Revelation and Science
Vol. 04, No. 01 (1435H/2014) 27-36

Modern Breakthroughs in Science: A Pragmatic Approach (*Review Article*)

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Abstract
Scientific breakthroughs have to some extent helped man's understanding of the laws of nature. However, scientific breakthroughs have raised some philosophical and moral concerns among ethicists as well as scientists. This is because, while scientific breakthroughs are worthwhile; nevertheless, in the prospect of putting scientific achievements into perspective, philosophical concerns have been raised about the position of *science* in man's stock of knowledge, particularly the authority of science and its relation to other sources of knowledge. These concerns are related to whether or not science constitutes the only genuine source of true knowledge, i.e. are the methods of science preferable over other sources of knowledge? In addition, besides the philosophical concerns about the modern progress of science, questions about the place of moral values in modern and contemporary scientific breakthroughs constitute another matter of concern among many scientists and scholars of ethics. One of the primary questions of this concern is related to whether or not scientific progress ought to be limited to what man ought to do? Similar question is raised about the relationship between the application of science and moral values. This paper intends to explain the need for *wasatiyyah* (pragmatic) approach in answering these and other questions related to the progress of science.

***Key words**: wasatiyyah, pragmatic approach, modern science, scientism, moral values.*

Abstrak
Penemuan saintifik telah membantu manusia untuk memahami undang-undang alam. Walau bagaimanapun, penemuan saintifik telah menimbulkan beberapa kebimbangan dari segi falsafah dan moral di kalangan ahli etika dan juga ahli-ahli sains. Ini kerana, prospek dalam meletakkan kejayaan pencapaian saintifik ke dalam prospektif, kebimbangan psikologi telah meningkatkan kedudukan sains dalam pemahaman manusia terutamanya penguasaan sains dan kaitan yang berhubung dengan sumber pengetahuan yang lain walaupun penemuan saintifik amat berharga. Kebimbangan ini adalah berkaitan dengan ketulenan sumber pengetahuan yang benar, dalam pemilihan kaedah sains adalah lebih baik daripada sumber pengetahuan yang lain. Kedua, selain daripada kebimbangan psikologikal mengenai kemajuan sains moden, persoalan melibatkan nilai-nilai moral dalam pencapaian saintifik moden dan kontemporari membentuk permasalahan di kalangan ramai ahli sains dan cendekiawan etika. Salah satu persoalan yang utama mengenai kebimbangan ini adalah penglibatan keterbatasan kemajuan sains terhadap keterbatasan keupayaan manusia? Persoalan yang sama dibangkitkan mengenai hubungan antara pengaplikasian sains dan nilai-nilai moral. Kajian ini bertujuan untuk menjelaskan keperluan bagi pendekatan wasatiyyah (pragmatik) dalam menjawab segala persoalan yang berhubung dengan kemajuan sains.

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***Kata kunci**: wasatiyyah, pendekatan pragmatik, sains moden, saintisme, nilai moral.*

Introduction: Scientific breakthroughs

Historians of science recorded successive achievements in science that were made by early civilizations and succeeding generations of humanity;[1] scientific discoveries of the classical civilizations such as the Greeks, Mesopotamians, Egyptians, and others have formed the basis of medieval scientific knowledge, which subsequently influenced the rise of modern sciences.[2] Historical achievements in science were marked by rapidly ascending accumulation, in such a way that since antiquity to modern times, due to the constant improvements in scientific methods and tools, the scale and the quality of scientific discoveries have also improved in times. Today the new discoveries in technology and computers has expended the scientific knowledge into greater scale, particularly in the synthesis of new chemical compound or drugs in pharmaceutics, the design of a new experiment in the laboratory researches, building and constructing new instruments to measure and obverse different planets and orbits in physics, as well as the facility of diagnosing different diseases and bacteria in health related researches. With the help of modern technology, scientific experiments in these areas have ended with a promising success. For instance, in the field of medicine, scientific discoveries in advanced instrumentation and robotics have tremendously helped in reducing the mortality rate, while useful tools of observing the development of the fetus and infants in the womb, have helped many families.[3] Likewise, the structural docking software used in molecular medicine helps in disease specific drugs and predicting their effects on human cell lines *in vitro*. Indeed, the advancement of computer technology has immensely helped the scientists to come out with new software tools to analyze the whole genome of an organism. Scientists have successfully sequenced whole genomic information of a human being (contains 3.2 billion base pairs) that can only be stored using 10 CD ROMs besides sequencing number of other organisms.[4] This massive information database is highly useful in predicting the genes responsible for disease initiation by adopting controlling measures to prevent the disease in its early stages. In the field of medicine, due to the advent and improvement of science and technology, many endemic diseases such as malaria, chickenpox and tuberculosis have been controlled. Some of the infectious diseases such as smallpox, Rinder pest diseases, poliomyelitis and Yaws (caused by *Treponema pertenue*) have been eradicated from the world completely in recent decades. At present, science and technology has further extended to develop patient specific drugs to cure the diseases and cancers with high percentage of success.

Similarly, with the progress of scientific knowledge, an average life expectancy has increased from 39.9 years to 49.9 years between 1960 and 1994; The infant mortality rate dropped by over 40% in the same period, falling from 166 per thousand live births to 97 per thousand; The percentage of the population with access to safe water has almost doubled in the past two decades, rising from 24% in the period 1975-80 to 42% in the period 1990-96.[5] Furthermore, in field of technology and computers, the advent of microcomputer has enabled spectacular progress in computing power, now almost doubling in every 18 months[6]. Cellular phones and cheap computers are beginning to bring internet service to even rural areas of developing countries, with major implications for distance learning and business opportunities. Alongside the microchip, biotechnological breakthroughs such as

[1] Craig Dilworth, (2009). Scientific Progress*: a Study Concerning the Nature of the Relation between Successive Scientific Theories*, (Dordrecht: Kluwer Academic Publishers, 1994). Sean F. Johnston, History of Science*: A Beginner's Guide*. Oxford: One world press.

[2] For further details about the history and progress of science, see Mayr, E., (1985). *The Growth of Biological Thought*, Belknap Press. Cohen, H. F., (1994). *The Scientific Revolution: A Historiographical Inquiry*, (University of Chicago Press. Serres, M. (ed.), *A History of Scientific Thought*, (1995). Blackwell Publishers.

[3] Anthony, R. L., Andres, E. C., Jaydev, P.D., and William, C. M. (2004). Robotic surgery. Annals of Surgery. 239(1): 14–21. Kim, V.B., Chapman, W.H., Albrecht, R.J., Bailey, B.M., Young, J.A., Nifong, L.W., Chitwood, W.R. Jr. (2002). Early Experience with Telemanipulative Robot-assisted Laparoscopic Cholecystectomy Using Da Vinci. Surgical Laparoscopy, Endoscopy & Percutaneous Technology, 12:34–40. Kwoh, Y.S., Hou, J., Jonckheere, E.A., Hayati, S. A. (1988). Robot with Improved Absolute Positioning Accuracy for CT Guided Stereotactic Brain Surgery, IEEE Trans Biomedical Engineering. 35:153–161.

[4] National Center for Biotechnology Information (NCBI), (2013). Entrez Database. www.ncbi.nih.gov/Entrez/index.html.

[5] World health organization (WHO), (2013). Global Health Observatory (GHO) World Health Statistics. Link: http://www.who.int/gho/publications/world_health_statistics/en/index.html.

[6] David Reed, (2008). *A Balanced Introduction to Computer Science*, Prentice Hall publisher, p380.

microencapsulation in the field of pharmacology and the emergence of genetic engineering as well as molecular biotechnology are among notable scientific discoveries in the second half of the last century; scientific discoveries in these fields have given new insights to explore more on nature, particularly in biology and chemistry. Extending pioneering inventories made by early scholars like Ibn al-Nafis (d. 1288 CE) on pulmonary circulation in 13th century, studies on blood circulation in human body were revolutionized by William Harvey in the 17th century CE.[1] These breakthroughs on blood circulation, together with the discovery of blood grouping system and antigen antibody reaction mechanism, has helped greatly the development of modern blood transfusion techniques from healthy individuals to the patients. Today scientists are making attempts to develop artificial blood cells *in vitro;*[2] however, even though, this research is in its early stages, the invention of stem cell technology, animal cell culture technique, together with microencapsulated oxygen molecules in the field of medicine will help in designing desired blood group type *in vitro* in near future. In addition, DNA profiling or fingerprinting technique developed by Alec Jeffrey is extensively being used to pinpoint the suspect human[3]. Recently, the advanced biotechnological techniques were used to develop site specific/antigen specific monoclonal antibodies (technically known as 'Magic bullets') that can target and kill specific disease causing organisms.[4] In the year 1996, first cloned sheep "Dolly" "Dolly" was produced by cloning a single mammary cell using advanced genetic engineering techniques.

In addition, in the field of physics, scientists have been able to interoperate a number of natural phenomena and the laws of nature that govern the universe. For instance, modern breakthroughs in physics such as the theory of quantum mechanics as described by Max Planck and others, the successful demonstration of motor powered flight, Newton's discovery of gravitational force in the universe, Albert Einstein's observations and his relativity theory, the discovery of atom structure by Niels Bohr as well as the demonstration of controlled nuclear reaction by Enrico Fermi in the field of physics and chemistry, are worth of mentioning.[5] Scientific inventions of the space satellite and Deep Submergence Vehicle such as Alvin have helped in exploring more on areas which were not known before. For example, in 1997 scientists have accurately predicted the El Niño climatic phenomenon, in the tropical pacific using satellite images and thus greatly reduced the social and economic effects of the floods and droughts that follow in many parts of the world.[6]

Authority of science and the place of ethics in modern discoveries of science

It is true that throughout history, from antiquity to modern times, scientists have made observable breakthroughs in the progress of science and technology. These breakthroughs have to some extent helped man's understanding of the laws of nature. However, scientific breakthroughs have raised some philosophical and moral concerns among ethicists as well as scientists.[7] This is because, while scientific breakthroughs are worthwhile, nevertheless, in the prospect of putting scientific achievements into prospective, philosophical concerns have been raised about the position of *science* in man's stock of knowledge, particularly the authority of science and its relation to other sources of knowledge. These concerns are related to whether or not science constitutes the only genuine source of true knowledge,[8] in such a way that

[1] Gregory, Andrew, (2001). *Harvey's Heart, the Discovery of Blood Circulation* Cambridge, England: Icon Books.

[2] Suman Sarkar, (2008). Artificial Blood. Indian Journal of Critical Care Medicine, 12 (3): 140–144.

[3] Jeffreys, A.J., Wilson, V., Thein, S.W., (1984) "Hypervariable minisatellite regions in human DNA", Nature. 314: 67–73.

[4] Nissim, A., Chernajovsky, Y., (2008). Historical Development of Monoclonal Antibody Therapeutics, Handb Experimental Pharmacology. (181):3-18.

[5] People and discoveries, (2013). Diresct link: http://www.pbs.org/wgbh/aso/databank/entries/dp42fe.htmll.

[6] Meehl, G. A. Teng, H. Branstator, G., (2006). Future Changes of El Niño in Two Global Coupled Climate Models. Climate Dynamics. 26 (6): 549.

[7] For further details about the philosophical and moral concerns about the progress of science, see Alex Rosenberg, *Philosophy of Science: A Contemporary Introduction* (New York: Routledge, 2005). Psillos, Stathis and Gurd, Martin, *the Routledge Companion to Philosophy of Science* (New York: Routledge, 2014). Anthony O'Hear (ed.), *Philosophy of Science* (New York: Cambridge University Press, 2007). Bernard E. Rollin, *Science and ethics* (New York: Cambridge University Press, 2006). Briggle, Adam and Mitcham Carl, *Ethics and Science: An Introduction* (Cambridge: Cambridge University Press. 2012).

[8] One of the primary questions in this regard is that, given the the fact that scientific experiments are theory-loaded, which in the best sense form a human understanding of given phenomenon; can science constitute an absolute source of

methods of science are preferable over other sources of knowledge. *Second*, besides the philosophical concerns about the modern progress of science, questions about the place of moral values in modern and contemporary scientific breakthroughs form another matter of concern among many scientists and scholars of ethics. One of the primary questions of this concern is related to whether or not scientific progress ought to be limited to what man ought to do? Similar question is raised about the relationship between the application of science and moral values.

Though these philosophical and ethical concerns are categorically raised by scientists as well as ethicists, however these questions were answered differently. *First*, with regards to the philosophical concerns about the position and the authority of science, there are those atheistic tendencies of seventeenth and eighteenth centuries such as scientism,[1] materialism,[2] secularism,[3] positivism,[4] modernism and others,[5] who exhibited an exaggerated trust in science over other sources of knowledge; though these tendencies belong to different epochs and different schools of thought, however an observable mood which these theories commonly share is that, these tendencies have over trusted in the authority of science, and thus categorically anticipated science to replace all other sources of knowledge, including the divine revelations. From the prospective of these tendencies, genuine knowledge is cacheable only through science; other sources of knowledge, such as divine revelations, are either worthless or subjective sources, the knowledge of which cannot be objectively verified. Historically, the flavour of atheistic tendency is traced back to the Greek philosophers like Democritus (d.270 BC), who interpreted the universe without making any reference to theology, however, with the modern scientific breakthroughs, particularly, at the "beginning of the nineteenth century, atheism was definitely on the agenda. The advances in science and technology were creating a new spirit of autonomy and independence, which led some to declare their independence of God. This was the century in which Ludwig Feuerbach, Karl Marx, Charles Darwin, Friedrich Nietzsche and Sigmund Freud, forged philosophies and scientific interpretations of reality which had no place for God. Indeed, by the end of the century, a significant number of people were beginning to feel that if God not yet dead, it was the duty of rational, emancipated human beings to kill him."[6] With strong rationalism and scientism, these and many atheists of nineteenth century, advocated for the application of methods of natural science to all areas of investigation, and denied the validity of other sources of knowledge such as religion and the divine revelation. This is so because, according to scientism tendencies, science is derived from empirical evidences and experiments, thus its findings are superior to all other interpretations of life, in such a way that science form the only proper way of interpreting and understanding the universe. Extremists among pro-scientism scholars like Sigmund Freud makes it clear that: "no, our science is not an illusion! An illusion it would be to suppose that what science cannot give we can get elsewhere."[7] Thus, with the denial of true knowledge outside science, scientism suggests the application of science in all aspects of life; in this respect the authority of science prevails over all other claims of knowledge.

knowledge? Another question is that, can there be a trustable knowledge outside the domains of science?

[1] Scientism means the belief that scientific theory and scientific methods are applicable in all fields of inquiry about the world, including morality, ethics, art, and religion. Here, *science* is held to be the ultimate recourse in questions of public policy and even religion. Entry "scientism", available at: http://www.wordiq.com/definition/Scientism, retrieved o5 October 2013.

[2] Materialism is the the theory that physical matter is the only reality and that everything, including thought, feeling, mind, and will, can be explained in terms of matter and physical phenomena. *The American Heritage Dictionary of the English Language*, (Houghton Mifflin Company), 2000, 4th edition.

[3] Secularism basically means the belief that religion should not be involved with the ordinary social and political activities of a country. *Cambridge Advanced Learner's Dictionary*, Cambridge University Press., 3rd edition, 2008.

[4] Positivism denotes a strong form of empiricism, especially as established in the philosophical system of Auguste Comte, that rejects metaphysics and theology as seeking knowledge beyond the scope of experience, and holds that experimental investigation and observation are the only sources of substantial knowledge. HarperCollins (ed.), *Collins English dictionary***, (**Glasgow: HarperCollins Publishers, 2000).

[5] Modernism is a "movement in the arts in the first half of the twentieth century that rejected traditional values and techniques, and emphasized the importance of individual experience." HarperCollins (ed.), *Collins English dictionary***, (**Glasgow: HarperCollins Publishers, 2000).

[6] Karen Armstrong. (1993). *A History of God: The 4000 year quest of Judaism, Christianity and Islam* (New York: Alfred A. Knopf, p. 397.

[7] Ibid.

Another tendency that offered an answer to the authority of science is materialism; it argues that physical matter is the only true reality of life, and thus immaterial or nonphysical ideas and entities are not real.[1] Though as mentioned elsewhere in this chapter, since the Greek philosopher, Democritus (d.270 BC) who suggested atomism to interpret atoms and motions in space, materialistic tendencies in the field of science was on the rise, however, the English philosopher Thomas Hobbes (d.1679) and others were among notable materialists who argued that the sphere of consciousness essentially belongs to the corporeal world, and thus disregarded transcendental and spiritual dimension of knowledge. Furthermore, dialectical Materialism of Karl Max (d.1883) and the philosophy of Logical Positivism constructed knowledge which confines the truth to sense-perception and the physical appearance of the universe. For instance, August Comte (1798-1857),[2] the modern philosopher of positivism, calls for a single method of inquiry, which is basically 'logical positivism'; a doctrine which teaches that "sense perceptions are the only admissible basis of human knowledge and precise thought."[3] A combination of logical reasoning and empirical evidence, Comte argues, is the only trustable way to interpret life and the universe; his contention does not acknowledge the limitations of what man can know through reason and empirical evidence.[4] According to materialism, everything including thought, feeling, mind, and will, can be explained in terms of matter and physical phenomena;[5] as such, knowledge based on something other than empirical observation and reason is invalid. For the truth of revelation, argues materialism, is not empirically verifiable by means of experiment and laboratory test, thus divine revelation is no longer a worthy source of intellectual inquiry.[6] On the one hand, philosophers of dialectical and logical positivists trust the absolute efficiency of science in all fields of intellectual inquiries,[7] while these tendencies treat religion with great skepticism and in some cases with forthright denials of religious traditions and their truth claims, on the other hand.[8] Likewise, secularism attempts to liberate man from religious and metaphysical tutelages; instead of appreciating the role of divine values in life, according to Max Weber (1864-1920), through disenchantment of nature, desacralization of politics, and deconsecration of values, secularism aims at the deliverance of man from religious ideas and beliefs;[9] and thus presents an exaggerated trust in man's reason and science. Furthermore, modernism, which describes itself as a deliberate departure from tradition, believes that human rationality and scientific factual experience should replace religious interpretations of the universe; this is to say that only reason and science, not divine revelations, are the true sources of knowledge. However, the truth claims of modernity are challenges by postmodernism, in which all forms of truth claims, including science, are rejected. Postmodernism treats all forms of acquiring knowledge with skepticism, in such a way that, in the eyes of postmodernists, there is no difference between science, religion and magic. According to the postmodernists, nothing has intrinsic reality or value, in such a way that everything we believe or trust is deconstructible and can be proven

[1] Armstrong, D. M., (1993). *A Materialist theory of the mind,* **(**London :Routledge.

[2] He is French philosopher and founder of the school of philosophy known as positivism. Comte attempted to introduce a cohesive "religion of humanity", and presented some early definitions of the term "*altruism*". See Mary Pickering, Auguste *Comte: An intellectual Biography*, (Cambridge University Press, 1993).

[3] HarperCollins (ed.), *Collins English dictionary***, (**Glasgow: HarperCollins Publishers, 2000).

[4] Ibid., pp.561-562

[5] *The American Heritage Dictionary of the English Language*, (Houghton Mifflin Company), 2000, 4th edition

[6] See the writings of the Friedrich Nietzsche, Karl Marx, August Comte and others, who exaggerated the position of science.

[7] Proponent of these theories are on the view that revelation is incompetent to provide genuine truth; the reason is because, contends the proponents of dialectical materialism and logical positivism, revelation lacks empirical evidence to prove the existence of divine powers and metaphysical origins of life and thus the validity of divine revelation cannot be trusted; both dialectical materialism and logical positivism promote human rationality over revelation. For further details of these tendencies, see the term "*naturalism*", in the *Encyclopaedia of Philosophy'*, Macmillan, 1996.

[8] August Comte, for instant, describes religion as something that is in the past, which should not be in the present times, while Friedrich Nietzsche, proclaimed the death of God, which eventually implies death of traditional religions.

[9] Max Weber, (1976). *The Protestant Ethic and the Spirit of Capitalism*, translated by Talcott Parsons, introduction by Anthony Giddens, New York: Scribner.

incorrect, including science and reason, thus nothing is absolutely true.

These are among atheistic perspectives about the position and the authority of science, which have categorically exhibited an extracted trust in science, however, regardless of how well presented the works of these scholars are, their conclusions about the authority and the scope of science have been resisted and challenged. For instance, it is worth of mentioning that, science and scientism are not similar; the former denotes the interpretation of the natural world through hypothesis and experiment, which is set to explain cause and effect relationship of given phenomena, while the later reflects the tendency of claiming that science is the only way of knowing the reality of the universe. Therefore, while science is not a worldview, but a method of interpreting given natural phenomena, scientism projects science as the most authoritative worldview, which should be extended to all fields of intellectual inquiries. Thus, given the fact that the truth claims of scientism cannot be verified by means of scientific methods, its conclusions are indeed worthless and unscientific claims. Similarly, materialism is marked by partial and subjective interpretation of the reality; its truth claims lead to the belief in partial truth of life, and thus it not comprehensive enough to provide a total picture of reality. In addition, both modernism and secularism concluded that religion and traditions are outdated, and thus argue that man should be freed from the inferences of religious teachings and concepts. Both of these tendencies associated the truth of life to human rationality and science, however, such truth claims are challenged by postmodernism, which concludes that utterly nothing, including divine revelations, science and rationality, is true; in postmodernism, not only religious traditions and revelations are meaningless, but also human rationality and science too are not true, and thus nothing is true. Indeed, according to postmodernism, the only trustable truth is, nothing is true, and thus postmodernism eventually leads to nihilism.

Therefore, as these atheistic contentions cannot be empirically proven through scientific means, and as these atheistic contentions are marked by an exaggerated trust in science, communities have always resisted, and most of the cases brushed aside the conclusions of these atheistic perspectives.

Second, with regards to the second concern, which is about the place of moral values in the progress of science, there are some, among the scientific community, who have exhibited pro-scientific tendency and give the priority to the progress of science over values; this group of scholars see no reason of why scientific breakthroughs should be guided by values, and thus gives less interest to ethical dimensions of the progress in science. This approach is a technical in nature and recognizes only the validity of scientific discoveries; it argues that recent breakthroughs of science exhibited the fact that the progress in science is remarkably ascending, and covers issues which were, traditionally, outside the domains of ordinary science. Thus we ought to let the scientists do their job freely, so that man can master the functions and law of the natural phenomenon. This is to say that, scientific experiments should be left to take their normal course, and available technology should be applied to expend further the stocks of scientific knowledge without obstacles. The initial flavor of this pro-scientific discovery tendency could be traced back to works of 16th and 17th century philosophers and scientists, such as *The New Atlantis* of Francis Bacon (d.1626 C.E.), who said: "the end of our foundation is the knowledge of causes, and secret motions of things; and the enlarging of the bounds of human empire, to the effecting of all things possible."[1] Bacon anticipates an unlimited scientific progress; an anticipation that recognizes only one value, that is: to maximize man's ability to achieve infinite discoveries of science. Belgium philosopher Gilbert Hottois argues that: "we shall do what we (scientists) can do, we shall not abundant any possible experiment or laboratory research that can be achieved, we shall not hesitate to conduct any experiment that can lead us to explore all potentials of living and non-living things." In this regard, the norm here is, if it is possible to maximize the storage of scientific discoveries, go ahead and do it; thus the continuity and expansion of scientific discoveries is legitimized by the possibility of achieving more in science. For it calls to achieve what is possible to achieve in science, this approach advocates for unlimited growth of scientific knowledge, which basically means endless and possibly valueless growth of what man can actually do in the field of science.

Again regardless of how well presented this view is, the position of the pro-scientists about the progress of science, is associated to a possible risk of advancing a harmful science, which might eventually harm man and the natural environment. This is so because, while

[1] The Project Gutenberg E-Book of The New Atlantis, by Sir Frances Bacon, available at: http://www.gutenberg.org/dirs/2/4/3/2434/2434.txt, accessed 05/07/2012.

developing science is basically a commendable idea, however, Hiroshima and Nagasaki events of 1940s, scientific experimentations in human subjects of Nazis of Germany, in which basic human rights were violated, as well as the climate changes of our times, which are all due to man's misbehavior and lack of morality, reveal the need for ethical regulations in the progress and applications of scientific knowledge.

Wasatiyyah (pragmatic) perspective of the progress in science

The term *wasattiyyah* is derived from Arabic root of *wasat*, and denotes 'middle' and 'moderation' often between two extreme sides. Conceptually, as reflected in the Qur'anic verses (2:143, 2:238, 5:89, 68:28 and 100:5), the term *wasatiyyah* signifies 'middle course' or 'noble way' of accomplishing given tasks. It also means having 'moderate behavior' of practicing religious ideals and beliefs;[1] in either way, moderate behavior or middle course, *wasatiyyah* does not mean to fall short of the desired quality of given tasks, rather *wasatiyyah* constitutes the behavior of those who choose to find a way between two extremes; for instant between excess and negligence, in such a way that *wasitiyyah* is equivalent to excellent, balanced and the best choice. *Wasatiyyah* therefore, means to practice the culture of balanced behavior and excellence with the best possible manner, and thus denies evils of transgression and extremism. In addition, as reflected in chapter 25, verse 67 of the Qur'an, *wasatiyyah* signifies the practice of the right course (*qawam);*[2] in this verse, and elsewhere in the Qur'an, *wasatiyyah* or the middle course is presented as the behavior of being between two blameworthy extremes of economic behavior, i.e., extravagant (*israf*) and niggard (*qatur*). Furthermore, in chapter 4, verse 171, the Qur'an prohibits religious transgression (*ghuluw),*[3] in such a way that to belief in God should be without committing excess in religion, while in chapter 7, verse 31 of the Qur'an, wasteful consumption (*israf*) of goods is prohibited, whilst in chapter 31, verses 18-19, and 28:77, balanced and moderate behavior is required.

In these and in many other verses, the divine texts of Islam aim to inculcate the culture of moderation in all aspects of life; a moderation which is driven by the principles of justice, fairness and the culture of being steadfast on the right course, and thus its teachings goes against all forms of transgression and extremism. This behavior is required in all fields of thought and practice, including scientific behavior and thoughts about the authority of science, as well as the place of moral values in the progress of science. With regards to the discoveries of science, while strongly disapproving the contentions of atheism tendencies about the progress of science, *wasatiyyah* perspective also disagrees with anti-science cultures, and thus intends to present a balanced approach towards the progress of science. Indeed, there are cases in which discoveries of science are resisted on religious grounds,[4] while in some other cases, the truth of science is challenged on ideological grounds such as postmodernism. Both tendencies are, presumably, not acceptable in Islamic approach to science; this is because Islamic approach to science acknowledges the value of science and thus encourages man to master the laws of nature. In the meantime, as science signifies human understanding of natural laws, which is basically a fallible understanding and value-loaded interpretation of nature, Islamic approach to science denies the exaggerated trusts in the authority of science, as exhibited by some atheists, over the divine revelation (*al-wahy al-rabaniyi*). Similarly, according to Islam, man's conducts including science should be guided by moral values, thus valueless progress of science have no place in the Islamic approach to science. Hence, same like other aspects of life, Islam presents *wasatiyyah* (pragmatic) approach towards modern breakthroughs in science. This approach to science includes the following attributes;

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[1] It also means, as in chapter 5 verse 89, the practice of the main stream of the society, such as the main or the best food that is commonly consumed by the mainstream of the society.

[2] The Qur'an states (25:67):
Those who, when they spend, are not extravagant and not niggardly, but hold a just (balance) between those (extremes).

[3] The Qur'an states (4:171):
The Qur'an states: O People of the Book! Commit no excesses in your religion: Nor say of Allah aught but the truth. Christ Jesus the son of Mary was (no more than) an apostle of Allah, and His Word, which He bestowed on Mary, and a spirit proceeding from Him: so believe in Allah and His apostles. Say not Trinity: desist: it will be better for you: for Allah is one Allah. Glory be to Him: (far exalted is He) above having a son. To Him belong all things in the heavens and on earth. And enough is Allah as a Disposer of affairs.

[4] Good example of this is the conflict between Christian Church and European scientists in the middle ages of Europe, in which the Church resisted discoveries of science of religious grounds. Historians of science mention that in the conflict number of scientists were told to cease their scientific activities while others were ex-communicated and sanctioned by the authority of the Christians Church.

First, *wasatiyyah* perceptive in science acknowledges the need of interpreting the laws of nature objectively, so that man understands how nature functions. To achieve this, as stated in the verses of the Qur'an, *wasatiyyah* approach invites man to observe (*nazar*),[1] to ponder (*tadabur*),[2] and have an intellectual insights (*basirah*)[3] on how the natural universe functions as well as the laws of humanity and social groups (*al-sunan al-ilahiyyah*); hence *wasatiyyah* perspective invites the mind to push further its bounders of knowledge. This fact is reflected in the verses of the Qur'an, in which man is invited to travel through the earth (*siru fi al-aradhi*) and observe the laws of Allah (*s. w. t.*) in the nature (*al-sunan al-kawniyyah*) with a reasoning mind (*fanzuru kayfa bada' al-khalq*).[4] According to *wasatiyyah* perspective, in principle man is mandated to study and discover the laws of nature (progress of science), provided that man would avoid intellectual transgression; on the one hand, the Qur'an invites man to observe the laws of nature with a reasoning mind and thus develop science, however, it warns man of the dangers of intellectual transgressions that might seize men and women for their ill deeds (*tusibuhum bima sana'u qari'ah*),[5] on the other hand.

Second, *wasatiyyah* approach towards the progress in science disagrees with atheistic tendencies of materialism, scientism, secularism, and etc., on the authority of science. This is because, from *wasatiyyah* perspective, these tendencies have categorically exhibited an exaggerated trust in the authority of science, over the divine revelation. For instance, scientism confines the truth to science, in such a way that no truth is achievable outside science, a claim which is actually not verifiable by methods of science; hence scientism is associated to an exaggerated trust in the authority of science over other sources of knowledge, thus cannot provide a viable theoretical framework for science. Similarly, materialism tendencies lead to the same conclusions of scientism; this is so because, by emphasising extremely on the physical reality of the universe, and on the denial of reality outside the material world, materialism advocates for the belief in the subjective eternal existence of matter, and thus leads to the belief in a limited or partial view of reality. Likewise, both secularism and positivism have categorically confined reality to the sense perception or temporal world, and hence rejected to acknowledge the reality of transcendental realms. Likewise, claims of modernism and postmodernism about the ultimate truth of life have contradicted; the later denied the truth claims of the former. From the perspective of *wasatiyyah* approach in science, these tendencies have exhibited intellectual transgression and extremism, and thus cannot be the framework of understanding the progress of science.

Third, *wasatiyyah* approach in science teaches that man ought to discover science but such discoveries ought to be harmless; in this regard progress of science has to be guided by universal values of morality; as such, in the progress of science: "the right action is the best action, that is, the one that maximizes the good or expected good."[6] This is to say that scientific community ought to: "search for what requires respecting human life and dignity".[7] It is true that, according to the *wasatiyah* perspective, man is entitled to discover the laws of nature, yet such mandate is driven by what man *ought* to achieve, rather than what man *can* achieve about the discovery of the natural universe. For instance, in the progress of science and technology, man ought to develop biomedical techniques which are set to ease healthy burdens, however, biological weapons, human cloning, and etc., are unnecessary and wasteful practices, and thus man ought not to develop such products. This is because, though man of science can develop biological weapons, nevertheless, man ought not to do it; the norm here is that what is *ought* to be done in the progress of science determines what *can* be done.

Conclusion

Wasatiiyah approach in science therefore is a response to a number of tendencies which are characterized by

[1] The Qur'an states (7:185):
"Do they see nothing in the government of the heavens and the earth and all that Allah hath created?"
[2] The Qur'an (38:29).
[3] The Qur'an (12:108).
[4] The Qur'an sates (29:20):
Say: "Travel through the earth and see how Allah did originate creation; so will Allah produce a later creation: for Allah has power over all things."
[5] The Qur'an states (13:31);
"Do not the Believers know, that, had Allah (so) willed, He could have guided all mankind (to the right)? But the Unbelievers,- never will disaster cease to seize them for their (ill) deeds, or to settle close to their homes, until the promise of Allah come to pass, for, verily, Allah will not fail in His promise."

[6] Ololade Olakanmi, *Xenotransplantation: A Rational Choice, p39.*
[7] Ibid.

lack of critical thinking as well as those tendencies which are associated to intellectual exaggeration. On the one hand, *wasatiyyah* perspective of science denies unscientific behaviors such as the belief in superstitious and unfounded claims, while it denies the perspectives of tendencies like scientism and other atheistic approaches in the discovery of science, on the other hand. This is because, while the belief in superstitions are marked by lack of reasoning to understand the laws of nature, scientism and other atheistic tendencies in the discovery of science is characterized by extremism and exaggerated trust in science. Similarly, in line with the saying 'be safe than sorry', *wasatiyyah* perspective gives the priority to the moral values over discoveries of science, in such a way that what ought to be done drives what can be done.

References

Anthony, R.L., Andres, E.C., Jaydev, P.D., and William, C.M. (2004). Robotic surgery. Annals of Surgery. 239(1): 14-21

Armstrong, D.M. (1993). *A Materialist theory of the mind*, London: Routledge.

Armstrong, K. (1993). *A History of God: The 4000 year quest of Judaism, Christianity and Islam*, New York: Alfred A. Knopf.

Bernard, E., Rollin, (2006). *Science and ethics*. New York: Cambridge University Press.

Briggle, Adam and Mitcham Carl, (2012). *Ethics and Science: An Introduction*. Cambridge: Cambridge University Press.

Cambridge University Press (2008). *Cambridge Advanced Learner's Dictionary* (3rd ed).

Cohen, H. F. (1994). *The Scientific Revolution: A Historiographical Inquiry*. University of Chicago Press.

Dilworth, C. (1994). Scientific Progress: a Study Concerning the Nature of the Relation between Successive Scientific Theories, (Dordrecht: Kluwer Academic Publishers.

Gregory, A. and Harvey's Heart (2001). *The Discovery of Blood Circulation* Cambridge, England: Icon Books.

HarperCollins (2000). *Collins English dictionary***,** Glasgow: HarperCollins Publishers.

Houghton Mifflin Company (2000). *The American Heritage Dictionary of the English Language.*

Jeffreys A.J., Wilson V. and Thein S.W. (1985). Hypervariable minisatellite regions in human DNA, *Nature*. 314: 67-73.

Kim V.B., Chapman W.H., Albrecht R.J., Bailey B.M., Young J.A., Nifong L.W. and Chitwood W.R., Jr. (2002). Early Experience with Telemanipulative Robot-assisted Laparoscopic Cholecystectomy Using Da Vinci. *Surgical Laparoscopy, Endoscopy & Percutaneous Technology*, 12: 34-40.

Kwoh, Y.S., Hou, J., Jonckheere, E.A., and Hayati, S. (1988). A Robot with Improved Absolute Positioning Accuracy for CT Guided Stereotactic Brain Surgery, *IEEE Trans Biomedical Engineering*. 35: 153-161

Meehl, G. A., Teng, H., Branstator, G. (2006). Future Changes of El Niño in Two Global Coupled Climate Models". Climate Dynamics. 26 (6): 549-566

National Center for Biotechnology Information (NCBI), (2013). Entrez Database. www.ncbi.nih.gov/Entrez/index.html

Nissim A, and Chernajovsky Y. (2008). Historical Development of Monoclonal Antibody Therapeutics, Handb Experimental Pharmacology. 181: 3-18.

O'Hear, A (ed.), (2007). *Philosophy of Science* New York: Cambridge University Press. People and discoveries, (2013). Diresct link: http://www.pbs.org/wgbh/aso/databank/entries/dp42fe

Pickering, M. and Comte, A. (1993). *An intellectual Biography*, Cambridge University Press.

Psillos, Stathis and Gurd, Martin, (2014). *The Routledge Companion to Philosophy of Science* New York: Routledge.

Sean F. Johnston, **(**2009). *History of Science***:** *A Beginner's Guide* Oxford: One world,

Reed, D. (2008). *A Balanced Introduction to Computer Science*, Prentice Hall publisher. Mayr, E. (1985). *The Growth of Biological Thought*, Belknap Press.

Rosenberg, A. (2005). *Philosophy of Science: A Contemporary Introduction* New York: Routledge.

Sarkar, S. (2008). Artificial Blood. *Indian Journal of Critical Care Medicine*, 12 (3): 140-144.

Serres, M. (ed.), (1995). *A History of Scientific Thought.* Blackwell Publishers. The Project Gutenberg E-Book of The New Atlantis, by Sir Frances Bacon, http://www.gutenberg.org/dirs/2/4/3/2434/2434.txt

Weber, M. (1976). *The Protestant Ethic and the Spirit of Capitalism.* New York: Scribner. World Health Organization (WHO) (2013). *Global Health Observatory (GHO) World Health Statistics.* http://www.who.int/gho/publications/world_health_

Article history
Received : 10/12/2013
Accepted : 24/06/2014