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## The Rise of Science in the Islamic World

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### ABSTRACT

From the 8<sup>th</sup> century, the center of scientific activities had been the Islamic world in the historical process of scientific activities between the period of Ancient Greece and the Renaissance period. This is the common view of both eastern and western science historians. The success of scientific activities in the regions dominated by the Islam is no coincidence. It is for sure that the civilization created by Islam was much influential on this success. In addition, one cannot deny the efforts of many Muslim and non-Muslim people living in that period, from politicians to scientists. The scientific activities emerging as an inseparable part of the Islamic civilization have an important share in the universal culture as they constituted a step for the development of science and philosophy in the West. Hence, the rise of science in the Islamic world is an inseparable part of the scientific progress.

**Key Words:** History of Science, Islamic World, Scientific Activity, Scientist.

## İslâm Dünyasında Bilimin Doğuşu

### ÖZET

Bilimsel faaliyetlerin tarihsel sürecinde Antik Yunan ve Rönesans dönemi arasındaki geçen zaman diliminde bilimsel etkinliklerin merkezini 8. Yüzyıldan itibaren İslam dünyası oluşturmuştur. Bu tespit hem doğulu hem de batılı bilim tarihçilerinin ortak kanaatidir. İslam dinin hakim olduğu coğrafyada gerçekleşen

bilimsel etkinliklerin başarısı tesadüfi değildir. Bu başarının arkasında elbet ki İslam dininin oluşturduğu medeniyetin büyük etkisi vardır. Aynı zaman da o dönemde yaşayan siyasetçilerden bilim adamlarına kadar Müslüman olan ya da olmayan pek çok insanında emeği göz ardı edilemez. İslam uygarlığının ayrılmaz bir parçası olarak ortaya çıkan bilimsel aktiviteler, Batıda bilim ve felsefesinin gelişmesinde bir basamağı oluşturması bakımından evrensel kültür içinde de önemli yere sahiptir. Bu nedenle İslam dünyasında bilimin doğuşu bilimsel gelişmelerinde ayrılmaz bir parçasıdır.

**Anahtar Sözcükler:** İslam Dünyası, Bilim Tarihi, Bilimsel Etkinlik, Bilim Adamı.

## INTRODUCTION

History of science initiates scientific activities as a process advancing from the East to the West. The first scientific ring emerging with the Egyptian civilization in the East maintained its existence with Mesopotamia, which is also known as “Fertile Crescent”. This civilization was fed by Euphrates and Tigris and represented by Sumerians, Akkadian Empire, and Babylonia. Another historical root of the Eastern civilization involves Indian and Chinese civilizations. The scientific activities transferred from the east to the west maintained its historical adventure with Ancient Greece’s rationalist systems in the Greek world (Topdemir- Unat, 2013: 4).

Scientific activities had lost their currency in Ancient Greece by the Middle Ages. In the West, the scientific activities faced with the Patristic period from the 3<sup>rd</sup> to the 8<sup>th</sup> centuries and the Scholastic period from the 8<sup>th</sup> to the 15<sup>th</sup> centuries. This phase is considered to be the dark age of the West in terms of science. However, in another region of the world, the Arabian Peninsula, this period witnessed the emergence of a new ring with the rise of Islam in the 7<sup>th</sup> century.

In 642 AD, Alexandria was captured by the Muslims, leading to an extension of the Islamic lands. In the late 7<sup>th</sup> century, the Islamic lands were extending from Iran to the south of the Mediterranean and Spain. In the 9<sup>th</sup> century, the Umayyad Caliphate was replaced by the Abbasid Caliphate, and the new rule transferred the capital city from Damascus to Baghdad in Mesopotamia. In this period, the interest in science and philosophy became prominent in the Islamic world. Muslims were familiarized with the Greek, Roman, and Christian cultures in a short period of time. They transferred the center of science to the eastern Islamic world once again. Though Middle Ages is called the dark age of science and philosophy in the West, the Islamic world witnessed a high-level scientific and philosophical movement

in that period. This plays an important role in universal culture both as an inseparable part of the Islamic civilization and as an important constituent of the development of the Western philosophy (Arslan, 1999: 45).

During the reign of the Abbasid Caliphate, all the regions once dominated by Greek ideas except for Europe and many lands from Iran to India joined the empire. The cultural and scientific background of these lands, especially the fields of medicine, astrology, and mathematics drew the attention of the governing intellectuals. Al Ma'mun, the Abbasid caliph, established Bayt al-Hikma (House of Wisdom) in 832 AD in that period. His intention was to contribute to the development of both philosophy and science in the Islamic world (Leaman, 1992: 5). The works directly translated from Greek and Syriac to Arabic made important contributions to the progress of philosophy and science in the Islamic world. Al Ma'mun also founded a library and an astronomy observatory in Baghdad. The observations that started with al-Farghani were maintained by Al-Battani and Sabit bin Kurra, who were Sabians (Mason, 2001:82). When Baghdad became the center of science and culture, the imprints of Islamic world started to be seen in scientific changes and innovations. Remarkable scientists of the period were invited to that center by the Abbasid sultans to be honored and provided with new opportunities. Hence, important scientific studies and scientists emerged in the fields of mathematics, astronomy, physics, chemistry, biology, and medicine. These studies also influenced the Renaissance period, which means rebirth for the Western world. For example, al-Khwarizmi, who lived in the 9<sup>th</sup> century, studied mathematics and astronomy. He introduced decimal positional number system based on Indian numerals with his work titled *De Numero Indorum*. The western people learnt this decimal system with this work (Topdemir- Unat, 2013: 96). Besides, Omar Khayyam and Abd al-Hamīd ibn Turk are other important mathematicians.

al-Farghani, the well-known astronomy expert of the Ma'mun period called as Alfraganus by Latin people, made a great influence on the Western world with his work titled "Elements of Astronomy". He also influenced Dante, an Italian poet. We also see Al-Battani, known as Albategnius in the western world, Al-Biruni, and Ibn Sina (Avicenna) as important experts of the Islamic astronomy, which experienced a tremendous rise from the 9<sup>th</sup> to the 11<sup>th</sup> centuries. In general, the astronomical technologies of that period included the observatories that were founded to observe stars and devices like astrolabes that were used to find directions (Bayrakdar, 1985:84).

Physics, which is a term interchangeably used with natural sciences in the Islamic world, appeared in two schools. The first was represented by al-Kindi, Avicenna, and al-Farabi, who were committed to the Aristotelian understanding. The second was represented by theologians such as al-Nazzam, Ash'ari, and Fakhr al-Din al-Razi and scientists such as Al-Biruni, Alhazen, and al-Jazari and was predominantly based on inventions. In the field of mechanics and dynamics, which is another field of physics, al-Jazari and Banū Mūsā brothers produced important works. The devices measuring the weights and time as well as time techniques operating with water are some of the physics technologies (Bayrakdar, 1985:97, 107).

Jabir ibn Hayyan was the leading chemist and chemistry expert of the Islamic world. Known as Geber by Latin people, this thinker produced hundreds of works in the field of chemistry. Most of them were translated into Latin. Apart from Jabir, there are also Sufi Dhul-Nun al-Misri, Al-Biruni, and another famous chemist named Muhammad ibn Zakariya al-Razi. Separators which were used to obtain chemical substances in that period and distillation oven were some of the chemical technologies of the period. In addition, there were also chemical precision balances (Bayrakdar, 1985: 121, 130, 134).

One of the fields in which scientific success was transferred from the Islamic world to the West was medicine. Muslims conquered Gundeshapur and Alexandria, which stood as medical centers in that period. Many medical works, including those of Hippocrates and Galen, the two important representatives of the Greek civilization in the field of medicine, were translated into Arabic in Baghdad by Hunayn and Ibn Kurra, who were medical doctors themselves. In addition, during the reign of the caliph Al-Mansur, the great medical figures were transferred from Gundeshapur to Baghdad. What should be mentioned here is that al-Razi and Avicenna were the unrivaled medical authorities of that period. Avicenna produced the work titled *Al-Qanun* (The Canon of Medicine) and was known as the sultan of the medicine. Al-Zahrawi from al-Andalus, known as Abulcasis in the West, made his mark in the age in the fields of the production of operational instruments and surgery (Nasr, 2006:154-174). As can be inferred from some of the examples regarding scientific activities in the Islamic world, Islamic world experienced its golden age in a period that was considered to be a dark age for the West. Although one cannot deny the influences of the stance of politicians, cultural centers, translations, and scientists on this success, it is obvious that there are some other reasons. One of the reasons contributing to the development of science in the Islamic world is the Holy Text and the words of the Prophet Muhammad.

The value attached to science is repeatedly mentioned in the verses of the Quran and the hadiths of the Prophet Muhammad. The first verse that was divinely revealed is about reading (i.e. knowing): “Proclaim! (or read!) in the name of thy Lord and Cherisher...” (The Clot, 1). Since this sentence does not have a complement (mef’ul) (i.e. what should be read is not mentioned), it is inferred that everything about the universe and humans needs to be known and learnt. In other words, it includes all the things that are covered by science. The same verse continues with the following expressions: “Proclaim! And thy Lord is Most Bountiful, - He Who taught (the use of) the Pen” (The Clot, 3-49). The pen represents all the righteous science and culture. The creator wants us to know all these. This is because this verse reminds us another verse: “And He taught Adam the names of all things...” (The Cow, 31). Undoubtedly, not only the supporting of science but also the characteristics of superiority and sophistication are emphasized by the verses in the Quran: “Say: ‘Are those equal, those who know and those who do not know?’” (The Companies, 9) (Bayrakdar, 1985: 9). The hadiths that are in line with the abovementioned verses indicate that science is also supported by the Prophet of Islam. Some of these hadiths are as follows: “The knowledge and wisdom are the lost property of the believer, so wherever he finds it then he has a right to it” (et-Tâc, v.I, p. 46). “Seeking knowledge is an obligation upon every Muslim” (Fevz ül-Kadîr, v.I, p.543). “Seek knowledge even in China” (Fevz ül-Kadîr, v.I, p.542). Based on these verses and hadiths, Islamic understanding started to contemplate on the reasons for the objects. Hence, scientific curiosity became prevalent.

Non-existence of any phenomena like church, clergy holding the instruments of goodness and favor, and council regulating religious principles in the Islamic world made philosophy and religion dominant there whereas the pressure of the church and the scholasticism led by religious authorities in the West in the Middle Ages impeded scientific developments in the Western world (Corbin, 1986: 20). Another factor influential on the value attached to science in the period of the Abbasids was that religious authority and military and political leadership were not held by the same person. They left all the important religious issues to the authority of experts (i.e. people called ulema) (Neill, 2004:314).

One of the factors contributing to science to gain a unique meaning in the Islamic world was the appearance of Arabic as a scientific language. Arabic, which is a Semitic language, is the strongest language in the region surviving thanks to the dominance of Islam. Arabic is the language of the Quran. In its form in the Quran, Arabic was spoken by all the natives of the Arabian Peninsula and the people settling in the Fertile Crescent, which is

situated just next to the Arabian Peninsula, one thousand years before Islam (İ.R. Farukî – L.L. Farukî, 1991: 35). Having very few written records in the pre-Islam period, this language completed its structure through grammatical and syntactical works performed with the emergence of Islam. Enriched by the words borrowed from Hindi, Farsi, and Ancient Greek in the following centuries, Arabic turned out to have an influential position in the entire Islamic region and became both a scientific language and the common worship language of Muslims.

This study made a general evaluation of the conditions underlying the birth of science in the Islamic world, which lived its golden era in terms of scientific activities from the 9<sup>th</sup> century to the 15<sup>th</sup> century. The results of this study in terms of the current situation of Muslims are explained below. Some facts that are phenomenal truths must be acknowledged so that the obtained results are perceived correctly. While the Western world started a rebirth in the scientific and philosophical fields with the Renaissance and Reformation movements, the Islamic world entered into the process of first stagnation and then downfall. The political power they had prevented the negative situation in the fields of science and thought from making itself felt initially. However, the political failures experienced against the West as of the 18<sup>th</sup> century continued in the 19<sup>th</sup> century as well. The Islamic world lived a downfall in the fields of politics, science, and thought as a result of the World War I in the 20<sup>th</sup> century in addition to other important factors. The political reasons for this downfall can be evaluated as a separate topic. However, the fact that today's Muslims do not have anything to say in scientific and philosophical matters can be explained with a comparison to be made with the conditions under which science was born in the Islamic world.

Emerging in a period when the ancient Greek scientific tradition could not be maintained in the West, where Christianity prevailed in the Middle Ages, Islam offered a civilization project for humanity after the political success it had achieved in the region where it prevailed. The scientific activities of that period were a product of that civilization. Unfortunately, the Muslim communities currently do not offer anything in the face of the Western civilization. They mostly seek to realize their ideals by integrating themselves with the Western civilization. This is a political goal rather than a scientific or philosophical aim.

The understanding prioritizing reasoning and thinking ordered by the verses of the Quran and the hadiths of the Prophet Muhammad that led the development of the scientific mentality in the Islamic world in the past is

now mostly replaced by a religious mentality that is far from the Quran-centered perspective, based on narratives, characterized by mysticism and mythology, and not aimed at touching the objective world. As a result, the chance to ensure the adoption of the Quran as an instrument of comprehending the era disappears.

The Islamic world faces with the obstacles set by religious authorities established by sects and communities to free thinking though there were not such obstacles initially. This is similar to the pressure put by the church in the Middle Ages, scholasticism led by religious authorities, and the obstacles set by clergy to scientific development in the Western world. These obstacles are one of the sources of the current political conflicts and turmoil in the Islamic world.

One of leading factors having an influence on the birth of science in the Islamic world was the formation of a scientific language. At the present time, however, Muslim communities even do not have any idea or intention to seek for a common scientific language. They also have an academic stance claiming that science cannot be done in their own languages. Eagerness to learn foreign languages is a result of colonial process for some and a result of the psychology of underdevelopment for some others. Knowing a language and doing science are confused.

The cultural centers that played an important role in the initial scientific success and the scientists coming to those centers from various regions of the world provided the Islamic world with a proper fame in the history of science. Now, however, neither scientific centers not scientists have a share in the universal quality of Muslim communities. On the contrary, brain drain is one of the biggest problems of the Islamic world though there are few Muslim-origin scientists educated at western scientific centers.

To conclude, if Muslims wish to do useful things for not only themselves but also the whole humanity, they must have an idea of civilization project, as before. In addition, they must make an appropriate analysis of the Western Renaissance and of the big break and downfall starting in that period in order to recapture the old golden era. It is only possible in this way that they can return to the basics and share the universal message of Islam with other people.

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Başvuru: 09.06.2016

Yayına Kabul: 15.08.2016