

The Influence of Culture on Development in Science

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The most important eras of development in science can be recognized as follow¹:

- 1- The Alexandrian Hellenic period,
- 2- The golden age of Islamic scientific development,
- 3- The scientific revolution in seventeenth century,
- 4- The materialistic scientific view in nineteenth century,
- 5- The early twentieth century,
- 6- The twenty first century's changes in scientific outlooks.

Each period has some characteristics which I am going to introduce them:

1- The first period must be understood in relation to the ancient pasts especially Egyptian and Babylonian science. In this period there can be distinguished three minor periods of origination and development of science. In the first one the origination of science among Egyptians and Babylonians and Phoenician can be seen. The origination of arithmetic and astronomy happened in this period about 600 BC.

The second period is the period of greatness of Hellenic civilization and Athenian science after Iran-Greece wars. This period was a glory of attempts in some speculative sciences especially in geometry and mathematics. We find a good origination and development in biology and the basic foundations of physics. In practical science medicine had developed more than other sciences. Engineering especially architecture and irrigation developed in some extent.

The most praiseworthy and permanent scientific activities in ancient period happened in Alexandrians scientific activities. It is the third period of scientific development in ancient period that happened after setting of Hellenic golden age after the victory of Macedonians in fourth century BC. Alexandria replaced Athena as the scientific center of the world. The library of Alexandria provides all that is needed for scientific developments for two centuries. Their activities focus on

mathematics, astrology, literature and medicine in an academic kind of research.

2- After a long time there were no bright activity in attention to the science. The monasticism, which is propagandized by Church made no tendency to developing science. In 8th century after ripening of Islamic civilization, the movement of translation in the Islamic territory caused a revival of Hellenic-Alexandrian thought and science. The tolerance of Muslim thinkers to other sources of knowledge, which is in the teachings of Islam, and the encouragement of Islam for seeking every kind of knowledge paved the pad for a scientific movement in Islamic territories specially in middle east countries. The golden age of Islamic science in eleventh and twelfth century not only was a revival of Hellenic science but also caused a lot of researches and discoveries specially in mathematics, astrology, optics, medicine, and chemistry. The Islamic scientific books transferred ancient sciences to third phase of development in science.

3- The third period is the scientific revolution in seventeenth century. This period had sprouted from thirteenth century, and continued until eighteenth century. The most effective scientific development was in this era. Since this scientific revolution, science played two roles instead of the one before: theoretical and technical roles. Technical influence of science had been insignificant in ancient ages. Technical development in engineering, agriculture, medical sciences, and military influenced deeply on everyday life of people and destiny of societies. This fact showed the importance of scientific development and the necessity of serious and continuous attempts in reaching to new area of development in science. The changes were so effective that could change the underlying level of human culture.

L.W.H. Hull has a good explanation from the phases of this period. He calls the first phase as heavenly geometry and the second one as heavenly mechanics². Although some political, economic, religious, and military movements provided the cultural atmosphere in which the scientific revolution became possible, each phase could make important changes in human thought.

However, the beginning point of this revolution was in the astronomy, both measurement and theories for explanation of movements of stars. Heavenly mechanics culminated to the vision of uniformities of nature in which the Newtonian mechanics could overwhelm all scientific attempts for two or three centuries and also became a principle for all upcoming scientific developments. We will go back to this period later.

4- The distinct aspect of fourth period is the origination of chemistry and biology and geology. Physics could go on developing specially in thermodynamics and electricity. All of these developments owed to atomic theory, which could be revived in its new justification after twenty centuries. This period is called as scientific materialism and brought some kind of atheistic points of view. This accelerated scientific development occurred in late eighteenth and nineteenth century. Science became the absolute governor of thought in this period.

5- The fifth period of twentieth century has been a changing point in scientific view. Although we encounter wonderful technical development and also delirious growth in pure sciences, the role of science as the governor of every kind of thought and the only explainer of world became in question. Scientific dogmas were reviewed; thus the dogmatic thought in science removed little by little. This matter caused serious studies in the philosophical foundations of science, which appeared in the debates of philosophers of science. Abandonment of pure mechanistic view of the world, tendencies to the more free thinking and finding that science must stop explanation of world and should satisfy with description and predication of it, all were the result of accurate study in scientific frameworks in this century.

Another aspect of scientific development in this period is generalization of scientific method to human sciences like sociology and psychology. This attempt began at the end of last period; and in the twentieth century the specialists in human sciences tried to use natural scientific method in their works. Although they succeeded in some extent they encountered a lot of problems to do all of their works in the framework of inductive scientific method.

6- In the last two decades of twentieth century and beginning of new millennium, the serious problems of environment caused a kind of suspicion to technology and its outcomes. Technology based on scientific discoveries must help men for a more comfort life, but its pollution made a lot of problems more than it went to do in helping mankind. Therefore, the absolute value of scientific development and its ability to give convenience to all people went under question. The moral factors with their limitations appeared in all scientific researches. The guided development alternated the free and open one, which had shown itself as a destructive factor of nature, which is the environment of man's life. A return to nature and old fashion account of life before mechanistic troubles happened in this period.

The Cultural Backgrounds of Scientific Developments:

It has been an important question that why these developments of science happened in a certain time and a specific geographic situation. As I mentioned before the most practical changes in human life happened by the third period of development, and a lot of changes had occurred before this third period. Some of these changes were in religious thinking, philosophical view, and some new intercultural relations that changed the vision of intellectual men in that time. I think that these changes provided a context for scientific developments. Thus, if we want to know the reasons for that developments we must study first those cultural backgrounds which paved the pad for it, so that after a long time (18 century from one point of view or 4 century from another one) this development is made possible. Let's study it in details:

There is one plausible question in this respect and it is: "Why the scientific revolution of the third period and also the two ones before happened in Europe and Middle East? And not in Africa or north or South America or Indo-China or Japan or north Asia? What was in Middle Eastern and European culture that provide a good context for the development?" This question is from a geographical point of view, which has been posed by historians as a strange occurrence of the human history. The most important answer that is posed for replying this question is due to religious circumstances of this territory. It is held with a lot of evidences that the theistic vision or religious teachings in Abrahamian religions brought some presuppositions for their believers that influenced on their activities as developing science.

Mankind always was subdued by the powers of nature like floods, volcanoes, powerful animals or thunders. He also had been having a feeling of weakness in front of greatness of some appearances of the world like mountains, sun, stars or big and long rivers. Therefore, based on these two factors, he gave sacredness to the nature for its power and its great appearances. Thus, the deification of the nature and its sacredness had been an obstacle in front of every attempt in prevailing over the power of nature. Man had to worship these sacred things instead of overcoming them. He did not allow to himself to do anything against this sacredness. It caused stopping every kind of developments in science that may be possible through overcoming the nature.

However, this was the theistic religions in Abrahamian ones that posed the "creation doctrine" in which the nature is created by God. In this doctrine the nature does not have any independent power and also being. It is subdued by God and does not have any spirit on its own. It is only ignorant and fool. All power came from the most powerful agent, and every glory in the world is due to His acts. The prophets taught men

that all the nature is not but stones and woods and etc. without any power of doing something for the man. God is the most intelligent being who created all things in the world in the best design. He has given men the intelligence and power to know its acts in the world and can made the nature to be in his service. The creation teaching desacralized the nature, and made it possible to overcoming it without any fear of doing against its alleged sacredness. The doctrine of omniscience of God, which is derived from conclusion of “order and coherence of nature”, brought about the logical design of nature. This logical design showing the wisdom of creator not only his power brought in account that the nature and its activities must be on the basis of general rules of the order of nature. Finding the laws of nature is not but understanding the intelligence of its creator that can give the man more knowledge about Him and His attributes and acts. This knowledge in its turn may bring more love to Him and man will have more obedience for Him. All of these views are favorites of those religions. Therefore, those religions in their essence may encourage man for discovering the laws of nature. This encouragement must not be a direct one, but it can be indirect. Although some peoples were not faithful believers, their cultural context, based on above religious belief, had given them a presupposition that encouraged them to discover the laws of ordered nature. However, the religious tendencies of advance guards of scientific movement are obvious. Galileo’s statements in this respect clearly show this presupposition. He believed³ that the true philosophy and science is written in this great book, namely the world, which is always in front of our eyes. He believed also that our attitude toward finding this true science must be through mathematics, because the design of nature shows us that the book of nature must be written in mathematical language. Newton as the hero of scientific movement had more theological book than scientific one. All the scientists in scientific movement confess to their religious attitude in their scientific works. But some of them had serious trouble with the dogmas of Aristotelian interpretation from Bible.

Therefore, it was two teachings of Christianity as an Ibrahimian religion (not all its dogmas) that brought the cultural context for scientific movement. These two are “the creation of the world” and “the order of nature”. The first one points to the omnipotence of God and the latter to His omniscience. The former encouraged the man to dominate over the nature that is desacralized by its creation by God. I think this teaching was more useful for technical development. The latter encouraged the man to discover the laws of nature. I think this teaching culminated in discovering the purely scientific laws.

Here, another question rises: Why did the development in science postpone until after Middle Ages in Europe if the religious view of

creation might help in that development? Was the church an obstacle in front of developing science? It must be noticed first, in reply to this question, that if the church was sinful for this development then why the other cultures must not be sinful because of their remaining in not developing science. The truth here is that because the essential persuasion of Christian doctrine of creation and design of the world, it was expected that the Church's attitudes must be in this direct. Therefore the Church that is imprisoned in Aristotelian interpretation of the Bible became in challenge with scientists that did their efforts toward what those teachings (creation and design) encouraged them. Yet, Whitehead's view in this respect is⁴: the belief in possibility of science, which had been interfered in origination and evolution of modern scientific theory, has been an unconscious borrowing from Middle Ages' theology. However, it remains the question that why the doctrine of creation could not brought the scientific development earlier. What was the obstacle in front of scientific movement that postponed it until seventeenth century. Ian Barbour's answer to this question is due to some Christian dogmas in that period⁵. The teaching of other-worldliness and persuasion toward monasticism were the main obstacle in front of every attempt toward scientific development. Protestantism could equilibrate in these extravagances.

However, the golden age of Islamic scientific development did not have those obstacles. Therefore, although the Islamic civilization appeared seven centuries after Christianity, its golden age of scientific development happened five centuries before scientific movement among Christians. This was because of some factors. Firstly, the Islamic prohibition of monasticism that is due to the direct teaching of Quran removed that impediment. Secondly, the direct encouragement of Islamic teaching toward discovering and learning the science in every kind and every place, was another context for development of science besides the doctrine of God's omnipotence and omniscience. Thirdly, the tolerance of Muslim thinkers which was according to Islamic teachings in accepting other Ibrahimian religions, paved the pad for every cooperation with other religion especially Christianity; while the doctrine of salvation through Jesus for Christians made no attention to other religions and their thought. But the question that why this light of scientific development was distinguished after two or three centuries must be studied in another research.

At the end I must add some other considerations. First, the scientific movement with its technological developments was so important and all embracing that bring about some new cultural views according to which it made the fifth and sixth period possible for all

peoples with every kind of religion in the world. Second, the scientific development in the third period made some changes in human worldview. The heavenly geometry and the heavenly mechanics removed anthropocentric view and brought in account the humanistic view that culminated in some extent to atheistic thought in eighteenth century. This matter must be surveyed in other places. Third, as Seyyed Hossein Nasr correctly indicates in his book “*Religion and the Order of Nature*”, the sixth period of development in science in twenty first century may not succeed without giving active role to Ibrahimian religions especially Islam. The scientific developments in eighteenth to twentieth century, which brought the feeling of independence from religious instructions based on divine orders, culminated to destruction of nature and environment. The scientific discoveries and technical developments not only did not bring convenience for men but also presented a lot of troubles for him. The only way for man in this century is to go back to religion. All the signs indicate to this return.

¹ - L.W.H. Hull enumerated four periods until the middle of twentieth century. Although he recognizes the Islamic scientific development he does not bring in account this period as an independent one. See, Hull, L.W.H., *History and Philosophy of Science*, Introduction.

² Ibid, fifth and sixth chapter.

³ - Galileo, *The Assayer*, Translated by S. Drake, in *The Controversy on the comets of 1618*, trans. By S. Drake and C.D. O'Malley, Philadelphia: University of Pennsylvania Press, 1960, 183-4.

⁴ - Whitehead, *Science and the Modern World*, pp. 13-14.

⁵ - Ian G. Barbour, *Issues in Science and Religion*, second chapter. Also his book, *Religion in an Age of Science*, first chapter,