



## **The Ethical Implications of the Modern Progress in Science**

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### **Abstract**

Moving from the known to the unknown, creation of devices, and prophecy of the future are the distinguishing features of human species. Throughout the course of history only mankind has been able to comprehend the world and interpret its natural and historical events. On the other hand, the scientific discovery has been possible because the Creator has made the entire universe in perfect orders and precise measures. Hence, nature has been the inspiring and motivating source of knowledge. The systematic processes of nature shifted attention of man to the Creator of the universe and to the research method, since nature functions only in certain modes. The Divine originated mechanisms, such as protein and cell, have guided human talent to the discovery of new technologies. Scientists, motivated by systems in the natural world, and inspired by engines of living creatures, have shown great interest to make new discoveries. The ability to rearrange objects, therefore, lies at very foundation of systematic research and advanced technologies introduced by scientists and technologists. The main objective of modern science, as established by Francis Bacon, is to dominate nature through understanding the procedures which nature follows. This paper primarily aims to present the human ability to unfold the unknown of the natural phenomena and the ethical implications of scientific progress. The article, also, aims to introduce the Islamic epistemology as a potential philosophy of science.

**Keywords:** Scientific progress, ethical implication, epistemology, descriptive knowledge, Islamic philosophy of science.

### **Abstrak**

Beralih daripada apa yang diketahui kepada yang tidak diketahui, penciptaan pelbagai peranti dan membuat ramalan masa depan merupakan ciri-ciri unggul spesies manusia. Sepanjang zaman sejarah, hanya manusia yang dapat memahami dunia persekitaran dan mentafsir kejadian semula jadi serta peristiwa sejarah. Penemuan saintifik dapat dilakukan kerana Pencipta atau Tuhan telah mencipta alam semesta dengan sempurna dan mengikut ukuran yang jitu. Jadi, alam semula jadi telah menjadi pencetus ilham dan sumber motivasi ilmu pengetahuan. Proses-proses sistematik dalam alam semula jadi telah mengalih perhatian manusia daripada Pencipta kepada kaedah kajian kerana alam berfungsi mengikut cara tertentu. Tuhan mencipta mekanisme seperti protein dan sel serta membimbing manusia kepada penemuan pelbagai teknologi baharu. Saintis yang dimotivasi oleh sistem dalam alam semula jadi dan memperoleh inspirasi daripada sifat istimewa hidupan telah menunjukkan minat yang mendalam untuk meneroka dan mencari penemuan baharu. Keupayaan menyusun semula objek telah menjadi asas kepada penyelidikan yang sistematik dan teknologi moden yang diperkenalkan oleh para saintis. Objektif utama sains moden sepertimana yang dinyatakan oleh Francis Bacon adalah untuk menguasai alam semula jadi melalui proses memahami prosedur yang diikuti oleh alam. Kertas ini bertujuan untuk menunjukkan keupayaan manusia membongkar rahsia fenomena alam dan implikasi etika daripada kemajuan saintifik. Selain itu, artikel ini juga memperkenalkan epistemologi Islam yang berpotensi menjadi falsafah sains.

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**Kata kunci:** Kemajuan saintifik, implikasi etika, epistemologi, pengetahuan deskriptif, falsafah sains Islam.

## **Introduction**

The scientific research is possible due to the fact that the entire universe has been created in a perfect order and in precise measures. Objects are formed from different components, nucleus, atoms, and molecules, with great potentials and capabilities of interaction and rearrangement. Things around us act as they do because of the way their molecules behave. Gold and earth are distinguishable only by their very components. The arrangement of atoms in specific but varying patterns culminated into different substances such as the soil, water, air, trees, ash, smoke etc<sup>1</sup>. Theologians and religious adherents use this making and unmaking process of the world as concrete proof for the existence and unity of the Creator. From scientific point of view, rearrangement processes of things are possible only with two main factors: careful observation and precise devices of measurement, i.e., empirical and observational method. Mankind throughout the history has been able to explore a little part of the world due to unsophisticated technologies that were being used. Scientists believe that science and technology are the major components of progress. Science is a method of discovery, i.e. description, explanation and understanding of the natural and human phenomena; while technology is the application of scientific knowledge<sup>2</sup>, which stands by its very nature for skills and practical problem solving. Technologists use knowledge produced by scientists who aimed at proposing the precise and universal scientific theories<sup>3</sup>, while the scientists utilize the technological tools<sup>4</sup>. Both scientists and technologists work with mathematical descriptions of natural laws and test ideas through experiments. Technology merely connotes application of scientific and technical knowledge to solve human problems. Technologists design, and manipulate the operation of useful objects or processes. Human ability to rearrange objects, therefore, lies at very foundation of creating new technologies or devices that help human to develop new knowledge<sup>5</sup>.

The basic purpose of scientific research, according to scientists, is to develop theories and laws, to explain, predict, understand, and control the natural phenomena. They suggested that science must have a distinct subject matter and a set of phenomena which serves as a focal point for investigation. The discovery of the underlying uniformities among these phenomena yields empirical regularities, generalizations, laws, principles, and theories. Through this process, science aims to produce knowledge of the world by establishment of generalizations<sup>2</sup>. Based on empirical

approach and practical technology, the modern science has made deep insights into the natural phenomena and attempting to rearrange the entire physical world. The progress in science and technology, however, holds without parallel development in the other aspects of human phenomenon, such as ethics and moral values. Through the accelerating progress in knowledge creation, new technologies have brought human future and future of entire living species into a critical turn.

## **1. Science and knowledge creation**

Modern scientists, inspired by the natural phenomena and advanced technologies are eager to develop new theories in all scientific disciplines. Unlike the past, the modern scientific research is based on empirical method aided by precise technologies. The observational and practical approach of modern science has led mankind to make crucial steps towards unfolding the secrets of the universe. Birth of modern science was associated with discovery of heliocentric cosmology, which was proposed by Nicolas Copernicus (1473- 1543)<sup>3</sup>. Although, the nature of laws that govern the machinery of living creatures and the rest of the world are universal, however, scientific revolution was caused by study of physical world, especially astronomy and physics aided by mathematics. The focal point of classical physics of Copernicus, Kepler<sup>4</sup>, and Newton<sup>5</sup> was the world at its macrocosmic levels. Hence, laws of motion, orbits of planetary bodies, and gravitation power were the first to be discovered. The modern science and engineering are, however, keen to search the micro-world, the world at its atomic levels. Therefore, technologists now make ever smaller devices in our practical live. Terms, such as "nanotechnology"<sup>6</sup> and "molecular technology" are interchangeably used to describe the new styles of technology. Engineers are using these technologies to shrink the size of their tools and its costs, meanwhile speeding up their operation capacities enormous times. "Increasing speed through decreasing size" is an old story in electronics.

### **A. The Intrinsic devices of nature**

Efforts to project devices and develop technology have a long history. Nature has been the inspiring instructor of mankind since the early stages of human life on earth. Nonetheless, the Creator has formed everything in the universe in precise measures. Birds, bats, and bees have been good examples for designing of flying machines, aerodynamics, and flight projection<sup>7</sup>. The entire universe, macrocosmic and microcosmic, is functioning in accordance to the great systems and

specific orders. Galaxies and stars are working through motion laws such as gravitation power. Biological laws govern all living creatures. Life of complex plants and giant animals begins from a single cell of great complexity. Machines originated by God, such as protein, DNA, and cell, have guided humanity to the discovery of new technologies. The systematic ability to organize is an intrinsic character of nature since nature can exist only in given forms, whether at its most primary constituents at subatomic level or at the level of crystalline structures.

Scientists and technologists, envisioned by these divine originated systems in the natural world and inspired by biological engines of living creatures, have made great efforts to create new discoveries<sup>8</sup>. Scientists, with building devices exact as in the atomic precision have started to examine human genomes<sup>9</sup>. They started to deal with the biological world in the same manner with the physical world. They are shifting from creation of devices and passive substances such as computers, to more complex patterns, such as genetic engineering and biotechnology. Biochemists are already working with these patterns at its human level. When biochemists need complex molecular machines, they still have to borrow them from cells of living creatures. Nevertheless, advanced molecular machines of living creatures have guided them to build nanomachines. Genetic engineers are already showing how second-generation of nanomachines can be built. Computer-aided design systems already have grown, spurred by advances in computer technology. Computer models allow engineers of today to evolve designs even in the absence of tools that required their implementation. Biologists have achieved great advances because they have found chemical and physical explanations for every aspect of living cells, including their motion, growth, and reproduction<sup>10</sup>. Indeed, this knowledge is the very foundation of biotechnology. Ability of enzymes and chemical reactions to form bonds, for instance, has helped scientists to develop machines to control the process. Capacities of future artificial nanomachines might be equal to the abilities of cells. All these technological developments have provided humanity with great ability and deep insights to understand the natural phenomena and an imminent prospect of knowledge creation.

## B. Dreams of scientists

In his “*Engines of Creation*”, chapter 3: *Predicting and Projecting*, Eric Drexler outlined the future of science and technology as follows: “We take pride in our

technology, with our lifesaving drugs and desktop computers. Yet our spacecraft are still crude; our computers are still stupid, and the molecules in our tissues still slide into disorder, first destroying health then life itself. For all our advances in arranging atoms, we still use primitive methods. With our present technology, we are still forced to handle atoms in unruly herds. But the laws of nature leave plenty of room for progress, and the pressures of world competition are even now pushing us forward. For better or for worse, the greatest technological breakthrough in history is still to come..., as we look forward to seeing where the technology race leads, we should ask three questions: What is *possible*, what is *achievable*, and what is *desirable*? First, where hardware is concerned, natural law sets limits to the possible. Because assemblers will open a path to those limits, understanding assemblers is a key to understanding what is possible. Second, the principles of change and the facts of our present situation set limits to the achievable. Because evolving replicators will play a basic role, the principles of evolution are a key to understanding what will be achievable. As for what is desirable or undesirable, our differing dreams spur a quest for a future with room for diversity, while our shared fears spur a quest for a future of safety. These three questions - of the possible, the achievable, and the desirable - frame an approach to foresight. First, scientific and engineering knowledge form a map of the limits of the possible. Though still blurred and incomplete, this map outlines the permanent limits within which the future must move. Second, evolutionary principles determine what paths lie open, and set limits to achievement - including lower limits, because advances that promise to improve life or to further military power will be virtually unstoppable. This allows a limited prediction: If the old evolutionary race does not somehow screech to a halt, then competitive pressures will mold our technological future to the contours of the limits of the possible. Finally, within the broad confines of the possible and the achievable, we can try to reach a future we find desirable.”

Above outline on science and technology is about what is *possible*, what is *achievable*, and what is *desirable*. Moreover, Drexler explains how scientists and engineers can remake the world, saying: “By adapting present technology, we could indeed open the space frontier - but we won’t. Along the path foreseen by the current space movement, human civilization would take decades to become firmly established in

space. Before then, breakthroughs in technology will open new paths. Nowadays, teams of engineers typically take five to ten years to develop a new space system, spending tens to thousands of millions of dollars along the way. These engineering delays and costs make progress painfully slow. In coming years, though, computer-aided design systems will evolve toward automated engineering systems. As they do, engineering delays and costs will shrink and then plummet; computer-controlled manufacturing systems will drop overall costs still further. A day will come when automated design and manufacturing will have made space systems development more than tenfold faster and cheaper... assemblers will open a world of new technologies. Advances in the technologies of medicine, space, computation, production, and warfare all depend on our ability to arrange atoms. With assemblers, we will be able to remake our world or destroy it."

## **2. The ethical implications of scientific progress**

Scientists and engineers, using experimental and observational methods, have achieved dramatic progress in knowledge and remaking of the physical world. However, this progress has been taking place without parallel development in other fields of human concerns, such as ethics and moral values. The entire corpus of modern science and technology is based on secular philosophy, which emphasizes on value-free science. With the accelerating progress in knowledge creation and new technologies, modern science has brought the future of living creatures into a critical turn. The increasing pollutions and contaminations of the atmosphere; chemical toxics; eradication of tropical forests; global heating due to ozone layer holes and the increasing carbon dioxide; all are results of misemployment of scientific progress. The major problem, however, is not only in undesirable outcomes of scientific research but also in the experimental method. In the past, mistakes of scientific experiment, such as a devastating blast or oil spill and a like, used to happen within the nature's cycle, not as a challenge to natural laws. Therefore, the nature's cycle could fix the damage. Hence, if a certain area was polluted, it has to be deserted for a number of years so that natural factors may repair the man-made damage. However, the new methods, such as nuclear research and genetic engineering experiments are so different from the traditional styles, in sense that it completely disregards the biological limits. It is always possible to add genes from virus, bacteria or animals to the plant genetic code

(genome). These experiments could evolve new creatures that the nature's cycle cannot deal with. Such creatures are beyond the domain of natural evolution<sup>11</sup>. Several distinguished scientists, who made important discoveries in the genetic engineering, have turned to stand against experimentation in this field due to its devastating consequences<sup>12</sup>. They have taken into consideration the necessity of integration between the experimental genetic test and the moral values.

"Respect for Nature" is one of six fundamental values of the Millennium Declaration of United Nations, which outlines sixty goals for peace; development; the environment; human rights, etc., which are essentials for sustainable development in the twenty-first century. To promote respect for Nature, the declaration announces that: "Prudence must be shown in the management of all living species and natural resources, in accordance with the precepts of sustainable development. Only in this way can the immeasurable riches provided to us by nature be preserved and passed on to our descendants. The current unsustainable patterns of production and consumption must be changed in the interest of our future welfare and that of our descendants."

Besides the "Earth Charter" of United Nations, various international conferences have been organized throughout the last few decades to reduce the pressure of human activities on the natural phenomenon. One of such efforts was "*International Conference on Chemicals Management (ICCM)*" which was held in Dubai, United Arab Emirates, to discuss issues relating to energy, environment, chemical management, monitoring and early warning. At the ICCM, delegates completed negotiations and adopted the "Strategic Approach to International Chemicals Management," including a high-level declaration, overarching policy strategy and global plan of action. However, while some participants were seemed to be satisfied with the outcomes of ICCM, others argued that it was not sufficiently strong to tackle the world's chemical-related problems<sup>13</sup>. Lack of cooperation in the global community always has been the major factor that hinders good efforts to deal with side defects of scientific progress on human life and the ecosystems.

The above reflection on scientific progress has made it evidently clear that integration of knowledge and moral value is essential. This presentation, also, might indicate that the outcomes of human understanding of

nature seemed to be inhumane. However, the progress of science and technology, in fact, has never been inhumane as far as the methods and objectives of knowledge inquiry are guided by moral values. The foundations of morality and ethical values are, usually, articulated by religious teachings. This fact, again, emphasizes the approach of integration between revealed knowledge and acquired knowledge. The Islamic worldview introduces the universal values which are generally recognized by other religious traditions; therefore, it might be useful to reflect on Islamic epistemology.

### **3. Towards the Islamic philosophy of science**

Sources of knowledge and final objectives of scientific inquiry are distinctive features of Islamic and secular philosophies of science. Revelation is a basic source of knowledge in Islamic epistemology, which aims to develop all aspects of humanity: physically, spiritually, and intellectually. Knowledge of the world in Islamic philosophy is established by two components: descriptive and interpretive. Descriptive knowledge aims to answer “*how*” questions, which address the external order of the world; meanwhile, the interpretive part deals with the causal question “*why*,” which addresses the internal order of the world. According to the prevailing philosophy of modern science, scientists are concerned with the first type of knowledge “*descriptive*,” while philosophers and theologians deal with the second type<sup>14</sup>. According to this approach, scientists might feel that their only concern is to explain how things work, not why they work as they do. They need to know, for instance, what atoms will do, not what atoms themselves are. From the view point of Islamic philosophy of science, however, the integration of both aspects of knowledge inquiry is essential to understand the world and to give meaning to life. A Muslim scientist, as he learns the descriptive part of knowledge, cannot just ignore the interpretive one, because he simply believes that the final objective of scientific research is not only to establish the fact of physical world, but more importantly to establish the Absolute Truth Who gives meaning to our life and being in this world. Therefore, the Islamic philosophy of science considers the natural phenomena and all creatures as clear signs (Ayat) which lead to the Absolute Truth. This implies that by studying and understanding signs one can attain the cognition of the Creator of the signs, and get closer to Him as much as he learns.

The integral approach of descriptive and interpretive knowledge was based on the Islamic worldview, which emphasizes unity of the Creator and unity of human knowledge (*Tawhid*). It means that Allah (SWT) who is the sole Creator and Sustainer of the universe, has made everything in truth, i.e. in precise measures and has set its own purpose of being. Nothing is created for sport or vanity. This view of nature was the foundation of the integrated science that produced and developed by the early Muslim scientists, such as Ibn Sina, al-Razi, and Ibn al-Haitham, who considered knowledge as means to establish faith; when you know more about the created world you can see more evidence of the Creator<sup>15</sup>.

Many of contemporary scientists have expressed their concerns that the modern scientific method which based secular philosophy is insufficient to interpret the entire events of the world. Walter R. Hearn explains that “The self-limitation of science to examining only secondary or mechanical causes should signal immediately that science has no capacity to deal with the existence of a purpose behind the universe. In my opinion to say anything at all about ultimate purpose requires stepping outside the normal boundaries of science”<sup>16</sup>. In this statement Hearn indicating that introducing the interpretive knowledge which provided by Divine revelation is essential to answer all cosmological questions. However, due to certain factors the modern philosophy separated itself from religion, during the Renaissance, and allied with the empirical method of the natural sciences. This step has led to the secularization of the modern science and the scientific enterprise.

Both rational and empirical methods are essential in Islamic epistemology, which is guided by the integral aspects of the Islamic worldview: man, nature, and the ultimate truth. Man is *Khalifah* or vicegerent of God who should reflect and ponder the natural phenomena for two major purposes: material development and establishment of good meaning to life through discovery of the Ultimate Truth. The holy Qur’an requires man to study nature from these two crucial dimensions: nature as a sign of God (*Ayah*), and nature as bounty of God created to be subservient to mankind (*Taskhier*)<sup>17</sup>. From the second dimension the holy Qur’an supposes that the study of nature would enables man to uncover laws of nature which are essential for his material development. On the other hand the holy Qur’an supposes, from the first dimension, that the study of the natural phenomena would, eventually, lead man to the fact that Allah (SWT) is the sole Creator and

Sustainer of the natural laws; hence He is the One behind every movement in nature<sup>18</sup>.

To the above two purposes the Qur'an shifts attention of mankind that nature is operating through two sets of patterns: direct and indirect patterns. It means both types are orders of God upon His created world. The first type constitutes the direct orders of God on His creatures, for instance to stop the burning power of fire, while the second type is reflected through causal order. In other word, the indirect patterns are the physical laws which manifested through causal systems, such as breeding system in animal kingdom and water as major cause of life. The direct patterns are that which reflect the creative power of God on His creatures, such as creation of Adam and Jesus. The holy Qur'an names the direct patterns as "*Mu'jizat*" which manifested by law of (*Kun fa Yakun*); when Allah wills He just say (*be*) to anything so it be. It means this pattern is out of causation system. Many examples of this latter type were occasionally manifested as miracles to emphasize the task of Prophethood and to support messengers of God in their missions to man community. However, according to the Qur'an, the direct patterns will be fully manifested to rule the next world after total destruction of this physical world, which is governed by causal laws.

From the other dimension, the holy Qur'an encourages man to use his talent mind and creative intellect, aided by advanced technologies and observational method, to study the natural phenomena, to ponder the universes, to explore the physical world, and to discover the hidden facts of nature. Observation of causal law can be in nature or in human phenomena. Hence, the Islamic epistemology establishes two main source of knowledge, which are revelation and nature; and three major research areas based upon the method in scientific inquiry. Man's observation of the Divine initiative in the natural phenomena is in the area of "*Natural Sciences*"; which leads to better understanding of the latter; meanwhile, man's observation of the Divine initiative in human domain and history is known as "*Humanities and Social Sciences*." These are three major classification of science in the modern method of scientific inquiry. The study of natural sciences aims to understand the physical environment so that human may have a suitable relation with it. The study of social sciences is intended to understand our social phenomenon and of human institutions in general, so that we may develop a proper relation to society not only the local but also the global society. By studying human civilizations, aided by study of history, we

would be able to understand the society of the past and even of the future. Finally, the purpose of humanities is to enable man to understand his own self; that is his inner aspirations and ideals.<sup>19</sup>

### **A. Foundations of Islamic epistemology**

The major objective of epistemology is to establish the truth on human knowledge. It investigates sources of knowledge, objectives, and methods of attaining reliable knowledge. The focal point of epistemology is the various methods of interpreting the world and understanding its meaning, such as rational and empirical approaches. In the evolution of scientific ideas, there are different ways people claim to know things, such as observation, revelation, report, and intuition. Some of these approaches are immeasurable such as the intuitive approach, while others are objective, i.e. their truth and fallacy are measurable and empirically testable. The modern philosophy of science emphasizes that observation, and experiments are necessary to understand laws of the natural phenomena<sup>20</sup>.

Epistemology and metaphysical assumptions play a major role in shaping the outlook of a scientist or culture within which he works. In Islam, the observational and rational modes of thinking are proceeded from certain epistemological foundations, which is established by the Qur'anic concepts. The most relevant of these concepts are *Taqdir*, *Sunnatullah* and *Taskhir*. The basic epistemological foundation in Islam, however, is established on the Qur'anic fact that Allah (SWT) has taught the first mankind (Adam) all names (Qur'an, 2: 31). Knowledge of the names, obviously, denotes to the faculty of abstract knowledge that encompassing the entire universe. Therefore, Adam could prove his superiority over other creatures, not only by his moral consciousness but also his potentials to attain knowledge of creatures and the Creator. This historical background of Islamic epistemology, besides Qur'anic emphasis on knowledge inquiry has laid down the metaphysical foundation of Islamic philosophy of science, which considers the study of nature as an essential and main gateway to the knowledge of God. Another epistemological foundation is that the Qur'an asserts this orderly universe was being created according to precise proportions and for a specific purpose, which is to be subservient to mankind. The term used by the Qur'an in this context is (*Tashkier*). On the other hand, the term *Taqdir* is used by the Qur'an to bridge the Divine order and natural causation

systems. As a sign of God's power, *Qadar* suggests the orderliness of creation and conveys measures and norms. If things are being acted as they do, if they have a natural disposition, it is because of the measure they have been allotted to by the transcendental power of God. When God creates anything, He places within its laws of behaviour, variously called by the Qur'an as guidance (*Huda*), and command (*Amr*) or "measure" (*Qadar*). (*Qur'an*: 20:50; 87:2-3; 7:54)<sup>21</sup>.

In its philosophy of knowledge, the holy Qur'an analyzes goals and final objectives of science. It explicitly declares two objectives for the entire scientific endeavour: (1) to uncover laws of the natural phenomena which are essential for material development; and (2) to acknowledge the Creator, Who has created this orderly universe. The first objective provides power and development of human community, while the second establishes that faith gives meaning to our life. The holy Qur'an stresses that, even empirical knowledge shall be of little benefit unless it is able to awaken the inner perception of man as to his own situation, potentialities, risks, and destiny. Scientific knowledge is based on observation, yet finally has to strike the heart and to kindle a perception in man who will transform his scientific and technological skills in accordance with the moral perception that will be borne in him. Without this perception, scientific and technological knowledge could be positively dangerous to human future and the entire universe as well<sup>22</sup>. Therefore, knowledge and faith, in Islam, are two indispensable components of human life, knowledge without moral value can be destructive rather than constructive, and faith without knowledge is blind, as expressed by Albert Einstein<sup>23</sup>.

The Qur'an also informs us that the empirical knowledge captured through various sensory faculties, such as *sam'a* (hearing); *basar* (sight), and *fuaad* (intellect) needs support of transcendental knowledge, i.e. Divine Guidance<sup>24</sup>. This implies that sensory knowledge is great for the development of human's physical aspects; however, it is insufficient to lead a successful life, or even it might be dangerous to purpose of being<sup>25</sup>. Therefore, Allah by His ultimate mercy has revealed guidance to the mankind through His prophets and messengers, who frequently conveyed the message of God to mankind, not only to teach ethics and mortality but also to introduce the possibility of attaining knowledge of the physical world through revealing the miraculous events<sup>26</sup>. The primary task of the prophets, however, is to remove the *plea against God* by awakening man's conscience so that he can

reflect on the natural phenomena and his true nature, and be able to decipher the primordial writing on his heart more clearly and with greater conviction. Consequently, both nature and revelation in Islamic epistemology are sources of knowledge. Revelation provides direct guidance; meanwhile, nature enables man to read the eternal message of divine wisdom written on the pages of the cosmic text. Islamic epistemology, therefore, is based not only upon the reading of the written Qur'an, or in words of Prof. Hossein Nasr, *al-Qur'an al-Tadwini*, but also upon deciphering the text of the cosmic Qur'an, or *al-Qur'an al-Takwini*, which is its complement. Nature in Islamic epistemology is not the adversary but the friend of the traveler upon these two books with scientific vision<sup>27</sup>.

### B. Compatibility of Islam and science

Various religions existed millennia before Islam, Hinduism, Buddhism, Taoism, Confucianism, Judaism, Christianity and others. Islam considers only three monotheistic religions: Judaism, Christianity and Islam, as Divine Revelation. However, Islam clearly declares that even scriptures of Judaism and Christianity are contaminated with human elements, so they do not present the pure revealed truth. Therefore, the contradiction of all above religions to the scientific truth is possible, because they are either man-made ideologies or corrupted religions. Pure Divine Truth cannot contradict itself; either revealed in scriptures or demonstrated in natural phenomena. Maurice Bucaille, in his critical examination of Divine scriptures in the light of modern science, has established this fact, i.e. information of all these scriptures is contrary with contemporary science, except the holy Qur'an<sup>28</sup>. Compatibility of the holy Qur'an, which is pure Divine Revelation, with science can be seen obviously from various dimensions:

#### First: The positive attitude of Islam towards science

The Islamic attitude, i.e. Qur'an and Sunnah, towards knowledge inquiry is very positive; it emphasizes intellectual thinking and study of nature. It also, emphasizes the study of human phenomena and the historical events. Besides that, it is a well-known fact that the first revelation to the Prophet Muhammad (SAW) was "*Iqra*" which means reading and learning. There are many Prophetic Hadiths (traditions) which clearly invite for knowledge acquisition.

### **Second: Motivation for creative thinking**

Scientific progress is based on curiosity of man to uncover secrets of nature. No exploration on nature would be possible without curiosity of human to research. Therefore, the first step to scientific investigation in Qur'anic approach is to create curiosity and creative thinking through various means. For instance, Qur'an considers nature as a sign (*Ayah*) to the knowledge of God, the name given to the Qur'anic verses as well. Thus, Qur'an constantly calls upon people to think, to investigate, to use their minds to ponder the physical world; alteration of day and night, water circulation, heavens and earth, stars and planets, creation of universe and man, historical events, and the natural phenomena that surrounds the humans in their everyday lives. As a result, a Muslim considers scientific investigation and creative thinking as a major way to the knowledge of the Creator<sup>29</sup>. Due to this Qur'anic approach, various scientific disciplines were developed by Muslim scientists of the Middle Age, such as Mathematics, physics and technology, medicine, geography, and astronomy. Nevertheless, historians of science owe a great debt to Islam, for the collection and preservation of early scientific legacy of human history.

### **Third: The empirical approach**

Scientific knowledge is based on two approaches: practical of observation and experiment; and theoretical method which is based on intellectual reflection and pondering. Since early history of scientific research, man adopted the theoretical reflection to investigate the natural phenomena. This rational reflection was the dominant since the time of Greek philosophers until the holy Qur'an was revealed to emphasize the experimental method. The Qur'an has recommended both, rational and empirical methods as valid methods of scientific inquiry. The Qur'an frequently calls for observation of natural phenomena and process for rational conclusions. Qur'an compares those who do not utilize their capabilities and faculties of knowledge for observation and reflection with cattle or even worst (Qur'an, 7:179). In many verses, Qur'an draws human attention to the empirical observation, for instance, it says; *"Do they not look at the camels how they were made, and at the sky how it was raised, and at the mountains how they were fixed firm, and at the earth how it was spread out?!"* (Qur'an, 88:17-20). However, without reasoning, observation and reflection would result to nothing, thus, various methods of reasoning

have been suggested in the Qur'an, such as analogical method (*Qiyas*), and inductive and deductive methods.

### **Fourth: No practical contradiction**

It is surprising that scientific information provided by the Qur'an, which was revealed at time known in the West as "Dark Ages", are consistent with facts of modern sciences. The holy Qur'an has used this factor to prove its authenticity as Divine Revelation. Many verses of the Qur'an have challenged humans to produce texts similar to Qur'an, even to its shortest chapter (Qur'an, 10:38). In this regard, Qur'an has anticipated the contemporary science and provided many factors, which became known only in contemporary times. Therefore the Qur'an condemned those Arabs who rejected the scientific facts of the Qur'an at the time of the Prophet, before its empirical interpretations came. Allah said; *"Nay, they charge with falsehood that whose knowledge they cannot compass, even before its empirical interpretation is yet to come"* (Qur'an, 10:29). The frequent reference to the natural phenomena in the Qur'anic verses, such as the different stages of human embryology, the creation of everything according to precise measures and specific proportions, the revolution of the sun and the moon at a certain speed and according to a system, and the creation of everything in pairs, all these factors can be interpreted by the empirical method of modern science, this time or in the future<sup>30</sup>.

### **4. Conclusion**

According to Phillip Hitti, the Islamic ability to reconcile monotheism and science, proofs to be the first time in human thought that theology, philosophy, and science were finally harmonized in a unified whole. Thus, Muslim contributions were one of the first magnitudes, considering its effect upon scientific and philosophic thought and upon the theology of later times<sup>31</sup>. Therefore, the most significant characteristic of Islamic epistemology was its metaphysical foundations, which is based on Islamic worldview, i.e. Islamic vision of man, nature, and the ultimate truth. Man in Islamic vision is a dignified creature deserved to be a vicegerent of God on earth. Meanwhile, nature is created in precise orders to guide man to the Creator and the development of his community. Also, nature is created with great bounties to support and sustain man's live on earth. Hence, nature is trust (*Amanah*) of God to man, and God is the Creator of both nature and man. Consequently, science and technology in Islam cannot be destructive rather it is a constructive and supportive



of human mission on earth, i.e. performing the task of Khilafah.

As regards to the spiritual and moral dimensions of science, Islam considers it as foundations of growth and progress. According to modern philosophy, progress in science, technology and economics, is regarded, unfortunately, as the final goal. The disasters in natural environment and human community in modern life are mainly caused by progress in science and technology; however, to overcome all these problems, we must be conscious about our moral responsibilities towards nature and all living creatures. Hence, we should necessarily tend towards God, our Creator, and fight against the tendency to totally become an independent creature. Related to his Lord, man is a spiritual creature; his heart is the only single window to look through to the light of his Lord. Without this window, man ceases to fulfill his purpose of life and his essential functions in this world. But with this window, he is the sole earthly receptacle of the spiritual light, which he dispenses among his fellow creatures. From this point of view, atheism or disbelieving is screening against the truth or the Light. In words of Charles Eaton, an atheist is defined as one who pulls down a curtain over the window and plunges the whole house of the world into darkness<sup>32</sup>.

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## Endnotes

- <sup>1</sup> Drexler, K. Eric, *Engines of creation*, [http://www.foresight.org/EOC/EOC\\_Chapter\\_1.html](http://www.foresight.org/EOC/EOC_Chapter_1.html).
- <sup>2</sup> Popper, Karl. R. (1980), *The Logic of Scientific Discovery*. Unwin Hyman, UK. PP 106-110. Also, see Hunt, S. D. (1991), *Modern Marketing Theory: Conceptual Foundations of Research in Marketing*, Southwestern Publishing.
- <sup>3</sup> Nicolas Copernicus (1473- 1543) is Polish astronomer who proposed that the planets orbit the sun, rejecting the established view that the Earth was the center of the universe.
- <sup>4</sup> Johannes Kepler (1571- 1630), is German astronomer, who discovered the three laws governing the orbital motion of planets.
- <sup>5</sup> Sir Isaac Newton (1642- 1727), is English mathematician and physicist, famous for his mathematical description of the laws of mechanics and gravitation. He developed differential calculus in mathematics.
- <sup>6</sup> Nanotechnology is any technology which exploits phenomena and structures that can only occur at the nanometer scale, which is the scale of single atoms and small molecules. Nanotechnology comprises technological developments on the nanometer scale, usually 0.1 to 100 nm. (One nanometer equals one thousandth of a micrometer or one millionth of a millimeter) The term has sometimes been applied to microscopic technology.
- <sup>7</sup> Study more: Drexler, K. Eric, *Engines of creation*, [http://e-drexler.com/d/06/00/EOC/EOC\\_Chapter\\_3.html](http://e-drexler.com/d/06/00/EOC/EOC_Chapter_3.html) / [http://www.foresight.org/EOC/EOC\\_Chapter\\_3.html](http://www.foresight.org/EOC/EOC_Chapter_3.html)
- <sup>8</sup> See a comprehensive study of the complex systems, Bar-Yam Yaneer (2003). *Dynamics of Complex Systems*: <http://necsi.edu/publications/dcs/Bar-YamChap2.pdf>. Also see his

book "Making Things Work: Solving Complex Problems in a Complex World" <http://necsi.edu/publications/mtw/>)

<sup>9</sup> The exact limits of electronic technology might remain uncertain because the quantum behavior of electrons in complex networks of tiny structures presents complex problems, some of them resulting directly from the uncertainty principle.

<sup>10</sup> Study more: Drexler, K. Eric, Engines of creation, [http://e-drexler.com/d/06/00/EOC/EOC\\_Chapter\\_3.html/](http://e-drexler.com/d/06/00/EOC/EOC_Chapter_3.html/) [http://www.foresight.org/EOC/EOC\\_Chapter\\_3.html](http://www.foresight.org/EOC/EOC_Chapter_3.html)

<sup>11</sup> See the remarkable presentation of Abdul Wahab El-Messiri, which translated by Mazen El-Naggar, at <http://www.islamonline.net/english/Contemporary/2003/12/Article02.shtml>

<sup>12</sup> See, for example, Brian Tokar (ed) (2001), *Redesigning Life?: The Worldwide Challenge to Genetic Engineering*, Zed Books (London & New York).

<sup>13</sup> The great hope for SAICM was that it would represent a major step forward in international cooperation on the sound management of chemicals on a global scale. The full text of the conference establishes the overall objective of SAICM as the sound management of chemicals throughout their life-cycle so that by 2020 chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment. On risk reduction, the objectives include minimizing risks to human health, particularly that of workers, and to the environment. See the full report at: <http://www.iisd.ca/vol16/enb1654e.html> or International Institute for Sustainable Development (IISD).

<sup>14</sup> For instance, to say: "In natural the process an object left in the air comes down to the earth due to gravity system", this is a descriptive statement, which is hard for philosophers and theologians to deal with.

<sup>15</sup> This fact was articulated by the holy Qur'an through various verses, see for example (*Surat Fatir*: 28).

<sup>16</sup> Davies, Paul (1994), "The Unreasonable Effectiveness of Science" in Templeton, John Mark (ed.), *Evidence of Purpose*, Continuum, New York, pp. 63-4. Also see Golshani, Mehdi, *Does Science offer evidence of a Transcendent Reality and Purpose?* "Islam and Science", June 2003, Vol (1) No (1), p. 50.

<sup>17</sup> Idea of *taskhier* was repeated in many verses, for instance "It We Who has created for you all things that are on earth", "And He Who has subjected all that is in the heavens and on the earth under your control, indeed there are signs in that for those who reflect".

<sup>18</sup> "With Him the keys of the invisible (Ghaib), none but only He knows them. And He knows whatever on the land and whatever in the sea. Not a leaf falls but He knows it, no a fresh or dry seed in the darkness of the earth, but noted in a clear record". (Qur'an, 6:59).

<sup>19</sup> See: *General Education in a Free Society*: Report of Harvard Committee, with introduction by James Bryant. Harvard University Press (Cambridge, Massachusetts 1955). PP58-64.

<sup>20</sup> Some people may claim that after special training it is possible to know some very important things about life and the universe intuitively without revelation. However, scientists do not believe it is possible to know the details of the dark side of the moon, for instance, intuitively. See more details about epistemology, Pine, Roland C., *Science and the Human Prospect*, Wadsworth Publishing, (California 1989). P 54

<sup>21</sup> -Fazlur Rahman, (1999), *Major Theme of the Qur'an*, Islamic Book Trust, Kuala Lumpur. Also see: Manzoor, S. Parvez, *Qur'an and Nature*, <http://islam21.net/friday/30-05-03.html>

<sup>22</sup> Fazlur Rahman, *Major themes of the Qur'an*, P. 34.

<sup>23</sup> Albert Einstein, in his "Religion and Science", said: "Science without religion is lame, and religion without science is blind". This work by Albert Einstein appeared in the New York Times Magazine on November 9, 1930 pp 1-4. It has been reprinted in *Ideas and Opinions*, Crown Publishers, Inc. 1954, pp 36 - 40. It also appears in Einstein's book *The World as I See It*, Philosophical Library, New York, 1949, pp. 24 - 28.

<sup>24</sup> This factor clearly decided by many of the Qur'anic verses such as the following verse: "Messengers who gave good new as well as warning that mankind, after coming of the Messengers, should have no plea against Allah" (Qur'an, 4:165)

<sup>25</sup> Therefore, the Qur'an describes unbelievers as following; "They know well the externalities of this worldly life, but they are so oblivious of the ultimate consequences of that in the next life" (Qur'an, 30:7).

<sup>26</sup> Miracles of the prophets have two main purposes: to guide people to believe in God, and to inspire them about the physical world i.e. laws of nature. The first purpose is clear to everybody, however the second is indirect. For instance when the Prophet Ibrahim came out unharmed from the flame of fire, that was direct evidence to his Prophethood. However, the indirect message was that man should develop a hypothesis about the physical reasons why he was not burned. If such hypothesis was being developed, just like Newton's question of falling apple, then human might have been able to discover anti-fire materials in his early history. In the same line the (*Isra` and Mi`raj*) journey of the Prophet Muhammad (pbh), should have led humanity to the discovery of high speed flying bodies and accelerated means of communications.

<sup>27</sup> Hossein Nasr, *Islamic Spirituality*, PP 345/46.

<sup>28</sup> Bucaille, Maurice(1996), *Bible, Qur'an and Science: The Holy Scriptures Examined in the Light of Modern Knowledge*, Thinker's Library (Kuala Lumpur)

<sup>29</sup> Harun Yahya, *the Islamic Origins of Modern Science*,

<sup>30</sup> Saud, Muhammad, *Islam and Evolution of Science*, Islamic Research Institute (Islamabad-Pakistan 1988). P.3.

<sup>31</sup> Hitti, K. Phillip, *History of the Arabs*. St. Martins Press, (New York 1970) (Hitti 580).

<sup>32</sup> Charles LE Gai Eaton, *Islamic Spirituality*, edited by Seyyed Hossein Nasr, P.369)

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