

THE LEGACY OF MUSLIM SCIENTISTS AND THEIR CONTRIBUTIONS TO MODERN SCIENCE AND ISLAMIC JURISPRUDENCE

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Abstract: The legacy of Muslim scientists in shaping Islamic jurisprudence underscores the harmonious relationship between science and religion in Islamic history. Unfortunately, many people today, Muslims and non-Muslims alike, are not familiar with Muslim scientists, even though many of them have contributed greatly to modern science and Islamic jurisprudence. This article reviews the works of Muslim scientists and examines their contributions to Islamic jurisprudence, their methodologies, and the lasting impact on science and modern life of their legacy. This research will be literature-based, which is commonly referred to as library research. Data will be collected by gathering information from various literature sources related to the theme of this research, such as books, journal articles, and other documents that discuss the progress of Islamic sciences during the medieval period and their contribution to Islamic jurisprudence and modern science.

Keywords: Muslim scientists, Contributions, Islamic Jurisprudence, Modern Science.

Introduction

Islam has a glorious history of scientific advancement and civilization building. The Middle Ages was the “Golden Age of Islam”, which is considered crucial because of the development of science and the birth of Muslim scientists. At that time, the history of Muslims reached a very high level of culture. However, in the Middle Ages- the 5th century to the 10th century, there was a stagnation in Europe that occurred after the collapse of the Roman Empire, so that this era was considered a “Dark Age”. Europe at that time experienced intellectual decline, without science, literature, and a primitive life (Masood, 2009).

Despite the decline of Europe in some aspects during this period, science continued to flourish and spread in Europe. Zakir Abdul Hamid says that the knowledge of the contribution of medieval Muslim scientists to our modern way of life is very little known by many people, Muslims and non-Muslims alike. The contribution made by Muslim scholars was so great that between 600 and 1600 Muslim scholars and inventors became pioneers in the development of science in various fields (Subagiya, 2022). The fact that many people do not know about this is a fact that is referred to as “lost history” by Michael Hamilton Morgan of the New Foundation of Piece.

The brilliance of the golden age of Islamic civilization in the development of science gave birth to brilliant works from Muslim scientists. The works were then translated into other languages, thus spreading the knowledge to other countries, including Europe. Until now, the works of Muslim scientists in the golden age of Islam are widely recognized by contemporary Western figures, even used as textbooks or reference books by contemporary Western

scholars. The contribution of Muslim scholars in carrying out this great mission is divided into several main periods. According to Mohd Yusof Hussain, Islamic history is divided into three major periods, namely the caliphate period, the colonial period, and the independence (post-colonial) period.

Science in the Islamic world connects the harmony between religion and science. Islam encourages the pursuit of knowledge as a form of worship, which makes Muslim scientists see science as a means to get closer to God. This approach allows the development of science to proceed harmoniously without conflict between religion and science. Muslim scientists combined empirical and rational approaches in studying the universe, thus successfully developing the scientific method which later became the basis for the advancement of modern science (Wibowo, 2023).

Literature review

Explanations of the contribution of Muslim scientists to the development of science have been discussed in various previous studies. One example is the research conducted by Alkadafi et al. (2024), who explained that during the golden age of Islam, the Islamic world became a global center of science, where Muslim scholars not only preserved the scientific heritage of previous civilizations, such as the Greeks and Romans, but also developed it significantly. This success was supported by Islamic teachings that emphasize the importance of seeking knowledge, both religious and worldly, to deepen understanding of God's creation while improving the welfare of humanity.

In addition, research conducted by Zarkasyi and Rachmawati (2023) revealed that the period of Islamic history can be divided into several major phases. Mohd Yusof Hussain classified the period of Islamic history into three main stages, namely the caliphate period, the colonial period, and the independence (post-colonial) period. During the caliphate, especially the Abbasid era, there was a peak of intellectual brilliance. This was marked by the establishment of Bayt al-Hikmah in Baghdad, a library that became the center of intellectual studies as well as a center for translating scientific works. At that time, two great scholars, Al-Kindi and Al-Farabi, emerged as influential thinkers in the development of science.

The previous article discussed the history of Islam in the development of science developed by Muslim scientists and how these developments were in line with the rules in the Qur'an and sunnah. This article will specifically discuss the integration of fiqh in the works of Muslim scientists such as the caliph Al-Ma'mun, Al-Khwarizmi, Ibn Sina, and several other scientists and how their contributions remain as guidelines and references in scientific research until today.

Method

This research will be literature-based, which is commonly referred to as library research. Data will be collected by gathering information from various literature sources related to the theme of this research, such as books, journal articles, and other documents that discuss the progress of Islamic sciences during the medieval period and their contribution to Islamic jurisprudence and modern science. This method is used by collecting sources and related information from books, journal articles and other documents that have been published previously and analyzing them critically in order to draw conclusions that are useful for the research conducted.

This approach aims to study the contribution of Islam in the development of science to contemporary science and understand the relevance between science and Islamic jurisprudence. This library research method can be used in the study of “The Legacy of Muslim Scientists and Their Contributions to Modern Science and Islamic Jurisprudence” because this research requires a review of previous literature regarding the legacy of Muslim scientists and their contributions to Islamic jurisprudence and contemporary science. After collecting related information and critically reviewing it, conclusions can be drawn that are useful for the research.

Result and Discussion

Muslim scientists have contributed greatly to scientific discoveries and research, as well as to the development of legal and ethical norms in Islamic society. The legacy of scientists has led to the development of civilization during its golden age. The history of the golden era, which lasted from the 8th century to the 13th century, is in fact not widely known by many people. In fact, this kind of history should be echoed in order to introduce modern society to the role of Islam in contributing to civilization which made the level of Islamic culture high at that time. The innovative contributions of Muslim scientists set the wheels of knowledge in motion and developed technologies that had a major impact in changing the world. Contemporary science luminaries claim that the innovative legacies of Muslim scientists serve as a fundamental element in contemporary science. Islam has an essential educational power, as affirmed not only in the verses of the Quran, but also in the countless collections of scientific works produced during the Middle Ages. As Europe sank into darkness, Muslims, inspired by the beauty of Islamic teachings, assumed the responsibility of preserving, developing, and eventually spreading ancient knowledge to Europe. It is incumbent upon today's Muslim society to recognize and appreciate the contributions and take a keen interest in the pursuit of knowledge just as the early Muslim scientists did.

1. Caliph Al-Ma'mun

The early Muslim scholars developed science strongly influenced by the values of the Quran and the principles of Islam. Philip K.T in his work “The History of Arabs” said that Muslims managed to achieve all components of science that had been developed by the Greeks for centuries and exceeded the limits of philosophical theory in just a few decades. Muslim scholars had mastered the earth sciences compared to Western societies during the golden age of Islam. Caliph al-Ma'mun, the caliph during the Abbasid dynasty, argued that the earth was round and ordered researchers to study it to prove that it was round. It is known that no caliph of the Abbasids was more intelligent than Caliph Al-Ma'mun. He mastered various fields of knowledge, such as literature, governance, law, hadith, philosophy, astronomy, and other disciplines. Al-Ma'mun also memorized the Qur'an as well as interpreted it. In addition, he was known as an eloquent speaker and an accomplished orator with a loud and authoritative voice (Manaf, 2021). At that time, religious leaders in Europe restricted scientific research by believing that the earth was rectangular. Then researchers discovered that the earth was round with a circumference of about 20,400 miles. Al-Khwarizmi, a mathematician, along with other astronomers also participated in this research and contributed to the creation of the first globe. A century after the Arabs proved that the earth was round, public discussion about it only began in Christian Europe. The search for the shape of the earth conducted by Caliph Al-Ma'mun was in line with the principles of Islamic jurisprudence. This is in accordance with the statement in the Qur'an, Surah Al-Mulk verses 3 and 4, which invites mankind to pay attention to the creation of the heavens and the earth. This verse encourages us to study the universe as a sign of Allah's greatness that will not find the slightest flaw in its creation, even if it has been seen many times. Therefore, astronomers used empirical approaches in their

research to deduce the shape of the earth. The research conducted by Caliph Al-Ma'mun and other scientists provided great benefits to Muslims, especially in determining the Qibla direction and more accurate prayer times. This shows that the contributions of Al-Ma'mun and other researchers had a significant influence on the development of modern science, especially in the fields of geography, astronomy and navigation. Navigational knowledge enabled long journeys by sea or air to be more precise and accurate. It also encouraged Europeans to explore the oceans in the 15th and 16th centuries. With the concept of a spherical earth, explorers such as Christopher Columbus and Vasco da Gama were better equipped to plan transoceanic voyages. It also contributed to the advancement of astronomy and science in Europe, as evidenced in the works of Copernicus, Galileo, and Kepler.

2. Al-Khwarizmi

Al-Khwarizmi, a mathematical scientist, is known to have participated in spherical earth research. Apart from mathematics, al-Khwarizmi, or more fully Abdullah Muhammad bin Musa al-Khwarizmi is also an expert in geography and a practitioner of astronomy. In the west, al-Khwarizmi is known by the name algorism. Because of his cleverness and intelligence, Al-Khwarizmi joined Dar al-Hikmah, a scientific research and development institution established during the Abbasid Dynasty by Caliph Harun al-Rashid. Al-Khwarizmi is known as one of the Muslim figures who played a major role in developing and discovering mathematical theories, including algebra. The famous historian of mathematics, George Sarton, states that Al-Khwarizmi was one of the greatest and leading Muslim scientists of his time. Some of his important discoveries, such as algebra, the concept of zero, and trigonometry, became the basis for various disciplines, including physics, chemistry, and astronomy. The works written by Al-Khwarizmi remain as guidelines in modern science to this day. Al-Khwarizmi discovered a systematic method of solving mathematical problems through the algebraic approach. His discovery helped solve a more structured and logical calculation system. Al-Khwarizmi introduced mathematical methods to solve linear and quadratic equations related to the science of faraidh. This invention was especially useful when dealing with problems regarding the division of inheritance that did not produce clear fractions. Al-Khwarizmi also provides methods to solve complex fractional problems, such as in the case of *aul* (when the number of shares to be divided exceeds the total existing assets) or *radd* (when there is a residue of assets returned to certain heirs). In conclusion, al-Khwarizmi's mathematical discoveries are very useful for practical needs, such as in calculating inheritance and also calculating zakat in Islam. In fact, his systematic and logical methods are still used today by modern science. The solution of linear and quadratic equations that he devised became the basis for modern calculus and analysis. In addition, Al-Khwarizmi introduced Hindu-Arabic numerals and the decimal system to the Islamic world and Europe. These numerals allowed for more practical calculations compared to the Roman system, and became the global mathematical standard. Al-Khwarizmi played an important role in developing trigonometric functions, such as sine, cosine, and tangent, which are used extensively in physics, geometry, and navigation. In his work *Kitab Surat al-Ard* (Image of the Earth), Al-Khwarizmi created a detailed map of the world based on geographical calculations. This was one of the first attempts to map the earth scientifically. The determination of geographical coordinates that he developed aided navigation and exploration. Al-Khwarizmi also developed systematic methods that later became the basis for the development of modern algorithms used in computer programming.

3. Ibn Sina, Al-Razi, and Al-Zahrawi

Ibn Sina, whose full name is Abu Ali Al-Hussein Ibn Abdullah Ibn Sina, is better known in the West as Avicenna. He was a leading Muslim scientist in medicine and philosophy. One of his monumental works, *Al-Qanun fi al-Tibb* (The Canon of Medicine), became the main reference in medical science in Europe for five centuries. Sir William Osler even described it

as “the holy book of medicine with a longer lasting influence than any other work” and called it “the most famous medical book ever written”. In the field of philosophy, Ibn Sina brought peripatetic philosophy to its peak during the golden period of Islamic civilization. In addition, he also mastered various branches of science of his time, ranging from religion, metaphysics, logic, medicine, mathematics, to psychology. Because of his extensive mastery, in some references he is nicknamed “the encyclopaedia” (Hidayat, 2024). Ibn Sina's contribution to the medical world also made him known as the “Father of Modern Medicine”. This is reflected in his major works such as *Kitab al-Syifa* (The Book of Healing) and *Al-Qanun fi al-Tibb* (The Canon of Medicine), which have greatly influenced the development of science and medicine in the world (Aligabi, 2020). Besides Ibn Sina, there are Muslim scientists who also contributed greatly to the field of medicine. Abu Bakr Muhammad ibn Zakariya al-Razi, known in the West as Rhazes, is one of the greatest Muslim doctors in history. In his dedication and contribution to medical science, he is often considered second only to Ibn Sina. In addition, there was Abu Al-Qasim al-Zahrawi, a Muslim physician, surgeon and scientist from Andalusia. He is often referred to as the “Father of Modern Surgery” because of his immense contribution to the science of surgery and medicine. The contributions of Ibn Sina, Al-Razi and Al-Zahrawi not only had a major impact on the medical world, but also established a space for learning in Islamic fiqh. They made it easier for scholars to examine the scientific aspects involved in health law, medical emergencies, medical ethics, as well as hygiene and funeral arrangements. With their scientific approach, Islam showed flexibility in the face of the times, in line with the sharia's goal of safeguarding the *maslahat* of mankind.

4. Al-Kindi and Al-Farabi

In the golden age, there was also the first Muslim philosopher who was very influential during the Abbasid period. His full name was Abu Yusuf Ya'qub ibn Ishaq ibn Shabbah ibn Imran ibn Ismail Al-Ash'ats ibn Qais Al-Kindi. Historians give Al-Kindi the nickname “Arab Philosopher” because he was the only Muslim philosopher of Arab descent who was originally descended from Ya'qub ibn Qahthan. Throughout his life, Al-Kindi was not only known as a philosopher, but also as a chemist, astronomer, physician, geographer and musician. In many of his works, he discussed logic and mathematics, and wrote commentaries on the works of Aristotle. Al-Kindi's interest in Greek philosophy, especially the thought of Aristotle and Plato, is evident in his efforts to understand and adopt this intellectual heritage. His diligence in studying and developing philosophy reflected a strong determination to introduce Greek thought to the Arab world, even though it often conflicted with the views of orthodox theologians who tended to be skeptical of foreign knowledge. One of Al-Kindi's greatest contributions was paving the way for Muslim scholars to study philosophy, which at the time was often rejected because it was thought to diminish reverence for God. Apart from Al-Kindi, Al-Farabi is also known as a very productive Islamic scientist and philosopher in various fields of science. According to the records of traditional bibliographers, Al-Farabi produced around 100 scientific works, both large and small, covering a variety of themes such as linguistics, logic, physics, metaphysics, music, astronomy, politics, as well as some writings that contained criticism of the thoughts of certain philosophers. One of his most notable works is the last book he wrote about music, *Kitab Al-Musiqa Al-Kabir* (The Great Book of Music), which has come to be regarded as the greatest contribution to the field of music in medieval times. In addition, in his work *Al-Madina Al-Fadila* (The Concept of the Ultimate State), Al-Farabi describes an ideal city led by a wise leader who understands religion, philosophy and science. He integrates religious values with political theory and philosophical ethics, creating a framework for creating a just and prosperous society. Al-Farabi had such a significant influence on science and philosophy for several centuries that he was widely recognized as the “second master” after Aristotle in the world of knowledge of his time. From the above explanation, it can be concluded that Al-Kindi and Al-Farabi

participated in harmonizing philosophy, science and religion for Muslim scholars. This interdisciplinary approach became an influence on great Islamic figures, including fiqh scholars such as Al-Ghazali and Ibn Rushd, who further linked philosophy to Islamic legal thought. Its contributions to logic, ethics, and science provided the intellectual foundations that strengthened the methods and principles of Islamic law.

5. Ibn Khaldun

Abd al-Rahman Abu Zaid Waliuddin Ibn Khaldun, better known as Ibn Khaldun, was a prominent sociologist who also delved into the study of education. His monumental work, *Muqaddimah*, is one of the most influential books in Islamic and world intellectual history. The book discusses various disciplines, such as historical methodology, sociology, politics, economics, and geography. As a Muslim scientist, Ibn Khaldun has an important role in offering solutions to conflicts that occur in various Muslim-majority countries. Ibn Khaldun's thinking, which is based on the dialogue between facts and social data, remains relevant to be analyzed and developed in the current context. He made significant contributions to science, covering various fields such as history, sociology, politics and economics. His analysis of historical data not only includes a chronology of events, but also explores the underlying factors behind each event. Ibn Khaldun's approach to history differs from that of most other historians, who often simply review or add explanations to the works of predecessors. His methodologies of historical criticism, such as causal analysis and verification of facts, are highly relevant today. With in-depth analysis, he succeeded in contributing a new understanding of social dynamics and human civilization, making his thought one of the main milestones in the study of history and society. According to Ibn Khaldun, science and teaching are fundamental elements in advancing civilization and improving the quality of society. He examined the close relationship between society and Islamic law, showing that the development of Islamic law is strongly influenced by the social dynamics that occur in people's lives. In the field of Islamic economics, Ibn Khaldun made a major contribution through his ideas on tax management, market mechanisms, and fair distribution of wealth. His thinking is an important foundation for the development of Islamic economics. In addition, his concepts of division of labor, progressive taxation, and market interaction were not only relevant for his time, but also influenced modern economic theories until today.

Conclusion

Essentially, the history of Islam in its advanced civilization and culture has a glittering period long before this modern era. Early Muslim scientists was having a great curiosity for science, encouraged them to conduct research to discover a science that is beneficial to humans, even today. In addition to the scientists mentioned in this article, there are other Muslim figures who also made great contributions to civilization. Some of them are Ibn Al-Haitham, known as the "Father of World Optics," Ibn Rushd, who earned the nickname "The Commentator," and Al-Jazari, who is referred to as the "Father of Robotics." There are many other Muslim scientists who helped enrich the treasures of science. Muslim scientists at that time were known as polymaths, those who had expertise and mastery in various branches of science at once, showing how broad their horizons and dedication to studying.

The first Qur'anic verse to be revealed commands reading, which is a strong indication of the importance of gaining knowledge. Reading here is not just an activity, but also a symbol of the effort to acquire new knowledge and understand more deeply the signs of Allah's greatness in the universe. Scientists' perseverance and fighting spirit in seeking the truth and studying the universe was based on the belief that science is part of worshiping Allah. Their contributions laid the foundation for the advancement of modern science, and many of their discoveries and thoughts are still applied today. In addition, Muslim scientists also bridged

the Greek and Roman intellectual heritage to the West, translating and expanding classical works into Arabic. This effort not only preserved knowledge, but also enriched it with new innovations that were relevant at the time. The advanced Islamic civilization is proof that the integration of religion, science and culture can give birth to extraordinary progress.

In this modern era, the history of the glory of Islamic civilization is often ignored, and many Muslims do not even realize how glorious the golden age of Islam was at that time. Muslim scientists continued to innovate and develop discoveries in various fields, including religion, philosophy, astronomy, mathematics, medicine, and other branches of science. Without realizing it, many aspects of life today, such as education methods, medicine, the concept of a round earth, navigation, and social media, have their roots in the thoughts and discoveries of early Muslim scientists. Their spirit and perseverance should be revived, especially for Muslims, to preserve and restore the glory of an advanced Islamic civilization that contributes to the world.

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