

The Spiritual and Ethical Foundation of Science and Technology in Islamic Civilization

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Introduction

Muslim scientists and technologists have for centuries pursued their scientific and technological activities within a spiritual and ethical framework.¹ There was a profound reason for their insistence on such a framework. They believed in an epistemology in which unity of science and technology and spiritual knowledge is duly maintained. They defended this belief by appealing to both revelation (*wahy*) and reason (*'aql*) or to both religious (*naqliy*) and intellectual (*'aqliy*) arguments. By *naqliy* arguments we mean arguments that are drawn from the Qur'an, the Hadiths, and other transmitted sources. For *'aqliy* arguments on the other hand, we mean philosophical and scientific arguments that are assembled for the purpose at hand through the independent exercise of reason. In Islamic intellectual tradition, these two types of arguments are not considered as opposed to each other but rather complementary and corroborative.²

Traditional Muslim scientists and technologists generally embraced the essentially God-centric world-view dictated by the Qur'an. This world-view argues that reality is not limited to the world of sensory experience. Beyond the world perceptible to our physical senses there is another reality encompassing it, which is what the Qur'an calls the 'unseen world' (*al-ghayb*).³ Subtle and spiritual creatures populate this world.⁴ This non-physical world is not unconnected to the physical world in which we human beings live. The existence of the physical world and its functioning in the cosmic system depend on it. There are many verses in the Qur'an that tell us about the connection between the sensory world and the unseen world.⁵ But it would be wrong to assume that, just because Muslim scientists believe in the unseen world on the authority of the Qur'anic revelation, they, therefore, lack a scientific spirit and a scientific frame of mind as we understand it today. For them, the unseen world is not just an object of faith. It is also an object of

¹ For an excellent introduction to the study of the spiritual and ethical framework of science and technology in Islamic civilization see Seyyed Hossein Nasr, *Science and Civilization in Islam* (Cambridge: Harvard University Press, 1968); reprinted (London: Islamic Texts Society, 2003); and *Islamic Science: An Illustrated Study* (London: World of Islam estival Publishing Co. Ltd., 1976); reprinted (Chicago: Kazi Publications, 1995)

² For an extensive study of the harmony between the *naqliy* and *'aqliy* types of knowledge, see Osman Bakar, *Classification of Knowledge in Islam* (Kuala Lumpur: Institute for Policy Studies, 1992); reprinted (Cambridge: Islamic Texts Society, 1998); reprinted (Kuala Lumpur: International Institute of Islamic Thought, 2006).

³ There are many verses in which 'the unseen' world is mentioned. See, for example, 2:3; 6:59; 6:73; 9:94; 10:20.

⁴ In the terminology of the Qur'an this refers respectively to the world of the *jinn* and the angelic world. For a discussion of the angels as an important part of the non-physical reality, see Sachiko Murata and William Chittick, *The Vision of Islam* (New York: Paragon House, 1994)

⁵ Murata, S. and Chittick, W., *The Vision of Islam*, chapter 3.

knowledge. Many traditional Muslim men of learning maintain the position that it is possible to arrive at a rational understanding of the unseen world on the basis of our knowledge of the physical world.

Obviously, the traditional Islamic position depicted above would be in sharp contrast to the mainstream epistemology of science and technology in the modern world. Many contemporary scientists do not believe that there is a knowable reality beyond the physical world. Even when they do as, for example, when they speak of the human mind they would argue that it has come into existence as a result of physical processes. There are contemporary scientists who believe in God, but then they look at the physical world as an autonomous reality that has no meaningful connection whatsoever with God. If the great majority of modern scientists have impoverished external reality through this kind of perceptions, it is because they have impoverished beforehand the inner reality of human cognitive powers by reducing trustworthy sources of knowledge to sensory experience and/or certain kinds of reasoning and thinking activities. It is this impoverished ontological and epistemological beliefs that have shaped the nature and characteristics of western science in the last few hundred years. This particular kind of impoverishment has profound consequences on contemporary science and technology, many of which are with negative implications, and, through these two 'idols' of modern man, have affected our contemporary human civilization.

From the point of view of Islamic conception of reality and epistemology, which is clearly demonstrated in the Qur'an and Hadiths, there is a strong basis for criticizing the ontological and epistemological foundation of modern science and technology. This criticism is absolutely necessary if we are to bring about meaningful changes to contemporary scientific and technological culture. Certainly there is a need to present a credible critique of contemporary science and technology.⁶ While duly acknowledging the many great achievements of modern science and technology, we should be courageous enough to admit their shortcomings, which have contributed to the many ailments of contemporary human civilization. These shortcomings pertain not only to their misapplications by man, which is essentially an ethical problem, but also to the inherent limitations in their epistemology, which is basically a problem of knowledge. We believe that, by accessing Islam's spiritual and intellectual resources pertaining to knowledge and presenting them to the world community, we would be able to make a contribution to the urgent task of creating a new scientific and technological culture that really serves the interests of the whole humanity. Accordingly, in this paper, we offer to

⁶ For those interested in contemporary Muslim critiques of modern science and technology see the various works of Seyyed Hossein Nasr, Ziauddin Sardar, Muzaffar Iqbal, and Osman Bakar. See, in particular, Nasr, S. H., *The Encounter of Man and Nature* (London: Allen & Unwin, 1968); reprinted as *Man and Nature* (Chicago: ABC International, 1997); *Islam and the Plight of Modern Man* (London: Longmans, 1976); reprinted (Lahore: Suhail Academy, 1999); Nasr (in conversation with Muzaffar Iqbal), *Islam, Science, Muslims and Technology* (Petaling Jaya, Malaysia & Alberta, Canada: Islamic Book Trust & Al-Qalam Publishing, 2007); Ziauddin Sardar, ed., *The Touch of Midas: Science, Values and the Environment in Islam and the West* (Manchester: University of Manchester, 1984); Sardar, *Explorations in Islamic Science* (London: Mansell Publishing Ltd., 1989); Osman Bakar, *Tawhid and Science* (Kuala Lumpur & Penang: Nurin Enterprise & Science University, Penang, 1991); 2nd (new) edition (Kuala Lumpur: Arah Publications, 2008); and Muzaffar Iqbal, *Islam and Science* (Aldershot: Ashgate, 2002).

present an introductory discussion of the spiritual and ethical foundation of science and technology in Islamic civilization in the belief that it is precisely such a foundation that contemporary science and technology are really in need of.

Making religion relevant to science and technology

If we hope to secure a spiritual and ethical foundation for science and technology in today's world, then we have to start arguing for the case of religion as an 'ally' of science and technology. But the challenge is formidable. Many scientists and technologists today, including Muslims, are of the opinion that science and technology have no need of religion. They would see any attempt to bring back religion into the secular domain of scientific and technological activities as an arrest on the progress of science and technology. But such a negative attitude toward religion in general, and not just Christianity, has been greatly influenced by the western experience of the relationship between religion and science, which throughout much of its modern history has been characterized by enmity and conflicts. The western public today needs to know that there are other living cultures and civilizations with a different kind of experience of relationships between religion and science. Their experience of it tells a story of mutual influence and harmony. This characteristic feature of harmony between religion and science is especially true of Islamic civilization.

But the modern west is not without prominent voices from the scientific community championing the unity of religion and science. A leading twentieth-century philosopher-scientist, Albert Einstein, once said, 'Science without religion is lame; religion without science is blind.' There is plenty of wisdom in these famous words of Einstein, which highlights the symbiotic relationship between religion and science. It is itself wisdom to say that religion and science are truly in need of each other. Lovers of wisdom would say, for the sake of God and for the sake of humanity, let religion and science stay united.

The words we have quoted from Einstein might be his own, but the wisdom which those words seek to convey certainly did not originate with him. Those who are fairly acquainted with the history of human thought would readily tell us that the wisdom in question is of perennial concern to the great majority of humankind. Many intelligent men before Einstein in various cultures and civilizations have talked about it. Thinkers and philosophers of science especially, from Plato and Aristotle in the West and Lao-tze in the Far East to Ibn Sina in Islam and Galileo Galilee in medieval Europe and right to the twentieth-century philosopher-poet, Muhammad Iqbal, are in love with this wisdom. And decades after Einstein, we continue to have thinking people talking about it although in different tones and with different intellectual styles.

We are quite sure that this voice of wisdom on the unity of religion and science will continue to be heard in the near and distant future. Whether the future voice is going to be louder or softer than what we are hearing now, no one can tell. However, judging from present trends, which clearly show a growing interest in issues of religion and science in various parts of the world, especially in the United States, there is place for hope and optimism for a louder future voice speaking for the cause of unity of religion and science.

In Islam, the idea of harmony and unity of religion and science is very much cherished. As we have earlier emphasized, harmony between religion and science is a major characteristic of Islamic civilization. In Islamic civilization, science was born in the cradle of religion. More precisely, it was born in the cradle of monotheism – belief in the one true God – or what Muslims traditionally love to call *al-tawhid*, which literally means unity.⁷

Islamic science grew and developed to become the most creative and the most advanced in the world for centuries until the seventeenth century, thanks to its nourishment by the teachings of monotheism or *al-tawhid*, which is at the heart of religion. In the finest moments of its history, Islamic science also owed its success to its nourishment and guide by the essential teachings of the Islamic Divine Law or the *Shari'ah*. Monotheism and Divine Law or *Tawhid* and *Shari'ah* were the twin forces of scientific and technological progress, which the religion of Islam gave to the world. Insofar as *al-tawhid* (unity) is a universal idea, we can easily find its believers outside the Islamic civilization. Sir Isaac Newton and Einstein in the West are good examples of scientists whose philosophical and scientific thinking and inquiries have been inspired by the idea of unity of reality. As for the *Shari'ah*, given its negative image in the minds of many contemporary men and women, we could easily be laughed at for claiming that it has been a source of scientific and technological progress in Islam. But modern scholarship supports the claim. Studies by such noted historians of Islamic science as David King and George Saliba⁸ provide ample evidence to demonstrate the creative role of the *Shari'ah* in spearheading practically-oriented scientific research, particularly in the field of astronomy. These studies also demonstrate the unity of religion and science at the level of law and ethics.

More generally, it could be maintained that the revealed teachings of the *Shari'ah* contributed to the origin, development and progress of science in Islam in at least three main respects. First, the religious sciences of the *Shari'ah*⁹ helped to give birth to the scientific spirit in its most comprehensive sense as we know it today. It is important to be noted that the origin and development of the scientific spirit in Islam differs from that in the West. In Islam this spirit was first demonstrated in the religious sciences. In the modern West it was conceived in rebellion against religion. Many modern scholars attributed the origin of Islam's scientific spirit to the foreign sciences it inherited especially from the Greeks. A study of the early Islamic religious sciences, however,

⁷ For a detailed study on the relationship between *al-tawhid* and science and technology in all their dimensions see Osman Bakar, *Tawhid and Science: Islamic Perspectives on Science and Religion* (Kuala Lumpur: Arahan Publications, 2008).

⁸ See, for example, David King, *Islamic Mathematical Astronomy* (London: Variorum, 1986); also his *Astronomy in the Service of Islam* (Aldershot: Variorum, 1993); George Saliba, *A History of Arabic Astronomy: Planetary Theories during the Golden Age of Islam* (New York: New York University Press, 1994); and his latest work, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: The MIT Press, 2007).

⁹ By these sciences we mean what is traditionally known as the sciences of the Qur'an (*'ulum al-Qur'an*), the sciences of the hadiths (*'ulum al-hadith*), the science of principles of jurisprudence (*usul al-fiqh*) and the science of jurisprudence (*'ilm al-fiqh*).

would reveal that by the time Muslims became deeply interested in the Greek philosophical and scientific heritage in the ninth century CE/third century AH, they were already in possession of a scientific attitude and a scientific frame of mind, which they had inherited from the religious sciences. As we have asserted in another work, “the passion for truth and objectivity, the general respect for fully-corroborated empirical evidence, and a mind skilled in the classification of things were some of the most outstanding features of early Muslim religious scholarship as can be clearly seen in their studies of jurisprudence (*‘ilm al-fiqh*) and the prophetic traditions (*‘ulum al-hadith*). A love for definitions and conceptual or semantic analyses with great emphasis on logical clarity and precision was also very much evident in Muslim legal thought as well as in the sciences concerned with various aspects of the Qur’an (*‘ulum al-Qur’an*).”¹⁰ In short, the early religious sciences of the *Shari’ah* sought to emphasize both the critical exercise of reason (*ijtihad*) and empirical investigations.¹¹

Second, the Quranic idea of God as the Law- or *Shari’ah*-Giver helps to create a scientific culture in which there is no cleavage between the “laws of nature” and the “laws of God” as to be found in the modern West. On the contrary, there is unity of laws of nature and the revealed Law of religion. This is because the “laws of nature” too are divine laws.¹² God manifests His Will both in the cosmos and in human societies through laws. In the human domain God has prescribed a *shari’ah* for every people.¹³ The Islamic *Shari’ah* is only the last to be revealed. Some Muslim scholars in the past have referred to the different Divine Laws revealed to different branches of mankind at different points of time in human history as *nawamis al-anbiya’* (‘Laws of the Prophets’). As for the Divine Law governing the whole of creation they refer to it as *namus al-khilqah* (“Law of Creation”).¹⁴

Third, there is the creative role of the specific injunctions of the *Shari’ah* such as the canonical daily prayers, fasting in the month of Ramadan, payment of religious tax (*zakat*), and the pilgrimage to Mecca in motivating scientific studies and research. The practical need of the new and fast expanding Muslim community to follow these injunctions of the *Shari’ah* necessitated the determination of the times of daily prayers and fasting, and the *qiblah*, the direction of prayer toward Mecca, which vary from place to place. It is an established historical fact that the early Muslim concern with the

¹⁰ Osman Bakar, *Tawhid and Science*, pp. 2-3.

¹¹ There are notable modern scholars both Muslim and non-Muslim who have reminded the world of the Muslim advancement of scientific thinking and scientific methodology beyond what was known and practiced by the Greeks. For example, Muhammad Iqbal, a leading Muslim philosopher of the twentieth century, highlighted on the Muslim inductive reasoning as a new departure from the Greek tradition of speculative thought. See his *Reconstruction of Religious Thought in Islam* (Lahore: Iqbal Academy and Institute of Islamic Culture, 1989). Bertrand Russell, a leading British philosopher of the same century, credited the Arabs for the introduction and wide practice of the empirical method in science. See his *Impact of Science on Society* (New York: Simon and Schuster, 1953).

¹² The Qur’an is replete with verses emphasizing this point. To cite an example, we may mention the following verse: “And the sun runs on its fixed course for a term (appointed). That is the decree of the All-Powerful, the All-Knowing” (36:38).

¹³ See *The Qur’an*, 5:48.

¹⁴ For further discussion of the issue of the relationship between the “laws of nature” and the “revealed laws of religion” see Osman Bakar, *Tawhid and Science*, pp. 70-72.

revealed law of inheritance and the *zakat* institution helped to give birth to a new branch of mathematics, namely algebra. In Islam, the closely related disciplines of astronomy, mathematics and geography have been well nourished by the various injunctions of the *Shari'ah*.

Islamic science pioneered and invented many new scientific and technological discoveries in homage to God and His last *Shari'ah* to humanity. It was only with the replacement of Islamic science by modern western science beginning in the nineteenth century that Muslims began to be influenced by a new kind of relationship between religion and science. This new relationship was shaped by western man's post-Enlightenment experience of religion and his insistence on a science that was free of religious influence that was characterized by tension, antagonism, and conflict. Consequently, Islamic civilization lost one of its most noted traditional characteristics, namely the unity of religion and science.

Throughout the centuries in the past, many Muslim philosophers, theologians and scientists wrote books on various aspects of the unity of religion and science. Al-Farabi, Ibn Sina, al-Biruni, and al-Ghazzali – to name just a few of the famous ones – are all known to have explained why religion and science are truly in need of each other. In the common view of these men of learning and scholarship, what science needs most from religion is guidance on its real purpose and on how best it can serve humanity. By virtue of being a religion of knowledge, Islam was able to provide that guidance, thus helping science to play its legitimate role in society for the benefits of mankind. At the level of practical applications of science and technology, this guidance was provided by the *Shari'ah*. At the level of epistemology, this guidance was provided by the metaphysical, cosmological, and psychological teachings of the Qur'an.

With guidance from a higher kind of knowledge made available by divine revelation and from a higher spiritual and moral authority – which religion in fact is – science would know that its real purpose in civilized society is to complement religion in the task of helping man to fulfill his intellectual, rational and material needs in his life on earth. It is also to help man overcome social problems – which arise as a consequence of both natural disasters and human moral choice – that are within its capability and power to solve. It is not for science to compete with religion, let alone to revolt against it and replace it as it was to happen in the modern West.

On the other hand, what religion needs most from science is its well tested knowledge of the natural world, which could help the spiritual teachings of religion to be more enlightened and to become better understood. According to the Muslim scholars we have mentioned, science can even contribute to our better knowledge of God. The positive views of these scholars on the harmony and unity of religion and science have no doubt been inspired by the Qur'an.

The key to a genuine understanding of the unity of religion and science in the Islamic perspective is the idea of *tawhid*. Islamic history was witness to the pervasive role of this idea in the promotion of progress in many branches of knowledge. It is most unfortunate

that such an important idea is little understood by the majority of Muslim scientists today. Equally distressing to observe is the fact that many graduates in Islamic studies have little grasp of the intimate connection between *tawhid* and progress in knowledge, particularly science, in the history of Islamic civilization.

This distressing situation among Muslims today needs to be corrected. A correct understanding of *tawhid* and its role in the progress of scientific ideas and other kinds of knowledge need to be presented in contemporary language to our students and younger generation of scientists. In particular, we Muslims today need to know how Muslim scholars and scientists in the past applied the principle of *tawhid* to their scientific thinking and research to the point of being able to create a healthy and balanced scientific culture. We need to learn lessons from our past history.

Understanding Islam's core teachings on knowledge and their implications for science and technology

Islam is at once a religion (*din*), a community (*ummah*), and a civilization (*hadarah; tamaddun*). In all three senses, Islam is a source of unique perspectives on relations between science, technology, spirituality, and ethics. As a religion, Islam upholds knowledge as the key to both individual and societal salvation. With the idea of unity of reality and knowledge as a guiding principle it refuses to entertain any distinction between the religious and the secular in the realm of knowledge. Science and technology are as relevant as the so-called religious sciences to the human pursuit of the divine.

As a community founded on the idea of the Prophet Muhammad as the last in the long series of law-givers God has sent to humankind, Islam stresses on the Divine Law (*al-Shari'ah*) contained in the Qur'an as the most important source of ethics to guide human actions in all sectors of personal and public life and as the most visible expression of Muslim cultural identity.¹⁵ This Law is generally viewed as not only all-embracing in the scope of its applications but also as dynamic enough to be adaptable to the changing needs of space and time. Science and technology are to be regulated by ethics embodied in this Law.

As a civilization, Islam seeks to promote the interests of all humanity by standing up for the perspectives of universalism, the common good and inter-faith understanding. As so many of Islam's thinkers have asserted over the centuries science and technology are the most powerful and the most enduring universal elements in human civilization and should be pursued for the sake of our common good and inter-faith peace. Given Islam's emphasis on universalism, the common good and inter-faith understanding, it is not surprising that it was in the Islamic civilization that we first find a multi-religious and multi-cultural collaborative research in science and technology.

¹⁵ The five pillars of Islam, which are the foundational elements of Islamic Law, are also the most fundamental elements of Muslim cultural identity. For an excellent introduction to the *Shari'ah* see Mohammad Hashim Kamali, *An Introduction to Shari'ah* (Petaling Jaya: Ilmiah Publishers, 2006).

We now proceed to discuss each of these three dimensions of Islam in detail. Much has been said about the religion of Islam as a “complete way of life” and as a way of doing things. But relatively little has been said about Islam as a religion of knowledge. It is this dimension of Islam that needs to be presented in its breadths and depths to the contemporary world. Through a correct understanding of this dimension of Islam we would be able to understand better Islam’s attitudes toward science and technology.

The term for ‘religion of knowledge’ is not found in the Qur’an. However, there is a verse in which the Qur’an describes Islam as ‘the religion of truth’ (*din al-haqq*). Says the Qur’an: “It is He Who has sent His messenger with guidance and the religion of truth (*din al-haqq*) that he may proclaim it over all religion even though the pagans may detest it.”¹⁶ The position of Islam as the religion of truth would imply that it is also a religion of knowledge. Philosophically speaking, truth implies knowledge. Human knowledge is possible because there are objective truths and realities that man can know through his cognitive powers. Otherwise, no human knowledge would be possible. To be in possession of truths is to have knowledge of all kinds of things.

We may advance many other arguments in support of the idea of Islam as the religion of knowledge.¹⁷ Here below we mention only eight more of these arguments:

[1] The Qur’an makes knowledge the criterion of superiority of man over all other creatures, including the angels. In the passage on God’s appointment of Adam as His vicegerent (*khalifah*) on the planet Earth, it is stated that the angels were told of the fact that God has taught Adam the names of all things, which many commentators of the Qur’an have understood as meaning ‘the natures of all things.’ It was upon their realization of the superiority of Adam in knowledge that the angels bowed down to him.¹⁸

[2] The five verses contained in the maiden revelation to the Prophet Muhammad in Mecca concern knowledge.¹⁹ One could say that these verses sum up the traditional Islamic view of reality and knowledge. Man should pursue knowledge (through reading) in the Name of God, which we understand to mean in its profoundest sense as ‘seeking knowledge with a full awareness of the Divine Reality.’ We human beings should always be conscious of God when pursuing knowledge. It is on the basis of our knowledge of God that we should acquire knowledge of everything else. From the Islamic point of view, therefore, science needs a context. The ontological context of science in Islam is the affirmation of Divine Reality, which is contrary to the ontological belief of modern science. Two types of knowledge are specifically mentioned in these verses. One is knowledge of God, the other knowledge of man.

¹⁶ *The Qur’an* (61:9)

¹⁷ For a detailed exposition of Islam’s teachings on knowledge, see al-Ghazzali, Abu Hamid, *The Book of Knowledge*, trans. Faris Nabih Amin (Lahore: Muhammad Ashraf, 1966, 1974); second revised edition, 1984.

¹⁸ *The Qur’an* (2:30-33)

¹⁹ The Qur’an says: “Read! In the Name of your Lord, who has created; has created man from a clot. Read! And your Lord is the Most Generous, Who has taught by the pen. Has taught man that which he knew not (96:1-5).

God is introduced in the verses as Lord (*rabb*) who created (*khalaqa*) man and taught (*'allama*) him knowledge and as the Most Bountiful (*al-akram*). Through these Divine Attributes and Acts revelation introduced us to knowledge of Divine Reality. Man is depicted as a creature of lowly origin as he was created from a clot of congealed blood, but who emerged to become a sentient being thanks to the intellect-reason (as symbolized by the Pen) God has given him. God is humanity's best teacher and the best human instrument of knowledge is the intellect. Clearly we see in these verses the Qur'an's first illustration of the unity of science and spiritual knowledge.

[3] In many verses of the Qur'an, man is commanded to make use in the wisest manner of all the instruments of knowledge that God has given him, namely his five physical senses, intellect-reason (*'aql*), heart (*qalb*) and his faculty of understanding (*fu'ad*). Man is reminded to be thankful to God for all the instruments of knowledge in his possession.

[4] According to the Prophet Muhammad, knowledge (*'ilm*) is the lost property of a Muslim. Wherever he finds it, he should take it. In another hadith, the Prophet similarly speaks of wisdom (*hikmah*) as the lost property of a believer (*mu'min*). Likewise, wherever he finds it he should take it.

[5] The Prophet reminded the Muslims that seeking knowledge is obligatory upon them, both males and females.

[6] Of all the sacred scriptures of the world the Qur'an mentions knowledge the most often. The word *'ilm* (in its various derivative forms), which refers to both divine and human attributes, is mentioned more than 750 times in the Qur'an. Then there are words related to *ma'rifah* and *hikmah* which also convey the meaning of certain types or forms of knowledge. In short, the Qur'an is impregnated with words pertaining to knowledge, thus emphasizing its importance in the teachings of the Book.

[7] The Prophet commanded the Muslims to seek knowledge from the cradle to the grave. He also commanded them to seek knowledge as far away as China.

[8] The Prophet reminded the Muslims that success in life in this world requires knowledge. Likewise, success in life in the hereafter requires knowledge as well.

The above arguments also show that for Muslims, the Qur'an is the most important source of guidance in the domain of knowledge. Muslims believe that the Qur'an contains the principles of all sciences. They also believe that the Qur'an affirms the supreme role of knowledge in ordering human life and thought and delivering success.

In viewing knowledge as the key to human salvation and to human happiness in this world and in the afterlife as alluded to in one of the above arguments, it is important to point to the kind of knowledge that plays this saving function. Obviously not just any kind of knowledge is efficacious enough to play this role. In the view of many traditional Muslim scholars, a knowledge that saves must be sacred in nature. In Islam, however, sacredness of knowledge is not defined in terms of primacy of revelation over reason. Not just revealed knowledge is regarded as sacred. Among Muslim philosophers and scientists in particular there is the conviction that human knowledge acquired through the use of reason could be considered as sacred if it fulfills certain conditions. By "sacred knowledge" they mean knowledge that is related in some way to God, pursued in the Name of God, and used and applied in the Name of God.

As Muslims generally see it, human knowledge, including science, possesses a sacred character since they see God as the ultimate source of all knowledge regardless of whether human beings acquire it empirically or otherwise. Their view finds support in the Qur'an. The Qur'an speaks of God as the All-Knower and the giver of knowledge to human beings through various avenues ranging from physical senses to intellectual reflection, the interpretation of dreams to divine revelation. The Muslim idea of sacred knowledge is also affirmed by the first revelation the Prophet Muhammad received discussed earlier.

In the Islamic view, the core of spiritual knowledge is knowledge of the Divine Reality, which is what *al-tawhid* is essentially all about. This means that it is knowledge of the Divine Reality that would serve as the spiritual foundation of scientific knowledge. But the question many people ask in connection to this is 'can we know God?' Islam is emphatic in acknowledging that God is knowable. It maintains that the ultimate purpose of human knowledge is to know God. This objective is attainable since human knowledge of creation will lead to knowledge of the Divine Reality, which is considered to be the highest form of knowledge possible. Muslims approach the study of different branches of knowledge, including science and technology, with this spiritual objective in mind.

Scientists view their study of the natural world as a form of religious worship, but the lesser objectives of knowledge are duly recognized. Knowledge helps human beings to fulfill their rational and mental needs such as clarity of mind, certitude of thought, and rational explanations of both natural and social phenomena, as well as those material needs that can be met by technology. In the traditional Muslim pursuit of knowledge, the deepest theoretical understanding of things goes hand in hand with an earnest appreciation of their practical utility.

It was the Prophet who inspired Muslims to pursue knowledge of things for both their theoretical and practical considerations. He encouraged his followers to reflect and contemplate natural phenomena pursuant to the Qur'an with a view toward deepening understanding of divine power and wisdom in creation. But the Prophet also compared knowledge that had no practical benefits to a tree without fruit. He often prayed to God seeking protection from "useless knowledge." On the basis of this tradition, Muslim scholars progressively sought to articulate ideas, concepts, and theories on the broader issue of the ethics of knowledge as activities of knowledge production and applications in the new civilization expanded and became more complex. Major issues included clarifying the meanings of beneficial and harmful knowledge in the perspective of Islamic Law and determining the general criteria for each type of knowledge.

Muslim preoccupation with the knowledge culture took many different forms. One was classification of knowledge,²⁰ which proved to be a good way of keeping track of the state of knowledge at any given time. Classification of knowledge divided the sciences into thematic groups of well-defined disciplines, and preserved their hierarchy.

²⁰ For a comprehensive study of this theme, see Osman Bakar, *Islamic Classification of Knowledge in Islam*.

Traditional Muslim scholars dealt with several systems of classifications, the most popular of which were the classification of knowledge into the *naqliy* (transmitted) and *'aqliy* (intellectual) categories and into the *fard 'ayn* (obligatory to everyone) and *fard kifayah* (obligatory to society as a whole) types. We will discuss later these two types of obligatory knowledge in connection with scientific and technological knowledge.

The Arab philosopher, al-Kindi (801-873) authored the first Muslim classification of the sciences in the ninth-century. Since then many scholars have devoted considerable effort to expositions of this theme. The last significant work on the subject is the classification written by the Indian theologian Shah Waliullah of Delhi (1703-1762) in the eighteenth century. The importance and popularity of classification of the sciences was evident not only from the large number of books written on the subject but also from the diverse nature of the scholarly community that produced them.

Both Sunni and Shiite theologians, philosophers, scientists, historians, and jurists were represented in this unique enterprise. Such classifications had been particularly useful to the organization of educational curricula. Interestingly, there appeared to be a correlation between the rate of production of classifications of knowledge and the intensity of knowledge expansion. The interest in classifications was at its height during the era when Muslims were the most productive in terms of adding new scientific disciplines to the existing body of human knowledge. After the sixteenth century when intellectual and scientific innovations began to decline in most parts of the Islamic world, work on classifications dropped sharply. The fact that hardly any work has appeared on the subject since the eighteenth century testifies to the reduced importance of the role of knowledge among Muslims in the last one century.

A Muslim classification of knowledge of any period reveals a great deal about the knowledge culture of the period in question, including its characteristics and achievements. Among the things it reveals is whether or not new branches of knowledge have been added since the last classification was written. It is also clear from past classifications that Muslims were concerned with the need for a balanced approach to both theoretical and practical knowledge. In addition, Muslims accord relative importance to each science in the context of human knowledge as a whole. Scholars generally use three criteria to determine the epistemic position of each science in what is traditionally called the hierarchy of knowledge. The criteria are defined in terms of the relative excellence of the objects of study, methods of study, and benefits of study. Some sciences may be viewed as more laudable than others on the basis of one or more of these criteria. The greatest science in light of the three criteria is the science of God or theology in the true sense of the word.

The societal and ethical dimensions of science and technology

Thus far we have concentrated on discussing the place and role of *al-tawhid* or knowledge of the Divine Reality as the core element in the spiritual foundation of science and technology. We now discuss in greater details the societal (*ummatic*) and civilizational (*hadari*) dimensions of science and technology and the place and role of

Shari'ah-based ethics of knowledge in their ethical foundation. Again traditional Muslim classifications of knowledge prove helpful in this discussion. As clearly reflected in classifications over the centuries Muslims do not consider science and technology to be the most important branch of knowledge, as do many people in Europe and North America who view science as the sole basis for reliable knowledge and technology as the best means to solve human problems. From the Muslim perspective, science could never take the place of metaphysics and theology in either temporal or moral importance since the latter have God and the divine realities as their "object of study" whereas science and technology focus on natural objects created by God. Additionally, technology could never replace Divine Law (*shari'ah*) as the best provider of efficacious solutions to human individual and societal problems. Despite these beliefs, at the apex of their cultural influence, Muslims demonstrated a degree of appreciation of science and technology unseen in earlier times. Such appreciation was contextual, as dictated by the *Shari'ah* itself.

The *Shari'ah* has conferred the status of *fard kifayah* knowledge to science and technology on the basis of their immense benefits to human society. Muslims distinguish between two types of obligatory knowledge. The first type is *fard 'ayn*, meaning obligatory for everyone to have as, for example, in the case of knowledge of canonical prayer. The second type is *fard kifayah*, meaning things societies are obliged to possess, though the task of acquiring them may be left to certain individuals or groups. Implicit in the meaning of this category of knowledge is that without it a society would lack something that is important to its well-being. The *Shari'ah* has conferred the status of *fard kifayah* knowledge to science and technology on the basis of their immense benefits to human society. A society without a level of science and technology proportionate to its problems is considered unhealthy. Political philosophers like al-Farabi (870-950) went so far as to claim that science and technology are necessary ingredients in the pursuit of human happiness. But to Muslims, science and technology serve society best when pursued and employed in the light of ethical-legal principles of the *Shari'ah*.

Muslims believe both *Shari'ah* and science and technology are necessary to societal salvation and that the two should be joined within the ethical and legal framework of the *Shari'ah*. The *Shari'ah*, which is primarily based on the teachings of the Qur'an and the prophetic *hadiths* is considered by Muslims to be the most important source of ethical values and principles to guide human actions and conduct. In the case of the Shiites the *hadiths* extend to embrace the teachings of their supreme spiritual leaders known as *Imams*.

In principle, insofar as the *Shari'ah* is deemed as a sacred law it refuses to separate between legal thought and spiritual ethics. In this particular view, what is legal has to be spiritually ethical as well. The Islamic view of the relationship between spirituality and ethics and legal thought is therefore philosophically different from the secular approach to ethics and law. The latter approach not only detaches ethical-legal thought from spirituality but also tends to separate between ethics and law. In practice, however, not everyone accepts the spiritual dimension of the *Shari'ah*. But this fact in itself does not preclude the possibility of the 'secular' dimension of the *Shari'ah*-derived ethics and

legal norms from being considered for adoption by non-Muslims as long as it serves the common good. This issue deserves further investigation and explanation, which is however beyond the scope of the present essay.

In Islam, the ethical significance of scientific and technological activities resides in the fact that the *shari'ah* divides all human actions into five categories. These categories are the obligatory (*wajib*), the meritorious or the recommended (*mandub*), the indifferent (*mubah*), the forbidden (*haram*), and the reprehensible (*makruh*). The main significance of these ethical-legal categorizations for science and technology in Islamic culture is that society and the state are in broad agreement on what ought to be the priorities in scientific and technological pursuits. Obviously, scientific and technological products and activities in the obligatory and meritorious categories are given the greatest priority. At the same time the *Shari'ah* is ever present to remind society and the state of the need to refrain from indulging in scientific and technological activities belonging to the forbidden category since *haram* would be harmful to society.

The *Shari'ah's* general objectives, such as to protect religion, reason, life, progeny and property, and its specific exhortations pertaining to both worship and social duties determine the types and scopes of scientific and technological activities to be encouraged or shunned. Muslim science and technology over the centuries had more or less developed along the ethical track that the *Shari'ah* provided. Muslims emphasized sciences like mathematics, astronomy, geography, medicine, botany, and agriculture because of their practical relevance to the *Shari'ah*. For the same reason, Muslims developed civil engineering and medical, agricultural, and navigational technology to new heights in the medieval period. But on the whole, harmony between science, technology and ethics was rarely shattered.

Reapplying Islamic ethics of knowledge to contemporary issues in science and technology

The traditional bond between Divine Law and technology has been severed in many early-twenty-first century Muslim societies. For various reasons, the *Shari'ah* is no longer seen as relevant to the shaping of technological pursuits. Muslims face the ethical challenge of dealing with science and technology issues that are largely not of their own making and that pose numerous challenges to traditional ethics.

Perhaps the most serious challenge emerges from military technology and biotechnology including medical technology that enables humans to, literally, determine life and death. Modern military technology in the form of weapons of mass destruction, such as nuclear and biological weapons, clearly transgresses the limits of traditional Islamic war ethics. Some Muslim states are defending the right to acquire such weapons on what they claim to be “Islamic grounds,” although it seems clear that their motive is primarily political. Many scholars in Sunni Pakistan defend that country’s “Islamic bomb” on the basis of geopolitical considerations. In Shiite Iran clerics are divided on the issue of possessing nuclear weapons with former President Seyed Mohamed Khatami (elected 1997) taking the stand that such weapons are contrary to Islamic ethical

teachings. Muslims throughout the world are divided on the issue not along theological or jurisprudential grounds but by political, ideological perspectives. However, one thing is clear. Pro-nuclear weapons advocates have been able to sustain their views largely by appealing to political considerations rather than to the more fundamental Islamic ethics on the conduct of war. It can be said that proponents of the supremacy of political Islam are likely to endorse such weapons.

Biomedical technology on the other hand has impacted the social fabric of Europe and North America in an unprecedented way and has sent shock waves into the Muslim world. The range of biomedical technology currently employed in Muslim countries is still limited. But that limited use is apparently dictated far more by economics than by perceptions of ethical incompatibility with Islam. The more prosperous Muslim countries as well as Muslim minorities in the West have helped their counterparts in other parts of the world to keep abreast with ethical issues arising from modern biomedical practice. In countries like Malaysia, Turkey, Iran, Kuwait and Indonesia issues in biomedical ethics that are debated in the West are likewise discussed in the medical profession and the academia. The Islamic Organization for Medical Sciences based in Kuwait is exceptionally active in organizing international meetings of Muslim medical doctors to discuss implications of contemporary biomedical technology for Islamic societal values. Experts in Islamic Law are often invited to these meetings for religious consultation. The meeting of scientific and religious minds has been successful in coming up with well-defined criteria for Muslim acceptance of biomedical technology.

There is a particular concern for the impact of biomedical technology on traditional family values and institutions. The general Muslim view is that while that technology is not the cause of the breakdown in traditional family and marriage institutions it nonetheless has created new possibilities that allow the viability of alternative life styles. Life-support machines that call into question the traditional definition of death, technology that uncovers information about babies still in the womb, sperm banks, and artificial insemination are major examples of modern-day scientific and technological innovations that have attracted the attention of Muslim ethicists.²¹ Debates on the ethical issues arising from such discoveries had hardly settled when the more serious ethical issue of cloning emerged. Muslims are unanimous in rejecting human cloning. But they are deeply divided on the use of stem cells for research. The overwhelming majority oppose using human stem cells for research. But some Muslim groups consider use of adult stem cells as religiously permissible.

²¹Contemporary Muslim ethical responses to biomedical technological innovations are not yet satisfactorily documented. Since many of these responses are independently initiated, either at national or regional levels with few interactions taking place between them, global Muslim discourses on the ethics of technology in general and the ethics of biomedical technology in particular with the view of formulating a united and universal Islamic position on the issue are still lacking. A fuller documentation of these discourses is necessary before we could provide an overview of the Muslim positions on the issue and if we were then to formulate an Islamic position that transcends legal schools of thought and Muslim geo-cultural regions.

The following patterns emerge in the still-fluid Muslim response to bioethical issues.²² First, Muslims are increasingly turning to Islam's inner resources as found in the Qur'an, prophetic traditions, and traditional ethics in looking for answers to dilemmas posed by the new technologies. Second, Muslims are evaluating the potential value of new technologies while remaining committed to defending *Shari'ah*-sanctioned social institutions. They are likely to adopt new technologies within the constraints of the *Shari'ah* as they have already done in many cases. For example, Muslim jurists have permitted artificial insemination as long as the couple is legally married according to Islamic Law and the semen is that of the husband. Third, Muslims are questioning whether humanity needs to have better and more encompassing ethical ideas than just those that appeal to "research interests" or "search for medical cures" in order to justify controversial, new scientific research and biomedical technology. As Muslims become more immersed in technological matters they more often find the need to consult the ethics of the *Shari'ah*.

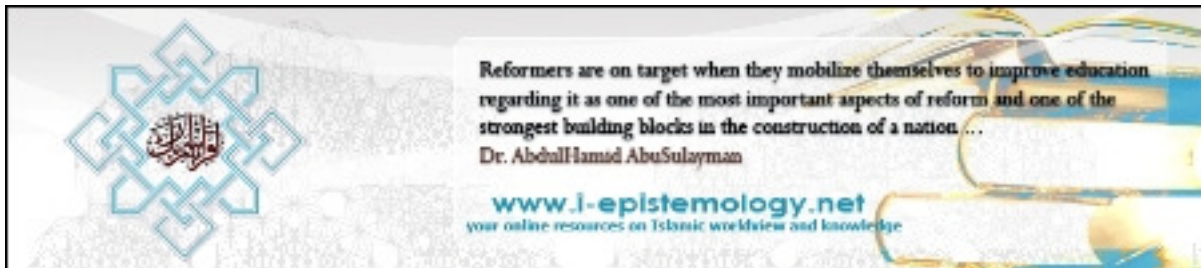
Conclusion

A deep interest in ethical issues in science and technology presupposes a certain level of scientific and technological progress. As things are, most Muslim countries have hardly attained that level of progress. Many factors ranging from the religious to the political have contributed to the present Muslim lack of progress in science and technology. One of these is the neglect in Muslim education of that dimension of Islamic teachings favorable to scientific and technological progress. The current lack of interest in the ethics of science and technology in Muslim societies is thus understandable. But this lack of interest does not at all reflect the intellectual richness that characterizes the traditional treasury of Islamic ethical wisdom. Students of the *Shari'ah* and the ethical dimension of Islamic science and technology when it was at its best are quite aware that Islamic ethical thought remains largely relevant to many of the contemporary ethical issues.

In the last several decades Islam has emerged as an important source of positive influence on the Muslim thinking on science and technology. Many Muslims now see the possibility of merging the best of modern scientific and technological culture with the best of Islamic intellectual and cultural tradition. Compared to many other Muslim countries, Malaysia is placed in a better position to take the initiative to realize this possibility. It is one of the most advanced Muslim countries in science and technology. While seeking to reap the benefits of modern western science and technology Malaysia has also shown much interest in Islamic values as a contributing factor to scientific and technological progress in the twenty-first century.

²² Works on Muslim responses to contemporary bioethical issues are still few in number. For introductory readings on this subject see Munawar A. Anees, *Islam and Biological Futures: Ethics, Gender and Technology* (London: Mansell, 1989); Anees, M. A., 'Human clones and God's trust: An Islamic view,' *New Perspectives Quarterly*, 2:1 (1994). See also Osman Bakar, *Tawhid and Science*, chapter 9; also his 'Abortion: Islamic Perspectives,' Warren T. Reich, ed. *Encyclopedia of Bioethics*, revised edition, vol. 1 (1995), pp. 38-42. See also Abu Bakar Abd Majeed, *Bioethics: Ethics in the Biotechnology Century* (Kuala Lumpur: IKIM, 2002).

There is a visible attempt in the country to create a new synthesis of tradition and modernity not only in science and technology but also in other fields of civilization. The Malaysian government has created several institutions with that goal in mind, one of which is the Malaysian Institute of Islamic Understanding (IKIM). IKIM is known to have organized several programs on ethical issues in science and technology. The newest entry into this category of institutions is the International Institute of Advanced Islamic Studies (IAIS) established in October 2007. IAIS under the patronage of the Prime Minister, Dato Seri Abdullah Ahmad Badawi, has already established a unit dedicated to research on science, technology, environment, and ethics. Hopefully through this unit, IAIS would be able to undertake research that contributes to the realization of a new synthesis of tradition and modernity, particularly in the field of science and technology. The goals of this research are very much in conformity with many of the principles embodied in Abdullah Badawi's Islam policy popularly known as *Islam Hadhari* ("Civilizational Islam").



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