

The Qur'an as A Foundation for The Development of Astronomy

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Article Info	ABSTRACT
<p>Article History Received 21-11-2023. Revision 18-12-2023 Accepted 28-01-2024</p>	<p>The Qur'an as a holy book of Muslims not only explains things that are '<i>ubudiyah</i>' but the Qur'an also explains the importance of science for human life. The word '<i>ilm</i>' itself is mentioned in the Qur'an 105 times, but with its conjunctions, it is mentioned more than 744 times, which is indeed one of the needs of Islam. The word knowledge is used in the sense of the process of achieving knowledge. The Qur'an contains various inspirations for the advancement of science and technology. This includes the knowledge of how nature was formed (cosmology) and the changing phenomena of the universe and stars (astronomy). There are no less than 750 verses that explicitly describe astronomical knowledge. Nature holds a lot of mysteries contained in it. As a virtuous creature, we need to study with scientific methods. The creation of the heavens without poles, the earth and everything in it, the alternation of day and night, the sun's journey from east to west, the circulation of the moon around the earth starting from the <i>hilal</i>, crescent, full moon, and shrinking again like an old bunch, the stars at night are also astronomical evidence for humans to always think it. Therefore, to appreciate the contents of the Qur'an fully and thoroughly, theological, philosophical, scientific, and sensory ways of thinking are required. This requirement is necessary because not all problems can be solved or overcome by philosophical thinking alone but require other methods that can be used together.</p>
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I. Introduction

Making the Qur'ān the basis of scientific construction will gain intellectual satisfaction. The Qur'an was revealed as a guide for all mankind. The process of descent outlined is certainly inseparable from the existence of various divine secrets behind it. In the Qur'an,

many verses contain scientific cues when talking about the phenomena of the universe. It is said to be scientific cues because the Qur'anic statements are not the product of positive-empirical studies, but approach or intersect with scientific topics and arguments. Thus, by "putting aside for a moment" the attitude of faith, the verses of the Qur'an that speak of the occurrence of the universe, for example, can be positioned as "Qur'anic hypotheses". For this reason, this miracle in the form of the Qur'an needs to be continuously studied and lived in depth so that its truth can illuminate the universe. This is as implied in surah *Fussilat* verse 53:

سَنُرِيهِمْ آيَاتِنَا فِي الْأَفَاقِ وَفِي أَنفُسِهِمْ حَتَّىٰ يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ۗ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ

53. "We will show them Our signs in the horizons and within themselves until it becomes clear to them that it is the truth. But is it not sufficient concerning your Lord that He is, over all things, a Witness?"

From the verse can take a lesson that there is nothing worth worrying about in the Qur'an. The content of the Qur'an is enough to confirm the sanctity and truth of something produced by scientific researchers who are relative (the truth is likely to change) after hundreds of years discovered by experts with discussion, study, and reasoning. One of the phenomena produced by these scientists is astronomical concepts [1].

The proof of this authenticity is the number of memorizers of the Qur'ān who continue to be born into the world and the scientific study of its verses that never stops. The miracle is that although the Qur'ān was revealed 14 centuries ago, many of its verses describe the future and are scientific. Even with the advancement of science and technology today, many verses of the Qur'an are proven to be true [2]. As written in surah *Al-Baqarah* verse 2:

ذَٰلِكَ الْكِتَابُ لَا رَيْبَ ۚ فِيهِ ۚ هُدًى لِّلْمُتَّقِينَ

2. "This is the Book about which there is no doubt, a guidance for those conscious of Allāh".

This is evident from the Qur'an as the basis of Islamic teachings, not only regulating the affairs of *ubudiyah* problems but also containing verses related to science and technology. Many verses of the Qur'an give hints about science such as biology, history, astronomy, and many more. However, there are still many of us who do not know about it. If we can present the signs of science and technology to mankind in the era of science and technology as it is today, it can be one of the elements of strengthening the faith of Muslims and become the most effective means of developing science [3].

II. Method

The research method used in this research is qualitative. The writing of this journal also uses the method of literature review. The literacy study method is a literature review based on the discussion of a theory that departs from the assumption of subjective knowledge and is then written on various sources of information. The sources of information the authors get are books, journals, and the internet.

III. Results and Discussion

1. The Meaning of Science in the Qur'an

Science is one of the main contents of the holy book of the Qur'an. Even the word *'ilm* (science) itself is mentioned in the Qur'an 105 times, but with conjugation, it is mentioned more than 744 times, which is indeed one of the needs of Islam. There are 854 times the word knowledge is repeated in the Qur'an. The word knowledge is used in the sense of the process of achieving knowledge. When viewed in terms of language, the word science means clarity. Knowledge is clear knowledge about something [3]. Meanwhile, knowledge is information that is known or realized by someone. It can be interpreted that science is clear knowledge or information about something that a person knows or realizes. Nevertheless, the word knowledge is different from the words *'arafa* (to know), *a'rif* (who knows), and *ma'rifah* (knowledge) [4].

2. The Concept of the Qur'an as the Foundation for Science Development

The Qur'an as the foundation of science development can refer to several types of understanding. First, that any science and technology (science and technology) developed must not conflict with the values contained in the Qur'an. Second, every scientific development developed must include Qur'anic values as an internal factor in the development of science and technology itself. Third, Qur'anic reasoning acts as a normative sign for the development of science, meaning that it can control the development of science so as not to get out of the Qur'anic way of thinking and acting. Fourth, every development of science must be rooted in the culture and ideology of the Qur'an itself better known as the indigenization of science (indigenizing science).

The development of Qur'an-based science, both substantially and methodologically, has at least two categories. First, interpreting the Qur'an using the findings of scientific research which is then called *al-tafsir bi al-'ilm*. Second, interpreting using positivistic scientific methods, namely interpreting rationally, then proving empirically, a tafsir known as *al-tafsir al-'ilmy* [5].

3. The Qur'an as the Foundation for Astronomy Development

Astronomy is the study of the universe. It uses mathematics and physics to observe, analyze and model celestial bodies. In the process, astronomy is an inverse problem at the limit: based on the data provided by the universe with complex statistical analysis, and based on the knowledge of physics that applies to the earth and its surroundings, astronomers build a description of the universe and its diverse contents [6].

Basing astronomy on the Qur'an is not a 'taboo'. The Qur'ān and astronomy do not contradict each other. In the verses of the Qur'ān, there are many religious issues on which science can be built. The Qur'an itself is explained based on science. In surah *Al-A'raf* verse 52 which means, "And We had certainly brought them a Book which We detailed by knowledge - as guidance and mercy to a people who believe".

Not only is it built on knowledge, but it is also evidence for everything. In surah *An-Nahl* verse 89 which says, " And We have sent down to you the Book as clarification for all things".

The progress that has been obtained by developed nations (western nations) in the field of science, science, and technology in this modern century, is a continuation of the scientific tradition that has been developed by Muslim scientists in medieval times or in other words Muslim scientists have contributed a lot to western scientists, this is as expressed by Yatim (1997) in his book *History of Islamic Civilization: "Western progress was originally sourced from Islamic civilization that entered Europe through Spain"* (p. 2)[7].

This is recognized by some of them. Science and technology whether it is discovered by Muslim scientists or by Western scientists in the past, present and future, all of it is evidence of the truth of the information contained in the Qur'an, because long before the events of these discoveries occurred, the Qur'an has given hints about it and this is part of the miracle of the Qur'an, where the truth contained in it is always open to be studied, discussed, researched, tested and scientifically proven by anyone [8].

The Qur'anic methodology and epistemology in discussing astronomy is empirical and rational. The Qur'an discusses the universe at length and considers the infinite amount of information that can be gained from its (metamorphosed) study and description. According to some Muslim writers, about 750 verses of the Qur'an can be found that deal with astronomy [1]. Some of these verses strongly encourage, even recommend the exploration and study of the universe.

It can be said that the Qur'ān does not condone the process of exploring science that only aims to satisfy one's curiosity in understanding the universe. Therefore, in the quest to understand the universe, one should not preoccupy oneself with secondary means and forget the primary goal.

The word "science" in the Qur'an refers to the act of interpreting the signs of Allah's power. Just as interpretation is the "science" of understanding the written verses of Allah. Regarding prediction, it is noted that the Qur'an has shown the regularity of natural phenomena and explained that the computability and predictability of these phenomena are intended for the benefit of humans as stated in Surah *Yunus* verse 5, "It is He who made the

sun a shining light and the moon a derived light and determined for its phases - that you may know the number of years and account [of time]. Allāh has not created this except in truth. He details the signs for a people who know". The concept of the cosmos is also found in the Qur'an in surah *Yasin* verses 38-38, "And the sun runs [on course] toward its stopping point. That is the determination of the Exalted in Might, the Knowing. And the moon - We have determined for its phases until it returns [appearing] like the old date stalk". The phrases 'determined', 'decree', all imply natural law [9].

A. Reasoning the verses of the universe

Reason is one of the human tools used in the search for truth. It can function the same as the senses, which is to recognize objects and process them according to the ability of reception. The process of reasoning the universe using Qur'anic verses can be easily sought. In the Qur'an, it is clearly explained that the structure of matter in the universe is filled with signs of His power. The Qur'an records in surah *Al-Imran* verses 190:

إِنَّ فِي خَلْقِ السَّمَوَاتِ وَالْأَرْضِ وَاخْتِلَافِ اللَّيْلِ وَالنَّهَارِ لآيَاتٍ لِّأُولِي الْأَلْبَابِ

190. "Indeed, in the creation of the heavens and the earth and the alternation of the night and the day are signs for those of understanding".

The Qur'an does not propose any new methods or techniques in astronomy. Instead, it demonstrates the existence of something beyond the universe by showing the life that occurs in the universe itself. The Qur'ān uses arguments to prove the existence of life beyond matter by using the ideas that humans have acquired in studying the universe. In the laws of the universe, there is harmony and unity. There is absolute uniformity in it. In other words, all the possibilities that exist in human thought when trying to understand the universe are used by the Qur'an as a whole [10].

The instructions given by the Qur'an are so simple, do not complicate, and do not use tortuous arguments. Everything uses the sources that exist in the life of the universe and encompasses both material existence and the existence of what lies beyond it. In other words, the Qur'ānic reasoning covers the entire life of the universe, both its inner and outer parts.

B. The harmony of Quranic Verses with Astronomical Theories

All the verses of the Qur'an confirm without a doubt that the entire creation is a single unit in which there is perfect balance, harmony, and harmonization. The Quran describes the creation of the universe over six periods.[13] In surah *Al-Furqan* verse 59, "He who created the heavens and the earth and what is between them in six days and then established Himself above the Throne - the Most Merciful, so ask about Him one well-informed". In surah *Adh-Dhariyat* verse 47, "And the heaven We constructed with strength, and indeed, we are [its] expander".

In line with the Qur'an, according to astronomical theory in the creation of the universe, the Big Bang, the entire universe was condensed into a singularity or point in infinitesimal space-time with infinite density and heat since 13.7 billion years ago, as seen in the figure 1. However, a sudden explosion occurred, inflating the universe outward faster than the speed of light. This period of cosmic inflation lasted for a fraction of a second, about 10 to 32 seconds.[11]

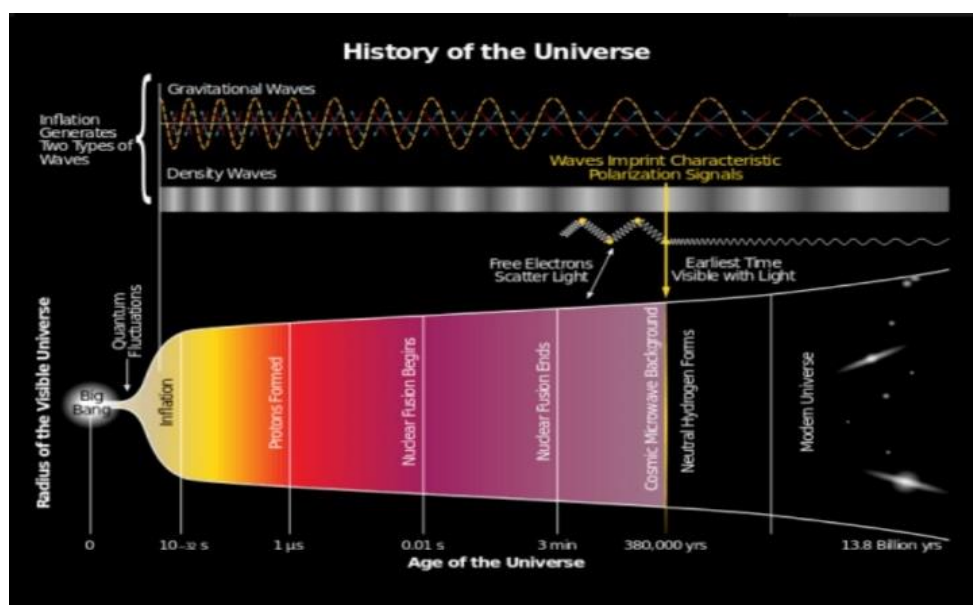


Figure 1: Big Bang Theory.

The Qur'an also explains that the sky was created without a pillar with more layers above it. It is stated in surah *Ar-Ra'd* verse 2, "It is Allāh who erected the heavens without pillars that you [can] see; ...". Furthermore, in surah *Al-Baqarah* verse 29, "[His being above all creation], and made them seven heavens, ".

The word sky, which appears in many verses of the Qur'an, is used for the heavens above the Earth as well as the entire universe. Given the meaning of the word, it appears that the Earth's sky or Atmosphere does consist of seven layers, viz: Troposphere Layer, Ozonosphere Layer, Stratosphere Layer, Mesosphere Layer, Thermosphere Layer, Ionosphere Layer, and Exosphere Layer, as seen in the figure 2. Scientists have discovered that the atmosphere is made up of several layers. Each layer has different physical properties such as pressure and gas types. The layer of the atmosphere closest to Earth is called the Troposphere which contains about 90% of the total mass of the Atmosphere. The layer above the Troposphere is called the Stratosphere. The Ozone Layer is part of the Stratosphere where Ultraviolet light is absorbed. The layer above the Stratosphere is called the Mesosphere. The thermosphere is above the mesosphere. The ionized gases that form a layer within the Thermosphere are called the Ionosphere. The outermost part of the Earth's Atmosphere starts from an altitude of about 480 km - 960 km. this part is called the Exosphere. If we count the

number of layers mentioned by this source, we see that the Atmosphere consists of exactly seven layers.[12]

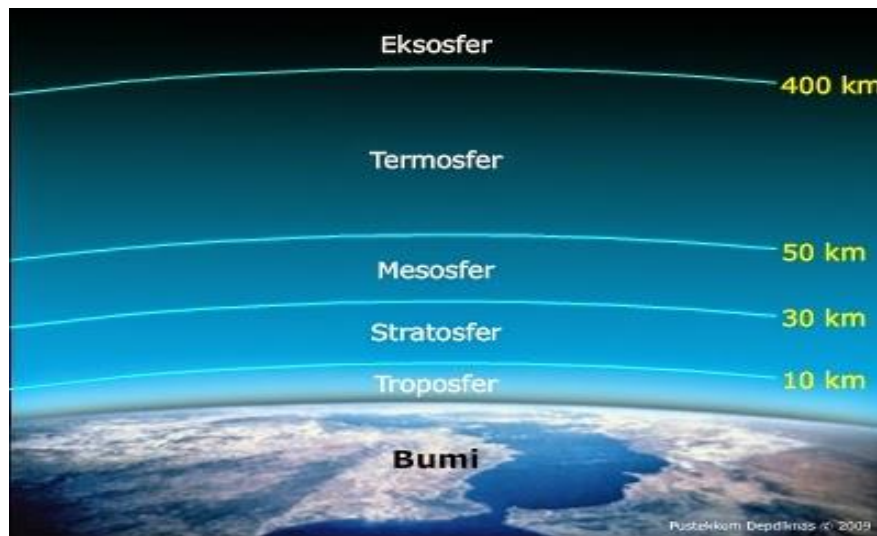


Figure 2: Atmosphere

The arrangement and control of the heavenly bodies is so amazing that it is beyond human understanding and imagination. The Qur'an explains the balance and regularity of the movement of the sun and moon in the alternation of night and day and will lead to the alternation of seasons and the calculation of time.[10] In surah *Al-An'am* verse 96, "[He is] the cleaver of daybreak and has made the night for rest and the sun and moon for calculation. That is the determination of the Exalted in Might, the Knowing". Furthermore, it is also explained that the movement becomes its wisdom for humans in life and study it, in surah *Al An'am* verse 97, "And it is He who placed for you the stars that you may be guided by them through the darkneses of the land and sea. We have detailed the signs for a people who know".

In line with the above verse, science explains that there is a false motion of the sun, which is the appearance of the sun moving from east to west and north to south, as seen in the figure 3. This motion is called apparent because the sun is stationary and does not move [13].

From the above understanding, it can be concluded that there is an orderly movement of the contents of the solar system that is so beautiful and the unity of the operational laws that control it.[10] The Qur'an also explains this in surah *Al-Anbiya* verse 33, "And it is He who created the night and the day and the sun and the moon; all [heavenly bodies] in an orbit are swimming". Furthermore, in surah *Yasin* verse 40, "It is not allowable [i.e., possible] for the sun to reach the moon, nor does the night overtake the day, but each, in an orbit, is swimming".

According to astronomy, the Sun is the center of the solar system based on the heliocentric theory proposed by Nicolaus Copernicus, the sun as the center is not static (stationary) but also moves. The Sun has two motions, namely circulatory motion on its axis

and circulatory motion together with its system around the center of the Milky Way galaxy. For a long time, European philosophers and scientists believed that the Earth was at the center of the universe and that everything including the sun moved around the Earth. In Western countries, this geocentric concept was believed from the time of Ptolemy (2nd century BC) until 1512, when Nicholas Copernicus stated the heliocentric theory that the sun was motionless and at the center, while the planets revolved around it [14].

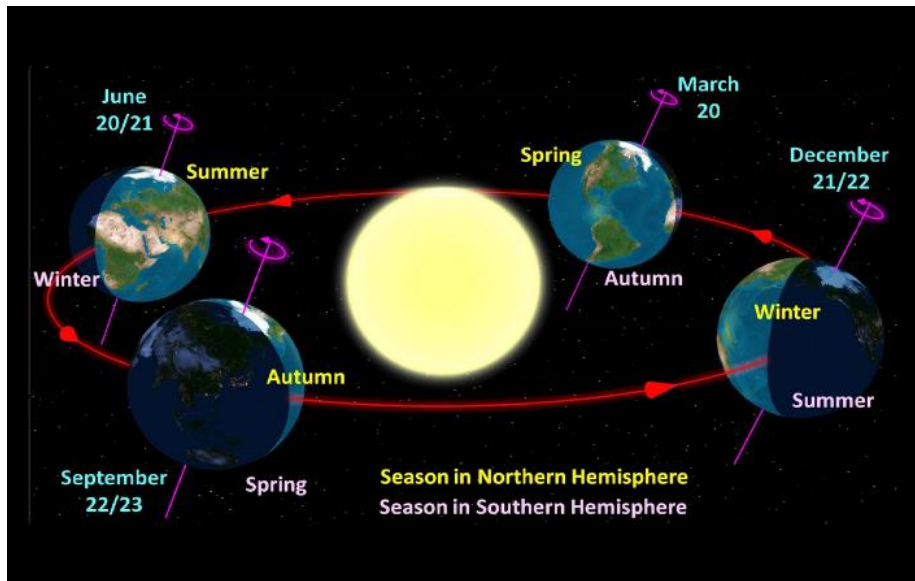


Figure 3: Apparent motion of the sun

Then, in 1609 German scientist Johannes Kepler stated that the planets not only move around the Sun, but they also rotate on their axes at different speeds. With this knowledge, European scientists could better understand the movement of the solar system including the sequence of day and night. After these findings, it was believed that the Sun was stationary. The Sun circulates 150 miles per second and revolves around the center of the Milky Way galaxy in 225-250 million years. The Sun takes 200 million years to complete its rotation. The verse mentions an important fact of modern astronomy, namely the existence of separate orbits of the Sun and the Moon [15].

When the Qur'an is used as the basis for astronomy, it will bring absolute knowledge and refute theories that state that the universe moves based on natural laws that are self-controlled, and self-adaptive (theories of naturalism and secularism).

And there are many more verses related to astronomy to the wisdom contained in it. The verses of the Qur'an, it can invite human attention to conduct a study of the universe and what surrounds it, conducting astronomical research in developing knowledge and advancing the times. Astronomical studies based on the Qur'an teach humans that there is omnipotence and omnipotence and how firm and strong the control of Allah as a substance

regulates the astronomical life of His creation. There is a perfect rule and unity that is very clearly visible and then gives humans flexibility in exploring more about the universe.

Conclusion

From the above discussion, we know that the Qur'an is a scientific guide throughout the ages, namely past, present, and future, where the Qur'an contains complete and lasting values. The Qur'an is the ultimate reference and foundation book, the basis for astronomy and science. Therefore, fully, and thoroughly appreciating the Qur'an's contents requires theological, philosophical, scientific, and sensory thinking.

The discussion of the universe tells us that it will never end and will always be interesting to discuss because the object of discussion is a source of knowledge so it will always be interesting to research. The verses of the Qur'an also talk about how the universe was formed and the background of its occurrence. In surah *Al-Mu'min* verse 57, it explains that the period of creation of nature took a relatively long time. The beginning of the creation of the earth with everything in it occurred in six periods, and each period is unknown how many thousands of years. According to astrophysicists and cosmologists, finding inspiration for the creation of the universe with the Big Bang event refers to Surah *Al Anbiya'* verse 30, which is a large explosion and eruption as the beginning of the formation of space and time including matter. Then the next verse gives instructions for the development of the universe so that the heavenly bodies are increasingly dispersed. This inspires that the formation of celestial bodies is not a one-off process, but an evolutionary process (gradual change). The 30th verse explains the process of evolution on earth after the moon was formed from the throwing of some of the earth's plates due to collisions with other celestial material, and the earth was spread out when the large continental plate Pangea began to split but could be older than Pangea.

Making the Quran the foundation of astronomy will further expand the horizons of the universe and the science that studies the trajectories of celestial bodies moving in their orbits. The study of various celestial bodies, especially the earth, moon, and sun. Humans can know and utilize many things. This science is always there and needed in human life and is always always talked about by people. This is because of how important and interesting this science is.

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