



ILMU FALAK : THE INTEGRATION OF ASTRONOMY AND ISLAM (IMPLEMENTATION OF THE PARADIGM OF UNITY OF SIENCE)

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Abstract

This study examines the phenomenon of ilmu falak which is often considered different from astronomy. In fact, if we examine further, both are the same science. The narrowing of definitions occurred between the two, along with the long history of the two sciences. Until then, today's definition narrows the terminology of ilmu falak as practical astronomy that is used to help the needs of Muslims in worship. Then the polemic occurred when ilmu falak was entered as a major taught at several Islamic universities in Indonesia. Is the application a "tragedy" dichotomy of science, or is it the opposite, an effort to implement the paradigm of the unity of science itself? Based on the literary method using a phenomenological descriptive approach and a unitary science paradigm approach, the results of the study show that ilmu falak and astronomy are actually the same scientific unit. The narrowing of the definition of astronomy occurs, because of the long history of science. And ilmu falak approach as a major/course at several Islamic universities in Indonesia, is an implementation of the paradigm of integration of science itself, namely between astronomy and Islamic jurisprudence.

Keywords: Ilmu Falak, Astronomy, Integration, Science, Paradigm

Introduction

Ilmu falak is still not very familiar to the ears of most Indonesian people, if it is called that way. But if pronounced with other synonyms; "astronomy", I'm sure some of us will immediately understand the terminology of the science. Why is that? In our opinion, because astronomy is a very rare branch of science. Unlike mathematics, for example, which is taught in almost all schools and at all levels of education. In addition, the characteristics of Indonesian's falak which are identical with "Islamic boarding schools"¹ and "ancient Islam" increasingly make this science "haunted" for some people, even for Muslims themselves.

Astronomy actually has a fate that is not much different from ilmu falak. This branch of science, because it is so difficult, does not really have room for interest by the Indonesian people. But at least, if people are asked about astronomy then they will immediately imagine about everything that is beyond Earth, for example; Sun, Moon, Stars, Asteroids, Comets, even Aliens. Because astronomy is synonymous with things like that in the minds and heads of our society. Falak does not have this kind of thing. Never mind imagining, hearing the phrase "ilmu falak" alone is not common in the ears.

Ilmu Falak and astronomy, from a linguistic point of view, are the same thing. If we look at the Arabic-Indonesian translation, falak is a translation of the word astronomy itself.² But etymologically, falak comes from Arabic which means; The orbit or orbit of a

¹ The history of the entry of ilmu falak cannot be separated from the network of Ulama and Pesantren Indonesia, who at that time studied a lot in the Arabic. Like Muhammad Manshur al-Batawi, it turned out that his monumental book "*Sulam an-Nayyirain*" came from the results of his studies while in Arabic. Look at Ahmad Izzuddin, *Analisis Kritis Hisab Awal Bulan Qomariyyah dalam Kitab Sullamun Nayyirain* (Semarang: Skripsi Fakultas Syariah IAIN Walisongo Semarang, 1997).

² Look at online dictionary *Mu'jam al-Ma'āni* and google translate. *'Ilm al-falak* is translated as the science of astronomy.

planet.³ In the terminology of Middle Eastern scholarship and medieval Islamic civilization, there is no difference in al-Biruni⁴, whether he was an *ahl al-falak* or astronomer. Because again, ilmu falak and astronomy are one and the same unit.

Over time, there was a narrowing of the definition of ilmu falak. In Indonesia in particular, some scholars define ilmu falak as practical astronomy that is used to assist Muslims in worship, in this case related to the time of worship.⁵ The focus studied in ilmu falak narrows only to matters of worship of Muslims. The object of ilmu falak study is only concerned with the circulation of the Sun and Moon. If viewed from a historical perspective, this narrowing of the definition of ilmu falak cannot be separated from the tradition of conventional scholars who only mention ilmu falak in several fiqh chapters in their work, without explaining in detail the process of calculating the astronomy.

In addition to narrowing the definition, ilmu falak is often associated and even equated with the science of reckoning (*'ilm al-hisāb*) and the science of timekeeping (*'ilm al-miqāt*)⁶, some call it the science of *raṣd* (observation)⁷ and some even say that astronomy is the same as astrology. Indeed, practically and theoretically, ilmu falak studies a lot about reckoning (calculation) and after obtaining the results, they will then be matched with reality (observation/*raṣd*). However, this kind of analogy brings more ambiguity to the definition of ilmu falak itself.

If we draw on today's reality, at UIN (one of which is UIN Walisongo Semarang), ilmu falak is included and taught at the Faculty of Sharia and Law. In fact, from the long history of ilmu falak, we can know that ilmu falak is actually astronomy itself. This means that ilmu falak should be included in the Faculty of Science and Technology. The most obvious impact of this "wrong entry" in ilmu falak is the limitations of the object being studied. Falak seems to have finished discussing only the movement of the Sun; to determine the direction of Qibla, eclipse of the Sun, and prayer times, and the movement of the Moon; to determine the lunar eclipse and the beginning of the Hijri calendar.⁸

However, from several explanations from the UIN community and academics, the policy is an effort to implement the integration paradigm of science. when ilmu falak was included in the Faculty of Sharia and Law, it was an attempt to correlate science (astronomy) and religion (fiqh). Apart from studying and practicing the exact and standardized science of astronomy, he also applies it to the dynamic and continuous needs of fiqh. From this background, the presence of this paper, using a literary method

³ Hadi Bashori, *Pengantar Ilmu Falak* (Jakarta: Pustaka al-Kautsar, 2015), 5.

⁴ A Muslim astronomer named Abu Raihan al-Biruni (d. 1050 AD), measured the circumference of the Earth using only the sine law approach. His greatest work entitled *al-Qānūn al-Mas'ūdi* contains many solutions regarding the solution of spherical astronomy. David A. King, *Kibla: Sacred Direction* (Leiden: E.J.Brill, 1987), 11.

⁵ Ahmad Izzuddin, *Ilmu Falak Praktis*, (Semarang: PT Pustaka Rizki Putra, 2012), 1.

⁶ Ma'sum Ali, *Tibyān al-Miqāt fi Ma'rifah al-Auqāt wa al-Qiblah* (Ploso: Madrasah Salafiyah Al-Falah), 1.

⁷ Howard R. Turner, *Science in Medieval Islam, An Illustrated Introduction* (Austin: University of Texas Pers, 1997), 75.

⁸ Ahmad Izzuddin, *Fiqh Hisab Rukyah di Indonesia* (Yogyakarta: Logung Pustaka, 2003), 32-40.

with a phenomenological descriptive method and a unitary science paradigm approach, tries to explain the position of ilmu falak as a science taught at Indonesian Islamic universities today. Is ilmu falak (in today's terminology) a narrowing of astronomy, or even an attempt to correlate astronomy with religion; the paradigm of unity of science (science integration).

Dichotomy Paradigm Shift Towards Unity of Science

The discussions on the relationship between science and religion have produced various theories of thought. However, in reality, these various ideas only lead to one goal, namely harmoniously juxtaposing science and Islam. This re-integration effort is the attitude and response of Muslims to the dichotomy of science and religion after the Western expansion that is wrapped up in secularism.

The paradigm of the dichotomy of science cannot be separated from the history of the birth of Western secularism. Friction and tension between scientists and clergy create polarization to separate the two. If we read the history of Western civilization, we find that a lot of friction has occurred because of the refreshment of knowledge that violates religious dogma (in this case the church). At that time, church authority played an important role in the structure of European society. Even his position is higher and absolute than the king. Every thought that is deemed to "deviate" from the teachings of the church will be sentenced to "*bid'ah*" and heretical, even the church and government will not hesitate to give punishments for the perpetrators.

Many have become "victims" due to the friction. History records that the cases of Copernicus⁹ and Galileo Galilei have become the starting point for the movement to separate religion and science.¹⁰ The geocentric understanding taught by the church seemed to be a fixed price that every European community had to believe at that time. Because of this dictatorship, it created an embryo of resistance to immediately separate religious affairs from science. Westerners believe that the excessive addiction to religious dogma will prevent them from experimenting in a science that will always evolve with the times.

This tension and friction eventually gave birth to the secularization of knowledge from religion. Science is considered not to have anything to do with religion. Science has its own territory, and religion too has its own territory. The absolute authority of the church was cut down to the roots. The church should not interfere in matters other than religion. Western society assumes that religion will only be an obstacle to the progress of science.

Over time, Western secularism began to spread throughout the world along with their expansion into Islamic countries. The fall of

⁹ Because he opposed Ptolemy's theory that had been embraced by the church for centuries, Copernicus eventually became an enemy of the church. The book by Copernicus entitled *De Revolutionibus Orbium Coelestium* was labeled forbidden by the church. A. Pannekoek, *A History of Astronomy*, (New York: Dover Publications, 1989), 190.

¹⁰ Slamet Hambali, *Astronomi Islam dan Teori Heliocentris Nicolaus Copernicus*, *Jurnal al-Ahkam*, Vol. 23, No. 2, <https://journal.walisongo.ac.id/index.php/ahkam/article/view/24/93> (accessed Dec 1, 2021).

the Ottoman sultanate in 1924 and the establishment of the Republic of Turkey are evidence of the strong influence of secularism in Islamic countries. The notion of secularism carries the characteristics of progress and modernity¹¹, making Islamic countries that see it interested in adopting this understanding. The progress of civilization experienced by the West is considered to be an effect arising from their attitude in secularizing science and religion.

What is unique is that the ideology of secularism that gave birth to the dichotomy of science has actually backfired on Muslims. If the Western leaves religion under the pretext of preventing stagnation of thought. Instead, Muslims choose to focus on religion and leave science behind. This way of adopting secularism causes the reverse effect for Muslims. Instead of pursuing, Islam is even more left behind from the progress of Western civilization. The method of merging science which is allegedly wrong is done by Muslims in the paradigm of the dichotomy of science.¹²

Therefore, some contemporary Muslim scholars argue that; the paradigm of the dichotomy of science is not a tradition that is fit to be adopted by Muslims. This is because the teachings of Islam, which have been manifested in the Qur'an are actually in harmony with science itself, if interpreted and understood correctly. The categorization or hierarchy of knowledge designed by al-Ghazali¹³, in his book entitled *Ihyā' 'Ulūm ad-Dīn*, is actually not an understanding that tries to separate the teachings of religion and science. In short, looking at the history of Islamic civilization in the past, it can be said that the paradigm of the dichotomy of science that was born from the ideology of Western secularism is not the right solution for Muslims.

Then actually, how important is science for the progress of a nation's civilization? Isn't it enough for Islamic civilization, diligently studying religious knowledge to become a good Muslim? Answering questions like this is very suitable if answered with intelligent arguments by Ibn Khaldun in his book; *Muqaddimah*. Ibn Khaldun said that; the sword (military/government stability) and the pen (scientist) cannot be separated from each other. A stable economy of a country because of its stable military will make its scientists free to develop, and vice versa; Scientists who are free to develop will have the effect of progress in science, so technology will also develop. With the development of science and technology, it is certainly a benchmark for the progress of a civilization.¹⁴

¹¹ M. Amin Abdulloh, dkk, *Menyatukan Kembali Ilmu-Ilmu Agama dan Umum: Upaya Mempertemukan Epistemologi Islam dan Umum*, (Yogyakarta: SUKA Press, 2003), 95.

¹² Fahri Hidayat, *Pengembangan Paradigma Integrasi Ilmu: Harmonisasi Islam dan Sains dalam Pendidikan*, Jurnal Pendidikan Islam, Vol. 4, No. 2, <https://core.ac.uk/reader/230725410> (accessed Dec 1, 2021).

¹³ In the book, he argues that the law of studying science is divided into two; *fardu a'in* (mandatory personal) and *fardu kifāyah* (mandatory collective). For al-Ghazali, the science of religion is a scienceclump *fardu a'in* to learn. While non-religious sciences, he categorized in scienceclump *fardu kifāyah*. Abu Hamid al-Ghazali, *Ihyā' 'Ulūm ad-Dīn*, (Semarang: Toha Putra), Juz. 1, 9-17.

¹⁴ Ibnu Khaldun, *Muqaddimah*, (Jakarta: Pustaka al-Kautsar, 2011), 457-458.

So it is very inappropriate for Islamic civilization to leave science and only prioritize religious knowledge, and vice versa. This shift in thinking eventually gave rise to various ideas, ideas and thoughts from Muslim intellectuals to build a unified paradigm of science. For example, Ismail al-Faruqi, with the idea of Islamizing his knowledge (Islamisasi Ilmu). The idea of al-Faruqi is trying to Islamize the disciplines of higher education by reinventing modern scientific disciplines into Islamic insight.¹⁵ Besides al-Faruqi, a Muslim philosopher from Malaysia; Naquib al-Attas also strongly criticized the idea of Western secularism. He argues that one of the goals of Islamic education is to give birth to civilized human beings. According to him, "civilized human beings" are those who can face this pluralistic world successfully without losing their identity. The idea of Islamization of science cannot be separated from the opinion that science is not free from values.

In line with al-Faruqi and al-Attas, Ziauddin Sardar argues that it is impossible for information and data in science to be separated from a value. According to him, information and data that work in "Western" science cannot be separated from the interests and views of the West itself. An example is Darwin's theory of evolution. This theory is a science that is infused with the poison of materialist understanding of Western scientists who seem not to believe in the process of creation. The agenda of atheism is suspected to be the background of the "boom" of the theory.¹⁶ Ziauddin Sardar concluded that science should contain elements of certain ideologies, values and philosophy of life. Therefore, to adopt knowledge from the West cannot be done immediately, but through a filtering process that is agree with Islamic worldview.¹⁷

The idea of Islamization of science is different from the idea of neo-modernism proclaimed by Fazlur Rahman. He prefers to select potential young Islamic scholars and teach them modern Western methodologies.¹⁸ The method taken by Fazlur is considered quite effective in producing reliable Muslim human resources. However, according to al-Faruqi and al-Attas, the method adopted by Fazlur Rahman is not an attempt to integrate knowledge by integrating the two, but rather to modernism which tends to be a hybrid of secularism.

In contrast to the idea of Islamization of science, Kuntowijoyo put forward a theory called "Pengilmuan Islam". This theory is recommended to replace the idea of Islamization of science (Islamisasi Ilmu). This theory encourages the Muslim intellectual movement to be no longer reactive but proactive. According to Kuntowijoyo, Islamic knowledge is a process, the Islamic paradigm is the result, and Islam as a science is both a process and a result. According to him, Muslims must see the scientific reality

¹⁵ Hasan Baharun dan Akmal Mundi, *Metodologi Studi Islam: Percikan Pemikiran Tokoh dalam Membumikan Agama* (Yogyakarta: Arruz Media, 2011), 111.

¹⁶ Mohammad Khadafi, *Kritik dan Pandangan Harun Yahya Terhadap Teori Evolusi Manusia (Evolusionisme)*, (Skripsi Fakultas Ushuluddin UIN Sunan Kalijaga, 2008), 60.

¹⁷ Ziauddin Sardar, *Tantangan Dunia Islam Abad 21: Menjangkau Informasi*, terj. A.E. Priyono (Bandung: Penerbit Mizan, 1988), 22.

¹⁸ Sutrisno, *Neomodernisme Fazlur Rahman dalam Pendidikan Islam: Telaah Metodologis-Epistemologis* (Desertasi UIN Sunan Kalijaga, 2005), 257.

through the eyes of Islam and the existence of the humanities in the Qur'an.¹⁹

In this perspective, the difference between Islamic education and Western education is the foundation on which it is based. Secular Western education is based solely on philosophy. While Islam makes the Qur'an as the mother of science. The difference in the foundation as the parent of these two educational models will also cause differences in one's motives for studying them. The purpose of the motive here is that science in the orientation of Western education is only to solve the affairs of everyday life. But in Islamic education apart from that purpose, it is also a form of relationship between the servant and his God (worship).

Discussions on the relation between science and religion have produced various theories. Starting from the Islamization of science (Islamisasi Ilmu), neo-modernism, to Islamic science (Pengilmuan Islam). However, in reality, these various ideas only lead to one goal, namely harmoniously juxtaposing science and Islam. This re-integration effort is an effort and response to the dichotomy of science and religion paradigm after the Western expansion that is wrapped in secularism thinking.

As stated from the beginning, that in fact the epistemology of science in Islam is integrative from its origin. Islam does not distinguish between religion and science. For Islam, science is a part of religion itself. If we look in the Qur'an, we can find commands to study the universe. Indirectly, this is proof that science and science are part of the pillars supporting an integrative Islamic epistemology. In closing, it should be noted that the harmonization of religion and science in the context of Islam is much simpler than in the West. This is because Islam has never experienced a "historical accident" as happened in the West in the Middle Ages. In the Islamic scientific tradition, scientific findings must never rub against each other and even have been previously stated in the Qur'an.

Ilmu Falak, Implementation of the Paradigm of Unity of Science

In the history of Islamic civilization, especially at the middle ages. Islam is in its golden age with the birth of many scholars and scientists, one of them in the field of astronomy. Mention al-Marrakushi, al-Maqsi, al-Sufi, Ibn Haitam, Ibn Yunus, al-Biruni, Ibn Shatir and Ibn Sarraj.²⁰ They are some famous Muslim astronomers, their various discoveries in the field of astronomy have made many significant contributions so that they are recognized as valuable findings in the field, therefore the astronomers we mentioned earlier, their name is very famous in the West.

¹⁹ Kuntowijoyo, *Islam Sebagai Ilmu: Epistimologi, Metodologi, dan Etika dalam Sutrisno, Neomodernisme Fazlur Rahman dalam Pendidikan Islam* (Desertasi UIN Sunan Kalijaga), 261.

²⁰ Many Muslim astronomers were born in the medieval era, and later they became scientists whose various thoughts and findings contributed a lot to the science of astronomy itself. Even in two decades (the era of the Mamalik dynasty), Islam gave birth to at least 75 famous astronomers. Look at David A. King, *The Astronomy of The Mamluks : A Brief Overview* (Muqarnas: Yale University Press, 1984), 76

But the fame of these Muslim astronomers is sinking due to the rise of Western civilization. People know Galileo Galilei better than al-Biruni. Nicola Copernicus and Kepler knew more than Ibn Shatir, although Copernicus himself admitted to being much inspired by the findings presented by Ibn Shatir.²¹ The spirit of Western science in the world of astronomy is currently far ahead of Muslims. Their various missions into space are clear evidence that in the field of astronomy, the Western is still the leader today.

A contemporary Muslim scholar, Ismail al-Faruqi, introduced the method of integration of science which he called the theory of "Islamisasi Ilmu". This theory he developed as a reactive-proactive attitude towards the backwardness of Muslims over Western civilization. According to him, the cause of the backwardness of Muslims today is the cause or impact of the dichotomy paradigm in the epistemology of applied science. Al-Faruqi's concept of "Islamisasi Ilmu", is alleged to be able to revitalize the scientific spirit of Muslims who have been eroded by the issue of secularism-dichotomy of science.

Al-Faruqi's method (Islamisasi Ilmu), is part of the response of contemporary Muslim scholars to revitalize the epistemological paradigm of science. In addition to Ismail al-Faruqi, several other contemporary Muslim scholars also put forward the same opinion and concept of the integration of science. Call it; Naqieb al-Attas, Ziauddin Sardar, Kuntowijoyo, Fadzlur Rahman, etc. They agreed that the appropriate paradigm in the Islamic scientific tradition is not the dichotomy paradigm of science, but the paradigm of science integration.

So what is the relationship between "ilmu falak" and the epistemology of Islamic science? Is ilmu falak an impact of the paradigm of the dichotomy of science with religion? or vice versa, astronomy is an implementation of the paradigm of integration of science itself. To understand it, of course, we must look at the reality that occurs in the application of ilmu falak in various Islamic universities in Indonesia today.

If the red thread is drawn on the implementation of ilmu falak, in fact the application of the Islamization of al-Faruqi's science is clearly described and projected in today's astronomy (ilmu falak). Where science (astronomy) tries to correlate with religion (*fiqh*). There is no living-death term between science and religion in ilmu falak. The science of ilmu falak is precise, studied and understood in order to meet the needs of Muslims to worship. Coincidentally, some acts of worship in Islam are related to the dimension of time, where time is a widely studied discourse in astronomy.

The focus of the study of ilmu falak related to some of the worship of Muslims, namely; Determining the direction of Qibla, the beginning of the time of prayer, eclipse, and the calendar of hijri, is not an effort to narrow the science of astronomy. But the evidence of correlation and application of science to religion, in this case is Islamic jurisprudence (*fiqh*). In the process of learning later, ilmu falak will not focus on the topics of discussion, but expand and adapt to the needs of the times. Some examples of the refreshment, upgrading and adaptation of ilmu falak to the development of the times are as follows :

²¹ His book entitled; *Nihayah Al-Sul fi Tashih al-Ushul*, allegedly the main reference of Nicholas Copernicus. In fact, many say that long before the helocentric theory was put forward by Copernicus, Ibn Sathir had alluded to this in his book.

The discussion of the direction of Qibla is one of the main focus in the study of ilmu falak. Because the basis of the direction of Qibla is *fiqh* (dynamic), the development in the discussion of the direction of Qibla also develops from time to time. In the past, humans determined the direction of Qibla only using instructions from celestial objects visible in space, such as; Sun, Moon, and Stars. They use the projected direction of the celestial object using only memory and temporary aids (Rubu' Mujayyab²², Istiwa' Stick²³ and Compass²⁴), so that the result of the accuracy of the calculation of the direction of Qibla is not very precise is still in the level of "*jihhah al-qiblah*"²⁵.



Image (1) : Ottoman Sundial, which is multifunctional. Can be used to determine the time and the direction of Qibla.²⁶

But the positive impact of the development of the times, and the vigorous experiments carried out by Muslim astronomers. Currently, the determination of the direction of Qibla has used quite sophisticated and precise tools, namely; theodolite²⁷. For the calculation (*hisāb*) of the Qibla direction, it has also applied trigonometric calculations with various corrections that make the results of the Qibla direction more precise and actually lead to the building of the Ka'ba (*a'in al-ka'bah*)²⁸.

²² Commonly referred to as a quadrant, is an ancient tool in the form of a quarter circle, eyelets, threads and grid sheets for trigonometric calculations. Look at Badan Hisab dan Rukyat Departemen Agama, *Almanak Hisab Rukyat*, (Jakarta: 1981), 132.

²³ A stick that is plugged perpendicular to a flat plane and placed in an open place, so that the sun can shine on the object. In ancient times this stick was known as "gnomon". Badan Hisab dan Rukyat Departemen Agama, *Almanak Hisab Rukyat*, 135

²⁴ Around the 14th century the Muslims in the Ottoman era had begun to make variations of the tools that combined a sundial with a magnetic compass to determine the Qibla direction. Look at Howard R. Turner, *Science in Medieval Islam, An Illustrated Introduction*, 115.

²⁵ Facing the Qibla by pointing to the "direction" of the Qibla, ignoring the level of precision because the condition of the person praying is far from the Kaaba.

²⁶<https://www.republika.co.id/berita/qa4jk4320/sundial-alat-pengukur-waktu-legendari-pemerintah-ottoman> (accessed Dec 2, 2021).

²⁷ Theodolite is an optical survey instrument used to measure the angle and direction mounted on a tripod. Until now Theodolite is considered as the most accurate tool to be used as a Qibla direction determination. Look at Ahmad Izzuddin, *Ilmu Falak Praktis*, 54-55.

²⁸ Facing directly with precision towards the direction of the Kaaba, with the level of confidence that the Kaaba building can be seen.

The development of instruments in the application of ilmu falak gives more value that the form of correlation of astronomy, even technology to religious science (qiblah direction fiqh). Of course, the development of these instruments cannot be separated from the encouragement and efforts of astronomers (ahl al-falak) to always experiment and research actively about astronomy. And things like this are a good climate for the development of science.



Image (2) : Theodolite, as a modern tool to help measure the Qibla direction²⁹

Similarly, the determination of the time of prayer and eclipse. The calculations used to determine are both evolving and gradual over time. From the beginning of calculations that are estimates (*hisāb taqrībi*), until now have been found calculations that are precision up to the second (*taḥqīq tadqīq*). Even for the calculation of the eclipse, one of the reference books on astronomy written by Indonesian scholars (*ad-Durr al-Anīq*)³⁰ always competes in its level of precision with the results of NASA's (American) calculations.

As an illustration of the significant development of astronomy in astronomy, as well as its correlation with exact astronomy (in this case Western astronomy). We take an example in calculating the Partial Lunar Eclipse that occurred on November 19, 2021 yesterday. Here, we will show comparative data on ilmu falak (books) calculations with modern astronomy (NASA)³¹ for the western part of Indonesian time (WIB), as follows:

Sistem Hisab	ad-Durr al-Anīq	NASA
Awal Penumbra	13 : 02 : 00 WIB	13 : 02 : 09 WIB
Awal Umbra	14 : 18 : 36 WIB	14 : 18 : 41 WIB
Awal Total
Tengah Gerhana	16 : 02 : 51 WIB	16 : 02 : 53 WIB
Akhir Total
Akhir Umbra	17 : 47 : 05 WIB	17 : 47 : 04 WIB
Akhir Penumbra	19 : 03 : 41 WIB	19 : 03 : 38 WIB

²⁹ <https://teknologisurvey.com/digital-theodolite-south-et02> (accessed Dec 2, 2021).

³⁰ The Book "*ad-Durr al-Anīq fi Ma'rifah al-Hilāl wa al-Khusūfaini bi ad-Tadīq*" by Kiai Ahmad Ghazali Muhammad Fathullah from Madura.

³¹ Lunar Eclipses: 2021-2030 at link <https://eclipse.gsfc.nasa.gov/LEdecade/LEdecade2021.html> (accessed Dec 2, 2021).

Image (3) : Comparison table of Partial Lunar Eclipse Data, on November 19, 2021, for Indonesian time (WIB).

Can be seen from the data from the beginning of the eclipse penumbra to the end, the difference between the calculations of the book and NASA is very thin even only in a matter of second. Again, this kind of comparison is not an attempt to divide scientific standards. But as proof that ilmu falak and astronomy are the same science, it's just that ilmu falak always intersects with Muslim worship. This is an implementation of the unity of science, between exact knowledge and Islamic jurisprudence.

The integration is applied in the discussion of ilmu falak, can also be seen from the aspect of the curriculum taught at several Islamic universities in Indonesia. We take the example of the curriculum in the Ilmu Falak Majors at UIN Walisongo Semarang. The subjects for ilmu falak are usually categorized into two parts; first, studying the scientific treasures of classical astronomy and second, contemporary. Classical astronomy usually uses references to the books of ulama/*ahl al-falak*, such as; *Khulāṣah Nur al-Yaqīn*. For contemporary use; Jean Meus Algorithm, VSOP/ELP and Nautical Almanac.

In addition to being taught to understand calculations, students are also supported to make observations to determine the level of accuracy of the calculations carried out. The forms of activities carried out are rukyah al-hilal, eclipse observations, checking the Qibla direction, fajar observations and *tahwiil* (change) from the *Milādiyah* calendar to *Hijriyyah*. Especially for UIN Walisongo Semarang, now it is equipped with an observatory which makes it easier for students to improve their skills in observing celestial bodies or other objects about astronomy.

And the most interesting thing, because the Ilmu Falak Majors is within the scope of the Faculty of Sharia and Law, astronomy students are also equipped with quite in-depth religious knowledge. Especially in the fiqh related to the astronomical dimension. Example; the fiqh of the Qibla direction, the fiqh of prayer times, the fiqh of the eclipse and the fiqh of the hijriyyah calendar. Of course this will further make astronomy students understand more about the dynamics of Islamic law which includes the science of astronomy being studied.

In addition to the applied astronomy curriculum, in terms of learning and teaching, some Islamic universities in Indonesia (in this case we take the example of UIN Walisongo Semarang) conduct a collaborative teaching system with competent scientists in the field of science related to science falak. Like; Thomas Jamaluddin (astronomer-LAPAN), Ing Khafid (Geodesist), Rinto Anugraha (Physicist), Cecep Nurwendaya (Planetarium Expert), and many more.

From this discussion, we can conclude that ilmu falak is actually practical astronomy that is used for the worship needs of Muslims, not a narrowing of the definition so that it is considered a dichotomy of astronomy in Islam. Rather, it is an effort to collaborate between science and religion, namely as the implementation of a paradigm of dichotomy of science towards a paradigm of science integration. As we know that the epistemology of Islamic science compared to the Western is to strengthen the relationship between humans and God through science. Therefore, the most important points in this paper are; ilmu falak is one of the implementations of the paradigm of integration of science (unity of science).

Conclusion

Islamic education is built by an integrative epistemology of science. The paradigm of dichotomy of science introduced by the Western through the ideology of secularism is not suitable to be applied in Islamic education. Instead of progressing like the promise of modernity delivered by secularism, Islam is getting left behind. Therefore, contemporary Muslim scholars have offered the idea of reintegrating science and religion as has been done by Islamic civilization thousands of years ago. The Qur'an as a manifestation of Islamic teachings is not a "science" book. But further than that, the Qur'an is a book of "guidance" that has been promised by Allah SWT. It does not only contain science and science, but it is further and bigger than that.

The paradigm shift, from the dichotomy of science to the integration of knowledge, is a basic need for Muslims in revitalizing the epistemology of science. Indeed, the Western world is currently proud of their progress and civilization, but we must remember; that knowledge without value will feel dry. Experiments without self-control will lead to disaster in the future. If the West leads to progress and modernity by leaving religion, then we as "civilized" people must take this glory while still carrying "clothes" and an identity called "religion".

The confusion regarding the position of astronomy is one of the causes of the decline of Muslims in the aspect of science (astronomy). Therefore, there is a need for research that uncovers the position of astronomy. Finally, through a research method literally using a phenomenological descriptive method and a unitary science paradigm approach. This study concludes that; Ilmu falak and astronomy are two of the same science. The narrowing of the definition of ilmu falak is not the cause of the dichotomy of science but is an application to correlate science (astronomy) with religion, in this case Islamic jurisprudence. So the conclusion is ilmu falak is an implementation of the integration paradigm of science itself.

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