

---

## VIII. BÖLÜM / CHAPTER VIII

---

İSLAMİ İLİMLER

ISLAMIC SCIENCES

---



# The Nature of Muslims' Sciences in the Golden Age of Islam

## İslamiyet'in Altın Çağında İslami Bilimlerin Tabiatı

Qodratullah QORBANI\* 

### ABSTRACT

The question concerning the nature of Muslims' sciences in the golden age of Islam is one of the most significant questions ahead for rethinking the history of Islamic civilization. In this case, it seems we can do research about the nature of Islamic Science as the most important virtue of Muslims sciences by paying attention to these three factors: 1. The quantity and quality of Islamic and the Quranic effects on Muslims' thought, 2. The quantity of Muslims' benefiting from other nations' sciences, 3. How much did Muslims change derived sciences and the measure of Muslims' scientific creativity. It is a fact that the most significant factor regarding inviting Muslims to getting the knowledge is epistemic teachings of Islam and the Quran. Since there is only after the appearance of Islam in Arabic and Islamic nations that such a brilliant scientific movement were started and some astonishing results flourished. In fact introducing divine teachings and epistemic information regarding the world, God, human being and other existents to Muslims and inviting them to thinking about them have had many scientific results. So, although some parts of Muslims' sciences were derived from other nations, but that sciences were reproduced and rebuilt under an Islamic framework and context. In the other words, if we consider some factors, like foundations, presuppositions, methods, subjects, theories, laws, aims and applications, as the factors that make the nature of science, it seems Muslims have reformed and rebuilt such factors regarding derived sciences from Greek, Iranian, Indian and Egyptian nations and added or attached Islamic virtue to them. So we can say whatever Muslims have reproduced by their intelligence and creativity through synthesizing or reforming derived sciences and using the Quranic and Hadith (narration) knowledge, was really led to Islamic Science, because regarding determining the nature of Islamic Science, derived sciences' factors had not more roles but it was Islamic framework and worldview that these sciences was reformed under its effects and reintroduced new factors. Such the virtue concerning Islamic Science was realized objectively in the golden age of Islam.

**Keywords:** Islam, the quran, islamic science, monotheistic worldview

### Öz

İslamiyet'in Altın Çağ'ında Müslümanların Bilim ile uğraşmalarının tabiatı ile ilgili soru, İslam Medeniyet Tarihini yeniden düşünmek açısından önemli sorular arasında yer almaktadır. Bu durumda, üç temel faktöre dikkat ederek, İslami bilimlerin en önemli erdemi olarak kabul edilebilecek İslam biliminin tabiatı hakkında araştırma yapmak mümkündür. Bu faktörler; 1. İslam'ın ve Kur'an'ın niceliksel ve niteliksel olarak Müslümanların düşüncesi üzerindeki etkileri, 2. Müslümanların diğer milletlerin bilimsel çalışmalarından niceliksel olarak yararlanma değeri, 3. Müslümanların türetilmiş bilimleri ne kadar değiştirdiği ve Müslümanların bilimsel üretkenliğinin ölçüsü. Müslümanları bilgi edinmeye davet etmenin en önemli faktörünün İslam ve Kur'an'ın epistemik öğretileri olduğu bir gerçektir. Çünkü İslam'ın Arap ve İslam milletlerinde ortaya çıkmasından sonra parlak bir bilimsel hareket başlatılmış ve hayret verici sonuçlar ortaya çıkmıştır. Aslında dünyaya, Tanrı'ya, insana ve diğer varlıklara ilişkin ilahi öğretileri ve epistemik bilgileri Müslümanlara tanıtmak ve onları düşünmeye davet etmek birçok bilimsel sonuç ortaya çıkarmıştır. Bir diğer ifadeyle, İslami bilimlerin bazı bölümleri diğer milletlerden alınmış olsa da, bu bilimler İslami bir çerçeve ve bağlam altında yeniden üretilip yeniden inşa edilmiştir. Dolayısıyla, temel ilkeler, varsayımlar, yöntemler, konular, teoriler, yasalar, amaçlar ve uygulamalar gibi bazı faktörleri bilimin doğasını oluşturan faktörler olarak ele alırsak, Müslümanların Fars, Rum, Hint ve Mısır Milletlerinden aldıkları bilimler ve bu bilimlerle ilgili faktörleri yeniden kurguladığı ve bunlara İslami bir erdem ekleyerek ya da iliştiyerek bu bilimleri yeniden ürettiği görünmektedir. Müslümanların zekâ ve üretkenlikleriyle, başka bilimlerden almış oldukları bilgileri sentezleyerek ya da reforme ederek ve de Kur'an ve Hadisten elde edilen bilgileri kullanarak ürettikleri tüm hususların İslam Biliminin oluşumuna sebep olduğunu söyleyebiliriz. Çünkü İslam Bilimlerinin tabiatını belirleme konusunda, türetilmiş bilimlerde geçerli faktörler bu süreçte çok fazla role sahip olmamış; ancak, İslam çatısı ve dünya görüşü ve bunların etkisi altında yeni faktörler ortaya konulmuştur. İslam bilimi ile ilgili bu tür bir erdem İslam'ın Altın Çağ'ında gerçekleştirildiğini görmekteyiz.

**Anahtar Kelimeler:** İslam, kur'an, islam bilimleri, tektanrıci dünya görüşü

Submitted/Başvuru: 04.05.2019 Accepted/Kabul: 14.05.2019

\* **Corresponding author/Sorumlu yazar:** Qodratullah QORBANI (Ph.D.), Kharazmi University, Philosophy, Tehran, Iran,  
E-mail: qorbani48@gmail.com, ORCID: <https://orcid.org/0000-0002-5829-9039>

**Citation/Atf:** Qorbani, Q. (2020). The nature of Muslims' sciences in the golden age of Islam. In F. Başar, M. Kaçar, C. Kaya & A. Z. Furat (Eds.), *The 1<sup>st</sup> International Prof. Dr. Fuat Sezgin Symposium on History of Science in Islam Proceedings Book* (pp. 507-518).  
<https://doi.org/10.26650/PB/AA08.2020.001.036>

## Introduction

Islamic scientific tradition was arisen from Islamic civilization and had/has a coherent and systematic relation with other branches of knowledge. The scientific revolution that was happened in the first centuries of Islam, is the cause of Muslims' confronting with ancient civilization and also was because of internal dynamic of Islam during the history. This Islamic scientific tradition that was made during 8<sup>th</sup> to 12<sup>th</sup> centuries in the Islamic world, was as the product of two different scientific resources. These two resources were first derived sciences from other nations, like Greece, Iran, Egypt and India, and second were most of the Quranic and Hadith epistemic teachings, that both have provided backgrounds of Muslims' scientific struggles (Iqbal, 2017, pp. 43–44). While there were some thinkers, before Islam, from different nations in the Middle East, it is only two centuries after appearance of Islam that in the light of the *Translation Movement* were translated many scientific texts and works from other languages to Arabic. Meantime the extension of Roman Empire realms, before the appearing of Islam, to some parts of the Middle East was led to near contacts of Muslims with Greek and Roman cultures. Muslims' conquests in Iran, Egypt, India and some realms of Roman Empire were led to their familiarity with scientific achievements of that nations. Establishing of some Roman cities in the Middle East, like Antioch, Alexandria and so on had effective roles regarding transferring their scientific achievements to the Islamic society. It should be noted the role of Jundishapour university in Iran that had an important function concerning transferring sciences to Muslim nations. We also should not ignore the role Christian schools that some Christian scientists had established in some parts of the Middle East. It is also notable to remember that many texts and works were translated to Arabic during the Translation Movement in the fields like philosophy, geometry, music, mathematics, history, medicine, chemistry, astronomy and so on that it took about two or three centuries.

The second scientific source of Muslims' sciences was epistemic teachings of the Quran and Hadith. In this case, the Quran as the most significant revealed book of Muslims, not only was/is as the provider of their monotheistic worldview, but meantime through inviting them to rational thinking, has introduced many epistemic teachings regarding cosmology, natural sciences, history, social sciences, ethics, theology, philosophy, anthropology and so on. In addition, the Quran itself was the first source for emerging and making some new sciences that their first characteristic was Islamic and Quranic virtue. Sciences like interpretation, mysticism, jurisprudence, Hadith, (Islamic Theology) and Islamic methodology were of the Quranic sciences that were grow up in Islamic background. In fact before absorbing other nations' sciences to Islamic civilization, the Quranic and Hadith sciences were firmly established. For example, before Muslims' familiarity to Greek natural sciences, Muslims had benefited from the Quranic data and teachings regarding them (Iqbal, 2017, p. 44). The Quranic teachings, also, had bestowed Islamic and theistic meaning to Muslims' attitude concerning derived sciences that some of them are history, literature, philosophy and even natural sciences. Meanwhile the plurality of Hadiths of Prophet of Islam and Shia Imams had been led to producing the Science of Hadith which was full of epistemic teachings in many fields that Muslims have needed.

Gradual growth of sciences in Islamic nations was led to pass over normal Greek classification, and reintroducing new forms and classifications of sciences that their special virtues were adding the sciences derived from the Quran and Hadith. So meanwhile Muslims have accepted the division of sciences into theoretical and practical ones, but have added new forms of sciences which were included of the Quranic and Hadith knowledge. It is possible to consider Muslims' new sciences in three classes included of Islamic and Quranic sciences, rational and philosophical sciences and natural (empirical) and human sciences. There are also some Muslim thinkers who have divided sciences into Islamic and non-Islamic, or rational and transmitted and so on (Nasr, 2001, pp. 45–48). In these divisions, some sciences like interpretation of the Quran, Hadith, mysticism, jurisprudence, and Islamic theology and history of Islam have been considered as those of sciences that have completely Islamic and Quranic roots, and being Islamic was as their essential virtue. Other sciences such as philosophy, logic, politics and ethics that had mostly Greek roots, through accepting some alterations in their foundations and principles, have been considered as Islamic sciences. Although sciences like physics, chemistry, history, medicine, astronomy and mathematics were derived from Greek, Indian and Iranian sources, but have attracted Islamic virtue. The

collection of derived sciences and Islamic and Quranic ones have made Islamic civilization during 8<sup>th</sup> to 12<sup>th</sup> centuries that is called as *the golden age of Islam*. In this research is tried to show that the sciences have been formed by Muslims in the golden age of Islam, had/have Islamic virtue which was made under Islamic and Quranic teachings and worldview.

## 1. The Nature of Islamic Science in the Golden Age of Islam

With historically considering the growth of Islamic science during 8<sup>th</sup> to 12<sup>th</sup> centuries, now we are encountered with this question that: what virtue did derived and Quranic sciences have which can be called as Islamic sciences? In this case, 8<sup>th</sup> to 12<sup>th</sup> centuries have their own significance. This era which is called as the golden age of Islam, is the age that Muslims could make Islamic civilization having its own scientific, cultural and moral virtues through benefiting from derived sciences of other nations, and Quranic and Hadith knowledge. This is historically clear that Quranic invitation to searching for knowledge in any possible way have caused to attract other nations' sciences and translate them to Arabic language during the Translation Movement. In addition to this, suitable circumstances of Islamic societies and tolerance of some Muslim states have been caused the migration of some Christian scientists to Islamic lands so that they had transferred their scientific heritage to that lands which speeded up translation of derived books within which Muslims translated many books regarding philosophy, medicine, astronomy, mathematics, literature and so on (See: Gustve Lubon 1968, p. 68). The more important point, however, concerning derived sciences was that Muslims were not merely passive receivers of other nations' sciences, but they benefited from Quranic and Hadith sciences, from one hand, and had mental creativity and innate talent regarding synthesizing and analyzing derived data for producing new sciences. So after translating and absorbing derived sciences, was started the stage of Muslims' scientific innovation and mental creativity that its result was appearing new forms of natural sciences and humanities in that era.

Therefore, Muslims have established Islamic civilization which has some significant aspects and virtues, its first aspect was originated from the Quran and Sunnah of Prophet Muhammad and some Shia Imams and scholars, that its result was introducing some Islamic sciences like interpretation, jurisprudence, Hadith, Islamic history, Islamic theology and even some natural sciences like medicine. In this case Quranic sciences have played effective role (Iqbal, 2017, p. 150). Other aspect of Islamic civilization was attracting other nations' sciences and giving them Islamic context, namely they have rebuilt and reproduced derived sciences based on their Islamic worldview and mental creativity and new innovation. So historical studies show that most cities of Muslim world have participated regarding attracting and digesting and reproducing Islamic sciences (See Zaydan, 1977, p. 257).

So with considering the totality of scientific culture of Muslims in the golden age of Islam, it seems it can be possible to speak about Islamic science in that era. Regarding this matter, we should pay attention to three points: first, the quality and measure of Muslims' acceptableness from Islamic and Quranic teachings, second the quantity of their benefiting from other nations' scientific achievements, and third how did Muslims change regarding derived sciences based on their innovation and creativity. This historical fact has been accepted that the most effective factor and guider of Muslims for attracting other nations' sciences were the Quran and Hadith, namely Islamic worldview, since in Arab peninsula and Islamic lands, it is only after appearance of Islam and making Muslims societies in the light of Islamic worldview that such scientific movement was started and flourished. In addition, the role of Islamic worldview was not only a guidance role, but it plays more influential roles by introducing religious teachings based on theistic belief and epistemic presuppositions concerning the world, human being and other existents, and by inviting Muslims to contemplate on them. This was led to invite Muslims to use their reason with its theoretical, practical and instrumental aspects regarding the whole system of being, in particular the natural world in order to benefit from divine blessings.

The second background and required factor regarding Muslims' scientific movement was the Prophet Muhammad's words and Shia Imams' hadiths, especially their scientific trying during the end of Umayyad and first part of the Abbasids ages. Martyr Mutahhari, one of Iranian contemporary thinkers, in this case, emphasizes on the importance of the science of Hadith and shows its role concerning Muslims' scientific developments. He says: "Muslims first motivation for learning,

gathering and telling many Hadiths are, firstly, related to their needing to Hadiths in religious affairs, secondly the Prophet of Islam, had repeatedly asserted and encouraged Muslims to record his words and transfer to posterity” (Mutahhari, 1993, p. 405). The significance of this is that Muslims before encountering with other nations’ sciences, have formed their own philosophical, theological and legal frameworks that its result was that not only they were not passive receivers of other nations’ sciences but have attracted and reformed and rebuilt derived sciences based on their own theological and philosophical frameworks. So, although a part of Muslims’ reproduced sciences were derived sciences from other nations but they have been reconstructed under Islamic worldview. In other words, if we consider some factors, like foundations, presuppositions, methods, subjects, theories, laws, aims and applications, as the factors that make the nature of science, it seems Muslims have reformed and rebuilt such factors regarding derived sciences from Greek, Iranian, Indian and Egyptian civilizations and added or attached Islamic virtue to them that Towhid (Monotheism) was on its top. Therefore the goal and end of derived sciences was changed based on Islamic framework, then some theories and laws were altered, and revealed method was added to Greek rational one. Regarding natural and empirical sciences, we can pay attention to the role of experience in the context of Islamic science.

In fact, Muslims, in confronting with derived sciences, had achieved some main acts, first, had attracted other nations’ sciences through translating their works, second, had absorbed and localized derived sciences based on Islamic worldview, its result was absorbing some parts of derived sciences and repelling some other parts. Third, they had tried to reread and rebuild Islamic science based on Islamic teachings. Muzaffar Iqbal says that most parts of derived data and theories were not merely passive translations for transferring to Europe, but translated texts were assessed through examination, experience and other methods. He believes that prior to translating other nations’ sciences, there were some sciences like astronomy, chemistry, medicine and mathematics that was as established research fields of Muslims. In fact it can be said Islamic civilization like other civilizations, was/is defined based on its religious beliefs system, and prior presuppositions and moral and legal frameworks. This framework based on Islamic worldview has made a central core within which have been grow up internal relations between science and religion and flourished in Muslim lands (Iqbal, 2017, pp. 57–58, 64).

In addition to mentioned cases, we should remark about Islamic methodology. In this case, Islamic rational tradition has benefited from the teachings about being hierarchical stages of sciences and integrity between methods regarding acquiring knowledge. Hence there are plural and different methods and ways concerning recognizing the reality, and all of them are legal ways based on Islam, and they have a kind of internal relations. In this approach, all scientific methods like observation, examination, logical thought, mathematical analyzing, and even rational interpretation of sacred texts have had effective roles regarding Muslims’ scientific struggling. They have discussed and argued not only based on rational and empirical data but based on revealed data and teachings. These plural and different data not only have not been led to theoretical conflicts, which make impossible to find solutions, but have been concluded to reinforcement and completing scientific data (Bakar, 1996, vol.4, 1681-1682).

In short, theistic frameworks of Islamic worldview has made a background and structure within which Muslims have recognized real and coherent picture of the system of being, and then based on this worldview, they could not only attract and absorb other nations’ sciences, but also rebuilt and redefined them to produce Islamic sciences. The result of this great evolution was not only establishing an Islamic science having its own characteristics, but making Islamic civilization and culture that have dominated on the Middle East for some centuries and other nations, like western ones, have benefited its fruits for next centuries (See: Iqbal, 2017, p. 75).

## **2. Some Aspects of Islamic Science**

As it was explained, Islamic sciences that was made in Muslim societies had two forms, the first was Islamic science derived from the Quran and Hadith, the second was Islamized sciences derived from other nations. Here, it is noted on some scientific developments concerning these sciences, and is tried to show the role of the Quran and Islamic worldview regarding the growth and next developments of these sciences.

## 2.1. Islamic Theology

It seems Islamic theology is as the most significant samples of rational and transmitted sciences that has benefited from rational and transmitted teachings of the Quran and Hadith, since most issues and theories that were gradually formed within Islamic theology had/have the Quranic roots. In fact, the science of theology has required to rationally review and study Islamic faith which its backgrounds had been introduced in the Quran and Hadith. Hence, it is seen that there are many theological issues and theories that had been planned in the Quran and Hadith through different ways that some of them are as follow: the theory of creation, the problem of destiny and providence, divine attributes, the nature of faith and impiety, the quality of resurrection and life after death, the outcome of sinners, compulsion and freewill, virtues of paradise and hell, and so on that were samples of those issues and theories that their forming and growing during the early Islam was led to form Islamic theology as the most important characteristic of Muslims' rational and transmitted thought before the Translation Movement. Here the notable point is the role of many factors regarding the Quran's effectiveness in making Islamic theology. Some of these factors were included of: 1. Rational and basic introducing of most theological issues and theories in the Quran, 2. The importance of the Quranic verses regarding Christian and Jewish beliefs that were led to theological debates, 3. The Quranic invitation to the best controversy and thought that was easily caused to and extended rational thought and logical confronting with opposite religious thoughts.

So it is considered that the primary introducing of rational questions and problems was started from early Islam simultaneous to descending the Quran in the form of theological issues. Some of these issues and problems were questions that were exposed to discussion through Christians and Jews of the city of Medina against the Prophet of Islam. After the death of Prophet of Islam, the most significant and basic religious and theological question that Muslims were faced was the problem of his successorship that has differences in Shia though as the teaching of Imamate and Sunni thought as the teaching of Caliphate. This problem was trying to answer these two questions related to political philosophy; who are competent for governing? And what is the best methods regarding political governing? During the first four caliphs and Umayyad dynasty, Muslims' theological questions were increased that were led to appearing and making many theological denominations that have their own religious and theological questions and were trying to find their answers based on their theological thought. Some of more significant theological issues are included of divine destiny and providence, the judgment of great sins' perpetrated, divine will and unjust acts, the creation or oldness of the Quran, the nature of divine attributes, the relation of divine essence and attributes, and the essence of faith. These issues were questioned in that theological atmosphere and had plural aspects and then changed to philosophical issues (See: Golpayegani, 1999, pp. 124–138). The significance of these issues were that they, prior to emerging rational and philosophical movement under the influence of Greek philosophy, have shown the place of rational contemplations and discursive struggles of Muslims. Ayatollah Mutahhari says: "Muslim theologians, before translating Greek philosophical books, have taken action in some rational and discursive debates, since they were the closest intellectual groups to philosophers that this fact is indicated very long life regarding Muslims' rational tradition which has the Quranic origin before the entrance of Greek philosophy" (Mutahhari, 2006, p. 5: 21). He believes that theological issues have been introduced by Muslim theologians have much helped Muslim philosophers concerning God and divine attributes and other theological issues related to the relation of God and the world and human being (Mutahhari, 1988, pp. 19–21).

## 2.2. Islamic Philosophy

The second sample of growing of Islamic science is Islamic philosophy. Islamic wisdom and philosophy, also as the most important aspect of Muslims' intellectual thought, had been formed after translating Greek philosophers' works and appearing some Muslim philosophers like Al-Kindi, Farabi, Ibn Sina, Zakariye Razi since 9<sup>th</sup> century, but two centuries before it, most of philosophical issues were introduced in the Quran and Hadith and developed by Muslim theologians that shows the long life of Islamic intellectual tradition. So Islamic philosophy has been made and grow up based on Islamic rich heritage of the Quran and Hadith and Islamic theology, from one hand, and befitting from Greek philosophy from

the other hand, while the Quran and its rational teachings not only have played effective role in providing the bases and theories of such philosophy, but also have affected its form and context. Hence from the beginning of Islamic philosophy forming most of its issues and theories, about God or absolute being, levels of the whole system of being, humankind and his/her perfection and resurrection, has its own meaning and possibility (See Nasr, 1996, p. 1: 69). In other words, theology, cosmology and anthropology that were made before growing Islamic philosophy, were under the influence of the Quran. Muslim philosophers, also, were confronted with some religious and rational issues like the meaning of revelation, the teaching of creation, the problem of world creation or oldness, absolute or limited being, God's knowledge to universals and particulars, eschatology, divine attributes, the relation of God's essence and attributes, human being's freewill, and so on that they have tried to give philosophical interpretation regarding these issues based on the Quran (See: Nasr, 1996, Vol.1, 55-69). Here, regarding Muslim philosophers' thought, we can consider the most significant effect of the Quran based on ontology, which its result was that Muslim philosophers have interpreted essential philosophy of Greek into ontological one. Among mentioned issues, considering revelation as one of the most important sources of philosophical knowledge and speaking about Prophetic Wisdom and Philosophy, is as the unique virtues of Islamic philosophy under the Quranic influences (See Nasr, 1996, p. 61). Here we try to show the quality of the Quran's influences on some philosophical thought of the first Muslim philosophers like Farabi and Ibn Sina.

The most significant effects of the Quranic teachings regarding Farabi's philosophy can be seen in his viewpoints related to some philosophical issues like: Towhid (Monotheism), God's attributes, the sameness of God's essence and attributes, divine simplicity and unity, God's knowledge, the creation of the world, the relation of the Prophets and philosophers, philosophical interpretation of revelation and Prophethood and King-Philosopher theory. He in his philosophy, calls God as the first cause and the first being who is worthy for simplicity and unity and is immune from any combination and defect. His God's essence and attributes are the same, and as far as God is the final cause of all things, His knowledge covers all of them which is originated from his knowledge to his essence (See: Farabi, 1991, p. 47, 1993, A, p. 45). In his theory of creation, Farabi introduces a combination of Platonic emanative theory and the Quranic theory of creation according to it there is no aim for God in his creation, since He is self-sufficient, but the creation of the world is the result of God's emanation and his inseparable requirement. He also pays attention to the problem of creation or oldness of the world, and thinks that its temporal oldness does not indicate its' needless to the creator which this argumentation is related to Farabi's division of existents into needy and needless or necessary or contingent beings. Also, one of his issues related to the Quranic knowledge is his philosophical analyzing of the place of the Prophet and its pertaining to the Philosopher that is done by Farabi's analyzing of dream. He calls true dream the same as the Prophets' unseen news, like revelation, and thinks that from one hand the revelation is achieved through getting to Acquired Intellect (Al Aqal Al Mustafad), and from other hand through perfection of imaginary faculty (Farabi, 1991a, p. 52). Farabi, finally, in his political philosophy divides cities into mundane and Utopia ones that has platonic root, but links it to the Quranic conceptions. For example, his understanding of King-Philosopher is like the Quranic interpretation of the Prophets. He says the head of Utopia is who his intellect is perfected and reached to Acquired Intellect and like the Prophets is worthy to receive divine revelation (Farabi, 1991b, p. 65-66).

Regarding the Quranic roots of Ibn Sina's thought, we can concentrate on the central role of ontology in particular issues like distinguishing Being from Essence (Mahiyat), division of existents into necessary and contingent ones, his understanding concerning spiritual and corporeal resurrection, otherworldly reward and punishment, the quality of God's being and attributes, and his explaining of the argument for the existence of God, known as Contingent and Necessary Argument. Concerning Ibn Sina's ontology, it should be said that he posited it as the base and center of Islamic philosophy, which has no background in Greek philosophy (Nasr, 2013, p. 70). He divided Being into necessary and contingent one which has had an effective role in next Islamic philosophy and effected medieval philosophy of the West, especially philosophers like Thomas Aquinas. This division was based on primary distinguishing between needy and contingent being from needless and necessary being in which God is the only necessary by existence and all beings other than God are contingent beings that have quiddities and are in needing. This division also is led to show that God is a pure being and has

no quiddity that is based on and originated from the Quranic teachings, and is different from Aristotelian understanding of the First Mover and Substance (Ibid, p. 71). In fact, such distinction was not questioned for Aristotelian philosophy, since Aristotle had played attention to the substance of those quiddities that have external existence, while Ibn Sina introduced the quiddities that have no external existence and are created based on God's will (Ibid, pp. 79–81). In addition to this, the theory of divine emanation, which was introduced by Plotinus, has been linked to Ibn Sina's understanding of God's unity and simplicity that according to it all other than God are as his manifestations and have been emanated from him eternally. This fact makes possible to explain the world's temporal oldness and essential creation which is compatible with the Quranic interpretation of creation (Ibn Sina, 1997, pp. 289–308). In fact, Ibn Sina's theistic ontology, based on teachings of the Quran, enables him to consider God as self-sufficient necessary being, pure and simple existent without any partner in his divinity, as the origin of the world, the knower, the omnipotent and self-alive being that has no plurality in his essence, and his attributes and essence are the same (Ibn Sina, 1997, pp. 49–55; 2002, pp. 267–270). Among divine attributes, the most significant one is God's unity and oneness that is as the center of Islamic philosophy and theology that has the Quranic root. In addition to mentioned cases, it should be said about Ibn Sina's viewpoints regarding corporeal and spiritual resurrection, since he thinks he can philosophically explain only spiritual resurrection and should believe in corporeal resurrection and forever rewards and punishments based on the Quranic teachings (Ibn Sina, 1987, pp. 460–475). He finally regarding practical wisdom and its divisions into four sections including ethics, home economics, politics and laws, believes that the last one is possible only through prophecy and that the base of practical wisdom is derived from religion and legal laws. In this case, he emphasizes on the importance of prophecy and divine revelation which are necessary for human being's life and social evolution. This view point shows the effective political role of the Quranic teachings concerning Ibn Sina's thought (See Eshkavari, 2011, p. 381).

### **2.3. Islamic Natural Sciences; Medicine**

The third sample of the growth of Islamic science in the golden age of Islam is natural and empirical sciences. It is needed to mention that the Quranic approach to the natural world is an inclusive one which has primary and effective role regarding making scientific tradition in Islamic civilization. The characteristics of the Quranic approach to the natural world is linking ontology and genealogy with the idea of God. Based on this approach, the science as a systematic study of the Nature cannot deal with it as unfamiliar with Islam, but it is a part of the whole system of created beings. Hence the Quran considers the Nature as a widespread and dynamic system that is in flux and motion not in inactivity. The Nature as whatever exists between the earth and heaven, obeys divine commands, and acts according to it. The Nature that the Quran describes is not a self-sufficient, automatic and chanceful thing, but is a developed system that its parts are linked to each other and have coherency and are ontologically dependent on the creator God (Quran, 24: 41). So the universal axis of the Quran's approach to the natural world and its relation to God and human being is included of three concepts that are theism and its related concepts, divine agency in the world and the quality of coherency of the Nature. In fact when has been appeared the study of the Nature in Islamic tradition as a distinct discipline, it has found its place in the framework of longitudinal classification of the knowledge. In short, such the longitudinal classification determines a paradigm that is based on the Quranic roots of knowledge. So all derived natural data from other nations, in particular Aristotelian natural philosophy, has been reread and rebuilt in the light of frameworks of the Quranic worldview (Iqbal, 2017, p. 49, 70).

With considering the importance of the Nature from the Quranic perspective, Muslims' sciences have achieved many qualitative and quantitative works regarding natural sciences which was under Islamic teachings, while they have adopted creative and critical approaches. In this case, they by absorbing different forms of natural sciences, have given to them Islamic and local virtues and colours, and entered to them many Islamic teachings. So one of the most significant virtues of natural sciences was their internal and essential linking with the Quran and Hadith.

The science of medicine was of those sciences that has developed astonishingly in the context of Islamic civilization. Although there were many important medical data derived from other nations, but the Quranic and Hadith medical teachings were efficient. Meantime, Muslim's medicine have believed in deep linking between the soul and body that

was under the influence of Islamic worldview. Brilliant developments of the science of medicine in the golden age of Islam and after that shows the appearance of Muslims' Medicine having its completely Islamic characteristics. In fact, Muslim physicians, through absorbing medical data of other nations like Greek one, never have imitated their patterns, but criticized and added to them many new Islamic data. The book *Al Hawi* of Al Razi and the book of *Al Qanoun* of Ibn Sina were as the best samples of medical encyclopedia and work having Islamic context. The latter one was taught at European universities until recent centuries. One of interesting philosophical and medical viewpoints of Ibn Sina is that he considers that adhering to medical orders as the primary condition is for receiving divine healing and recovery. In fact the base of Islamic medicine is to attract healing and recovery from the spiritual world and wise God that was emphasized in the Quran (Quran, 17:82). So all medical acts are considered as only the providers of healing backgrounds from God. In fact, it should be noted that most of Muslim physicians were as philosophers that was led to their philosophical and religious approach to the science of medicine and to cure illnesses.

Based on this fact, Ibn Sina calls his best medical book as *Al Qanoun* (the laws) to show that the final aim of the science of medicine is to adhere the mundane world's orders and laws, his most significant metaphysical and philosophical book, however, known as *Al Shifa* (healing) indicates that the real healing is given by God and the spiritual world not by corporeal instruments. The medical importance of *Al Qanoun* was so much that one of Muslim thinkers says that if Hippocrates and Galenus were alive, they should prostrate before this book (Nizami, 1948, p. 79).

There were, also, some collections of medical Hadiths of the Prophet of Islam and Shia Imams that help us to speak about the prophetic medicine that have had many effective results in the Muslim world.

## **2.4. Islamic Cosmology; Astronomy and Physics**

Islamic cosmology is one of brilliant Islamic sciences that has directly rooted in the Quran and Hadith. Islamic cosmology is relied on hierarchical levels of mundane and spiritual universes that all of them are creatures of God as the creator who has created them for a specified goal. Some of the most significant issues of the Quranic cosmology are about createdness or oldness of the world, the problem of creation from nothing, the existence of several universes and planets, and moving and rotation of all beings in cosmic system that all of them are relied on divine will. It should be said that the most important cosmological and philosophical problem was about: how is divine agency in the world? Based on such questions and issues, within Islamic civilization was made a cosmological tradition that was relied on interpreting the Quranic data, and Hadiths of Prophet of Islam, and rereading them by next thinkers during further centuries through completing by scientific observation and examination. There are some interpretive works regarding cosmological verses of the Quran that their basic virtues are introducing and rebuilding Islamic cosmology prior to translating scientific sources of other nations. So Islamic cosmology has directly rooted in cosmological verses of the Quran that for example are explained in some verses like Baqarah/255, Nour/25, and Qalam/1. These verses, which have lexical specific system have given a certain cosmological attitude to Muslim scientists through introducing some ideas about createdness, temporality, effectiveness, and cosmological hierarchy. Essential virtue of Islamic cosmology was/is its basic conflicts with Aristotelian cosmology and the necessity for passing it over. This main task was happened in Ibn Sina and other Muslim cosmologists. Regarding Ibn Sina's cosmology, contrary to Aristotle's one, the distinction between being and quiddity is ontological distinction and that the whole cosmic system is finally ended to God not to Aristotelian plural gods (Iqbal, 2017, p. 151, 161).

Among cosmological sciences, astronomy has more relations with the Quranic teachings and Islamic narrations. There were some religious requirements like the necessity for determining the direction of Qibla and religious prayers, seeing the Moon and lunar and solar eclipse, in Islamic lands has been caused Muslims to pay more attention to the significance of astronomy. The Quranic order for determining the time of Prayer has been led to the growth of some branches of astronomy which it directly was pertained to determining the direction of Qibla and times of prayers and seeing the Moon (Ibid, p. 104).

Regarding astronomy, although Muslim astronomers primarily have benefited from Ptolemaist theories, but their critical approach was led to introducing Copernicus' theory of Sun centered by Muslim astronomers. Muslims' developments in astronomy, by making brilliant observatories, have so much importance so that the thirteenth and fourteenth century was called as the golden age of astronomy (Saliba, 1994, p. 252). In this case, the achievement of Maragheh School, that its founder was Khajeh Nasir Al Din Tusi, was as a revolution in the history of astronomy. This school has paved the way for reviewing and reforming the paradigm of Ptolemaist. In this case, Ibn Haytham, of its astronomers, has demonstrated many contradictions in Ptolemaist astronomy. Hence it can't give a correct description from the material world. So we should release it in order to get the better paradigm (Iqbal, p. 109). Having this attitude, the astronomers of Maragheh School have continued their critical approach regarding Ptolemaist theory and were able to make a revolutionary thought in astronomy. Victor Roberts in 1957 has shown that Ibn Shater's celestial pattern was the same as Copernicus one. After that most of historians of science have decisively argued that Copernicus had basically benefited from Muslim astronomers' achievements, although it is not clear how Islamic astronomy was transferred to the West (Kennedy, 1963). It also is shown by recent developments that what is called as the Quarter of Walled Circle of Tycho Brahe was used previously in the age of Khajeh Nasir Al Din Tusi in the Islamic world (Iqbal, 2017, p. 112). Another one of Muslims' innovations was making Astrolabe. Astrolabe for the first time was designed and made in the Muslim world with its special artistic characteristics. Oliver Hoover says Islamic civilization's ability concerning completing whatever derives from others and processing whatever makes beautifully has no sample better than astrolabe (King, 1999, p. 17).

In the science of physics, also, as a branch of material cosmology and a part of natural sciences, although Aristotelian tradition was preserved, but Muslims under influences of some Islamic teachings, like theory of creation, substantial motion and causality, have made essential changes in it. Meantime their approach to it were mostly critical rather than passively acceptance. They have tried to give new Islamic ideas regarding fundamental conceptions of physics like time, space, matter, substance, accident, causality and so on. So we are witnessed to gradually growing of non-Aristotelian physics based on Islamic background. For example, the theory of Balance of Abdol Rahman Khazani, and Umar Khayyam, Beirouni and Razi's struggles regarding non-Aristotelian hydrostatic and mechanic have their own significance. Muslim theologians, pertained to physics, also, have developed atomistic theories so far that time was considered as an atom and causality only from God. From other hand, Razi had an idea of absolute space that was near to Newtonian viewpoint and was contrary to determining Aristotelian plenum place (a place that was occupied by a matter). There were, also, some epistemological and methodological issues concerning the science of mechanic that was led to new ideas, that the possibility of making vacuum and the possibility of mathematical equation were some samples of them (See: Hall, 2001, pp. 319–320).

### 3. Islamic Sciences or Muslims' Sciences

There are some Muslim thinkers who have questioned about the legality of Islamic sciences during past centuries, and have tried to call it as Muslim Sciences instead of Islamic Sciences. Based on this point of view, there is no any geographical border and boundary regarding the science. Therefore it is incorrect to restrict it to Islamic science or Christian or western or Indian ones. In this case, some Muslim thinkers have paid specially attention to the science that was flourished in the golden age of Islam, and argued that the science of Islamic age compared with western modern empirical science and its developments, could not make effective developments and changes that can be named as Islamic Science, and to distinguish it from western and eastern sciences. Prof. Pervez Hoodbhoy, a Pakistani physicist and thinker, is one of those thinkers who in opposition to the idea of Islamic science, have denied such a science in the golden age of Islam. He in his book, *Islam and Science; Religious Orthodoxy and the Battle for Rationality*, studies many aspects of science and how it's entering and growing and the kind of politics and religion's dealing with it in the Islamic world during 12<sup>th</sup> to 14<sup>th</sup> century. Then he asks this question, did the sciences that Muslims have developed and grow up, have Islamic identity to the extent that can be called as *Islamic Sciences*, or they had global origins and was called as Islamic sciences because of Muslims' more eligibility (Hoodbhoy, 2005, p. 201). He regarding answers to these questions, tries by mentioning some samples to show that the science that Muslims had made had no so much independent identity like western science that can be called as

Islamic science. Meantime it could not originate basic developments and was not changed to technology. Based on this, Hoodbhoy says: “the basic note is that there was no coexistence and correlation between science and technology in ancient civilizations, such as Islamic one. The ancient science was not led to progressing agriculture, house building, textile and even military industries. The ancient technology was often empirical, temporal and without any theoretical and practical foundation. The science essentially was a category for more learning books and dealing with debates, and has been tried to rarely apply its functions” (Ibid, pp. 212–218).

Hoodbhoy, then, declares that the main causes concerning growing of Islamic science in the golden age of Islam was due to Muslim Caliphates’ knowledge friendship, while this science was limited to intellectuals and high classes of Muslim societies, and has not notable functional and quantitative progress. He says probable applications of sciences in the golden age of Islam as systematic methods with theoretical supports was so much scare that could not affect the technology of its time. So the Islamic science had never able to make economic organizations, and had not built any economic basic act, and had not made any expert association (Ibid, p. 214). He then remarks regarding keeping away people and some clergies from attaining wisdom through some philosophers like Ibn Sina, Al Kindi, Razi and Ibn Rushd, and argues that the reason for this was their fears from the dangers regarding spreading wisdom and science in the society which its result was people’s stimulating against philosophers through clergies. Hence, albeit of Islam’s more emphasizing on public seeking for knowledge, the science was restricted to independent scientists and governors. Hoodbhoy, however, himself pays attention to the role of Islamic science in the West, and even considers it as an unresolved mystery. He says with considering all notes, it has been an unresolved mystery until now: “Islamic science was continued for six centuries, hence it has superiority to ancient Greece, the middle age’s Christians and even modern science. That how Muslims had succeeded to keep this continuation, is always an unanswered question” (Ibid, p. 215).

Hoodbhoy with saying these notes tries to pathologize the problem of Islamic sciences. Hence regarding the answer to his question that: “why had not happened a scientific revolution in Islam”? He, then concerning inability of Islamic science refers and remarks five causes and factors that are included of: 1. Factors related to Muslims’ method of thought and philosophy, 2. Factors pertained to educational methods, 3. Factors concerning to the special nature of Islamic laws, 4. Factors regarding weakness or lack or shortage of economic and social organizations like autonomous cities or trade unions, and 5. Factors arising from virtues of Islamic politics.

Finally, although Hoodbhoy pays attention to some brilliant aspects of Islamic civilization, but does not consider philosophical, social, political, cultural and economic conditions of Islamic centuries as qualified circumstances for making Islamic science, then he prefers to use and call as Muslim Sciences instead of Islamic Sciences.

It seems Hoodbhoy’s pathology and some other thinkers’ critical approach, even those who opposite to Islamic science, clarify some facts. For example, emphasizing on growing of the culture of Islamic determinism is undeniable fact that had/have harmed too much Islamic scientific and philosophical thought. It should be noted, but, that being Islamic regarding science in the golden age of Islam was a category different from its declining during next centuries. In other words, we can explain the nature of Islamic science in this way that regarding philosophical thought of Islam there was a kind of hierarchical relations between sciences and they have been seen as a united and integrated knowledge that the science of Towhid has been posited in their top, and that this united knowledge has been defined within the framework of Islamic worldview. In addition to this, it was very Islamic science that was used as the base of European further investigations so that they by using Muslims’ scientific data have achieved astonishing successes. In fact, Islamic science itself had some potentialities that Europeans have applied them easily, and perhaps Islamic science had not been used as the base of their progresses, they have not achieved such successes yet. The relation between Islamic science and people’s social condition, however, is needed more investigations, that is, despite Islamic emphasizing on the generality of knowledge, it seems it had not been happened in the golden age of Islam. Some of its causes are governors’ policies and scientists’ fears. But at the same time every curious Muslim had the freedom and opportunity to individually seek for knowledge and achieve scientific successes.

On the other hands, it seems there were some deterministic theological thoughts that were supported by Abbasid caliphates and some political interests have had effective roles regarding restricting science to some special classes. We also should notice the role of some superficial clergies who have tensioned free thinkers and even threatened them to excommunicate. Some samples of these problems can be found and seen in the life of Ibn Sina, Razi, Ibn Rushd, Hallaj, Einol Quzat Hamadani, Suhrawardi and Mulla Sadra. For example Ibn Sina was of those thinkers who had troublous during his life and there were some people who had tried to excommunicate and execute him. Muhammad Gazzali as the most conservative thinker of that time called him as disbeliever (Kafir) due to transferring Aristotelian philosophy to the Islamic world (Watt, 1953, p. 32).

All of these problems, but, have not been caused to disintegrate Islamic identity of science in that age, since we should not expect functions of Islamic science as much as western science. In fact, every science is directly related to human being's objective requirements, that it was the social, economic and political needs of the West that caused that its derived science led to modern discoveries and innovations. In addition to these, it should be paid attention to six centuries continuation of Islamic science and its extension in most branches like theology, philosophy, natural sciences, mathematics and so on and its notable role regarding making modern civilization. Liberi, in this case says if Islam and Muslims was omitted from the history, the age of scientific revolution of Europe was delayed for some centuries. Louis Henry, also, confesses that Muslims' contribution regarding scientific heritage and mathematical knowledge is to the extent that is needed very long time to assess its value. He believes that concerning the science of mathematics and algebra, we are indebted to Muslims, and European mathematical revolution was arisen from the role of Arabian numbers that Europeans had derived from Muslims (See Halabi, pp. 71–72).

So Islamic nature and identity of science in the golden age of Islam, not only could continue this science for six centuries, but also through transferring to western culture had played effective roles. Hence if Islamic science could not have achievements like western science, this problem is not related to the identity of Islamic science, but is pertained to thought of people of that age. This problem also is related to the depravity of governors and deterministic thought of some religious clergies, and people's social and religious requirements and circumstances. In other words, the collection of political and religious changes was led to negate the functions of Islamic science.

So we can enumerate some different social, political, historical and theological causes regarding Muslims' declining and Islamic civilization's mustiness. Among historical causes can be considered Mongols attack, Tamerlane's attack and the Crusades wars have more importance. Among political causes, we can indicate changing the Islamic government to the Monarchy government, and the prevalence of monarchical government and tyranny way. From theological causes, it can be possible to speak about Muslims' theological determinism that had restricted the chance for wise and liberal philosophers, thinkers and scientists. Finally, from social causes, can be cited people's epistemic ignorance that albeit of Islam and the Prophet Muhammad's emphasizing on searching for knowledge, they had not played enough attention to the science that this was led to their less social progress. Hence we can understand, by the words of Will Durant, the depth of Muslims' problems regarding unusual collapsing of Islamic civilization. He says: "no one of the civilizations of history, like Islamic one, have been involved such a sudden corruption, for example Barbarians had conquered the Roman Empire gradually during two centuries, but Mongols' attack had been only for forty years, they had not come to conquer and stay, they had wanted to kill, plunder and carry out the results to Mongolia. When have been calmed down Mongols' attack, whatever was remained were corrupted economics, ruined and blind Qanats, burnt schools and libraries, poor and disunited states that could not govern the country, and the people who have decreased to the half and have no morale. After Mongol's attack, unfortunately, have been corrupted the Islamic State due to Epicurean's pleasure, corporeal and psychological tiredness, cowardice and disloyalty, sectarianism and religious ignorance, political corruption and unrest" (Durant, pp. 4: 431–432).

## Conclusion

The experience of the golden age of Islam is shown that although some parts of Muslims' sciences were derived from other civilizations, Muslims, however, were not merely imitators that their acts were saving derived sciences, but they had attracted other nations' sciences, then absorbed some of them and repulsed some others, and rebuilt the absorbed ones. In fact they had used creative and critical approach regarding derived sciences. Hence Muslims, in the golden age of Islam, could enter many changes in derived sciences and produce new ones based on Islamic worldview. Reproducing new sciences were relied on the role of three factors including attracting other nations' sciences, rebuilding them based on Islamic teachings and using the Quranic and Hadith (narrative) epistemic sources that finally was ended to producing Islamic science. So whatever Muslims have rebuilt in the golden age of Islam was qualified to be called as *Islamic Science*. Since it was done in the light of and based on Islamic worldview. We also should pay attention to this fact that Muslims' hierarchical attitude to the whole system of being was led to making Islamic science which has the structure of hierarchical levels within which every science has its own place and function not as disjointed part of sciences. Therefore, Islamic science is a science sees the natural world as the sign of One God. It also is a science that rationally uses natural blessings for human being, meantime there is a real and objective link between human beings' real needs and scientific investigations. Muslim thinkers and scientists have also considered God as the origin of all knowledge, and through making a longitudinal relation between all sciences, have linked all religious, philosophical and natural sciences and knowledge together. The result of this attitude is to presenting a coherent picture of the whole system of being, in particular the natural world and its logical relation to God and other universes. The extensive effects of Islamic science in the Middle East and Europe regarding producing western modern civilization is as a reason to be called as Islamic sciences, since such a scientific revolution was only happened some centuries after the appearance of the religion of Islam in the Middle East.

## References

- Bakar, O. (1996). Science. In S. H. Nasr & O. Leaman (Eds.), *History of Islamic Philosophy* (pp. 926–946). London and New York: Routledge.
- Durant, W. J. (1958). *The History of Civilization* (A. Aram, Transl.). Tehran: Iqbal Press.
- Eskavari, M. (2011). *An Introduction to the History of Islamic Philosophy*. Tehran: Samt Press.
- Farabi, Abu Nasr Muhammad (1991a). *The Civil Policy (Al Siyasat Al Madanyiah)*. Beirut: Darulmashrq Press.
- Farabi, Abu Nasr Muhammad (1991b). *Fosoul Al Montazeah*. Beirut: Darulmashrq Press.
- Rabbani Golpayegani, A. (1999). *An Introduction to the Science of Kalam*. Qom: Darulfekr Press.
- Hall, R. (2001). Mechanics. In A. Y. Al Hassan (Ed.), *The Different Aspects of Islamic Culture, vol.4, Science and Theology in Islam*. Paris: UNESCO Publishing.
- Hoodbhoy, P. (2005). *Islam and Science: Religious Orthodoxy and the Battle for Rationality* (P. Matin & E. Qorbani, Transl.). Tehran: Institute for Humanities Research & Developments Press.
- Ibn Sina, H. (2002). *Isharat & Tanbihat* (M. Zareei, Ed.). Qom: Boustan Ketab Press.
- Ibn Sina, H. (1997). *Ilahiyat Shifa* (H. Amoli, Ed.). Qom: Islamic Center Publication.
- Iqbal, M. (2017). *The Making of Islamic Science* (M. R. Q. Nik, Transl.). Tehran: Tarjoman Press.
- Kennedy, E. S. (1963). *Studies in the Islamic Sciences*. Beirut: American University of Beirut.
- King, D. (1999). *Worlds Maps for Finding the Direction and Distance to Mecca*. Leiden: Brill Press.
- Lubon, G. (1968). *The Civilization of Islam and Arab* (S. H. Hosseini, Transl.). Tehran: Islamiyeh Press.
- Mutahhari, M. (1988). *An Introduction to Islamic Sciences, Vol.1*. Tehran: Sadra Press.
- Mutahhari, M. (1993). *Reciprocal Services of Islam and Iran*. Tehran: Sadra Press.
- Mutahhari, M. (2006). *The Collections of Works*. Tehran: Sadra Press.
- Nasr, S. H. (1996). *History of Islamic Philosophy, Vol 1: History of Islamic Philosophy*. London and New York: Routledge.
- Nasr, S. H. (2001). *Science and Civilization in Islam*. Chicago: ABC International Group, Kazi Publication.
- Nasr, S. H. (2013). *The Islamic Intellectual Tradition in Persia* (M. A. Razavi, Ed.). London and New York: Routledge.
- Nizami, Ahmad Ibn Umar (1948). edited by Muhammad Qazvini. Tehran: Armaghan Press.
- Saliba, G. (1994). *A History of Arabic Astronomy*. New York: New York University Press.
- Zeidan, J. (1977). *The History of Islam Civilization* (A. Javaherkalam, Transl.). Tehran: Amirkabir Press.