Al-Battani in the form of a book in the field of astronomy *Makrifat Mathali' in Nujum and Ta'dil Al-Kawakib* (Sunanto M., 2003, p. 106).

5. Al-Biruni (973-1050 AD)

Al-Biruni was the most prominent scholar in the field of exact sciences. He has the full name Abu al-Rayhan Muhammad ibn Ahmad al-Biruni (Hitti, 2018, p. 471). In addition to mastering Arabic, Sangkrit, Persian, he also mastered Hebrew, Syriac, and Turkish languages (Sunanto M., 2003, p. 107). In 1030 AD, he wrote a note on astronomy entitled "*Al-Qanun al-Mas'udi fi al-Hay'ahwa al-Nujum*" which was dedicated to his close friend, Mas'ud, son of Mahmud al-Ghaznah. Mas'ud is his supporter in conducting investigations. In the same year, he compiled a book about short questions and answers on geometry, arithmetic, astronomy, and astrology entitled "*Al-Taftim li Aw ail Shina'at al-Tanjim*" (Hasan, 1979, p. 118).

6. Abdurrahman As-Sufi (903-989 AD)

Abdurrahman As-Sufi's full name is Abu Husain Abdurrahman bin Umar bin SahalAr-Razi. He was the first scientist to lay out a detailed rising star schedule. He authored a book entitled "*al-Kawakib al-Tsabitah* (The stars are in place)" (Hitti, 2018, p. 470). These books explain the stars who appeared in 911 AD. This book is very important to present this for those who want to research the history of some of the stars, the orbit, and its movements. Everything is described in the book for more than 1000 stars (Khalil, 1996, p. 73).

7. Abu Wafa' Al-Buzajani (940-998 AD)

Abu Wafa 'Al-Buzajani's full name is Abul Wafa Muhammad bin Yahya bin Ismail. He is a scientist who discovered one of the tools, *Muadalat* (straightness), to straighten the places of the moon, which is called the straight speed level. Among his contributions to the field of Astronomy were discoveries related to errors in the theory of the moon's motion. The existence of these findings led to expansion in the areas of Astronomy and mechanics (As-Sirjani, 2011, p. 322).

8. Abu Ishak An-Naqash Az-Zarqani (1029-1087 AD)

Abu Ishak An-Naqash Az-Zarqani is one of the famous scientist in the fields of astronomy and mathematics. He has the full name Abu Ishak bin Ibrahim bin Yahya

At-Tajibi An-Naqasy. He is a scientist who discovered what is called astronomy with the "Toledo Sheet" attributed to his city of Toledo, Spain. This note is known to have been written by earlier scientists such as Bathlemeus, Al-Khwarizmi, and others. In these notes, he recorded the conclusions of astronomical binoculars. He wrote the book "*Ash-Shahifatu Az-Zaijiyah*" a book that explains how to use the Astrolabe in a new way, namely the Astrolabe tool called surfaces (*Zurqalah*). He was also the first to prove that the motion of the Sun's orbital tilt (almanac), when attributed to fixed stars, reached 12.05 seconds, then proved later that the correct number was 12.8 seconds (As-Sirjani, 2011, p. 322).

9. Abu Basar Bahauddin Al-Kharaqī (1076-1139 AD)

Abu Basar Bahauddin Al-Kharaqī is a scientist who is very persistent in the field of Astronomy. He has the full name Bahauddin Muhammad bin Abu Bakr Al-Khuraqi. In addition to his expertise in the field of astronomy, he is also quite proficient in the fields of geography and mathematics. The most phenomenal works in the field of Astronomy from Abu Basar Bahauddin Al-Kharaqī are *At-Tabshirah* and *Muntaha Al-Idrak fi Taqsim Al-Falak* (As-Sirjani, 2011, p. 323).

10. Badi' Al-Asthalabi (1139 AD)

Badi' Al-Asthalabi has the full name of Abu Qasim Habbatullah bin Al-Husain bin Yusuf Al-Baghdadi. He was a scientist who excelled in creating astronomical instruments. Among the works of Badi' Al-Asthalabi is the arrangement of the Astronomical schedule in the era of Sultan As-Saluji in Baghdad. In his book *Az-Zanji Al-Mahmudi*, it is attributed to the ruler Mahmud Abu Qashim bin Muhammad (As-Sirjani, 2011, p. 323).

Conclusion

The Abbasid caliphate stood after the collapse of the Umayyad caliphate, the name of the Abbasid caliphate is derived from one of the uncles of the Prophet named al-Abbas ibn Abd al-Muttalib ibn Hashim. With the establishment of the

Abbasid state, the influence of Arab power decreased and was influenced by the Mawali, in the social and religious system in the Abbasid period, giving a different pattern to the Umayyad state. The concept of ethnicity in the design of government began to be abolished. This can be seen from the caliphs' lives in setting the government system that involves the mawali people. During the Abbasid rule, precisely during the reign of Abu Ja'far Al-Mansur, Harun Al-Rashid, and Al-Ma'mun, the peak of success in science was seen. One of them is in Astronomy, which has a significant development. Astronomers in the Abbasid period laid the foundation for the development of astronomy in later times. The many works and figures of scientists who were born give a picture of the progress of science, especially astronomy at that time. Active astronomical studies conducted in the present should pay attention to the historical site of the classical period.

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