How to Make Sense of 'Islamic Science'?

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Abstract

The idea of Islamic Science has been around for at least three decades, and it has generated a lot of controversy. Some people deny that this idea makes any sense. They argue that science is an objective and universal enterprise, and it does not depend on any creed or ideology. We believe that this is a naïve interpretation of scientific activity and that 'Islamic Science,' or for that matter, 'religious science,' has relevance at two levels: the theoretical level and the practical level. At the theoretical level, the philosophical and ideological presuppositions of the scientist are very effective in his or her theory-making or choice of theories. As for the practical orientation of science, the cultural traditions of the scientist make a difference. Thus, 'Islamic science' ascertains the relevance of scientific activities to Islamic worldview, which has implications for both the theoretical and the practical aspects of science.'

Historical Introduction

In recent decades the terms 'Islamization of Knowledge' and 'Islamic Science' have been frequently used and have caused a lot of controversy. But the history of the subject goes much further. In 1930s, Mawdudi criticized the newly established Aligarh Muslim University and called for the Islamization of knowledge:

> It is, therefore, high time for the Muslims to get rid of the old and stale system of education as well as the modern system of secular orientation and work out a separate system of education of their own, as modern in nature as possible, making best use of modern science and techniques but with undiluted Islamic orientation. This plan should be exe-

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> cuted and implemented through those who are not only well versed in Islam but one also armed with firm faith and conviction and full of missionary zeal.[1]

During the 1960s and 1970s several scholars talked about Islamic Science, notably S.H. Nasr, Naquib al-Attas and Jaafer Sheikh Idris. During the 1980s Isma'il al-Faruqi was very active in this field as was Seyed Ali Ashraf. In April 1977, the First World Conference on Muslim Education was held in Mecca. In this conference, which involved many eminent scholars from various parts of the world, the Islamization of various disciplines was emphasized. In the last two decades, the international Institute of Islamic thought, with headquarters in Virginia (USA) and with branches in a number of capitals world-wide, has been very active in this area. Furthermore, many International Conferences dealing with this subject have been held in the Islamic and Western countries, and several scientific journals have been published, including: *The American Journal of Islamic Social Sciences* (America), *Journal of Islamic Science* (India), and *Muslim Education Quarterly* (U.K.), to name just a few. Furthermore, many books have been published which deal with this subject. The appended table shows a sample of them.

The problem of religious science has not been under consideration only in the Islamic world. It has been under discussion in the Christian world too. In fact, the Pascal Center has held two conferences in Canada in the last eight years under the banner of "Science in a Theistic Context." Here we want to discuss why the problems of Islamization of knowledge or Islamic Science have been brought up in the Islamic world, and how one can make sense of Islamic science.

During the golden age of Islamic civilization, the sciences of nature were part of philosophy, and they were taught along with mathematics and theology and all of them were embedded within a single metaphysical framework. Muslim scholars believed in a hierarchy of knowledge which started from revealed knowledge and terminated in empirical knowledge. But, they also believed in the interrelatedness of various disciplines. With the development of modern science in the sixteenth and seventeenth centuries, and with its subsequent success in the description of natural phenomena, the sciences of nature became separated from philosophy and followed their own way. During the nineteenth century, positivism and other schools of empiricism emerged and they controlled academic circles. This situation is still dominant. Thus scientists in the West predominantly neglect religious

concern in their scientific investigations or are even antagonistic toward such considerations. The revival of religious concerns among Western scientists in the last few decades is still a weak current, though it has been gaining strength with the passage of time.

It was during the strong current of positivism that modern science was transferred to the Islamic world and carried with it the underlying empiricistic overtones—an outlook which separated sciences from a theistic metaphysical framework. Thus, secular science became prevalent and the view that science is not compatible with religion or is independent of it became dominant.

Since the Islamic world has not, in spite of loosening its ties with religion, caught up with western progress in the fields of science and technology, and because immorality has been strengthened due to the misuse of science and scientific products, many celebrated Muslim scholars throughout the Islamic world have preached for the concept of Islamic science.

Is There Any Room for Islamic Science?

Science is usually taken to be an objective, value-free enterprise. Thus, when the concept of 'Islamic Science' is brought up, it is said that physics, chemistry, etc. are neutral toward any religion or ideology, and that in fact science and religion are two independent endeavors. On the other hand, some people mean by Islamic science one which involves the discussion of miracles of the Qur'an or the Islamic tradition or one that discusses the possible ways of proving God or one that tries to attribute the origin of science to the Muslim scholars, etc.

We believe that these interpretations of the concept of Islamic science are misguided and that this concept is badly interpreted. Our scientists or students of science are neglecting the fact that the selection between various theories depends to a large extent on the metaphysical presuppositions of scientists. In fact, as Einstein emphasized, theories are not pure deductions from experiments. Scientists' metaphysical commitments have a large influence in the development as well as the interpretation of theories. If science were simply based on simple observations, then there would be no difference between Islamic or non-Islamic science. But, the generalizations from simple or limited experiments to general claims always take place within an explicit or implicit metaphysical framework. Consider, for example, the science of cosmology. One of the difficulties of this science is that we are observing the universe from a specific corner and our knowledge

about most of the celestial objects is indirect. Thus, we are forced to extend our local physics and in this extension we are using some assumptions which are not directly verifiable. For instance, we often make the following assumptions: local physics is extendable to the whole universe; our location is not a privileged one (cosmological principle); our world is a four dimensional space-time continuum; and the red shift observed for the light reaching us from distant galaxies is due to the expansion of the universe.

Similarly, there have been differences of opinion about the nature of physical reality, for example: Pythagoreans reduced everything to numbers; Parmenides reduced everything to space; Materialists reduce everything to matter; and Positivists reduce everything to sense data. Scientific theories are made under the influence of scientists' metaphysical outlook about the nature of physical reality, and this in turn has frequently been under the influence of philosophical or religious commitments.

Recent studies have shown that religious ideas have been influential in the making, selection and evaluation of theories. It seems obvious that if one is not denying other kinds of knowledge besides the scientific knowledge, then there will be room for the revealed knowledge and its effect on scientific knowledge. It is on this basis that we want to elaborate on the relevance of religious science, and in particular Islamic science.

The Relevance of Islamic Science

By Islamic science we mean a science that is framed within an Islamic worldview and whose main characteristics are that it considers Allah as the Creator and Sustainer of the universe; does not limit the universe to the material world; attributes a telos to the universe; and accepts a moral order for the universe.

These characteristics are more or less present in the other two Abrahamic religions (Judaism and Christianity) too, and they could be taken as general characteristics of a "theistic science." In comparison, secular science neglects God, limits existence to the material world alone, denies any purpose for the universe and is negligent about values.

We deny that any of the following definitions for Islamic science are acceptable:

- That scientific activity (experimentation, observation and theorizing) be done in a new fashion.
- That for physico-chemical research one should refer to the Qur'an or *Sunnah*.

- That emphasis be put on the so-called scientific miracles of the Holy Qur'an.
- That for scientific work we return, exclusively, to the old scientific theories or experiments.
- That we put aside all of the scientific and technological accomplishments of humanity in the last few centuries.

However, we believe that the main difference between Islamic science and secular science shows up in the following areas:

- Metaphysical presuppositions of science can often be rooted in religious worldviews.
- Religious outlook is effective in the proper orientation of the applications of science.

Now, we elaborate on these two points.

Science Is Not Free from Metaphysical Presuppositions

Empirical science often starts with experiments and observations. But, in the selection of experiments and observations, the presuppositions of scientists are very important. For example, Heisenberg opposed the indefinite divisibility of atomic objects on philosophical grounds, and so he questioned the advisability of building more powerful atom smashers.[2] It is, however, in the interpretation and extrapolation of experimental results that the presuppositions of scientists are most effective. What an experimentalist does could be the same throughout the globe. Even the phenomenological description of phenomena could be the same. But in the making of universal theories, the philosophical presuppositions come into play. As Mawdudi put it:

> In all sciences, there are two aspects. One aspect consists of realities of nature, i.e. facts. Another aspect is the human viewpoint which classifies these facts, moulds them into theories and formulates some concepts. These two aspects need to be distinguished. As far as the facts are concerned, they are universal; they are just facts. But, for instance, the Marxist mentality organizes these facts according to Marxist outlook. You hear such terms as Russian science or Communist philosophy. Communism has a particular view of universe and man; it has its own theory of history as well . . . Thus, every child in the communist societies learns the science developed according to communist ideology. Similar is the case with Western scientists. They have their own peculiar concept of the universe, God and man . . . From these examples, we can see that each ideology shapes knowledge and science according to its own point of view. Whenever

> Muslims learnt different branches of arts and science, they Islamized it [sic] in the sense that they contemplated them with Muslim Mind . . .[3]

Andre Linde, the celebrated Russian cosmologist, sums up the matter elegantly:

> When scientists start their work, they are subconsciously influenced by their cultural traditions.[4]

And in the words of Robert Young, the editor of the journal *Science as Culture*:

> Recent work has made it clear to those with eyes to see that there is no place in science, technology, medicine and other forms of expertise where you cannot find ideology acting as a constitutive determinant.[5]

Thus, when we are dealing with the problems of the nature of the universe and we want to select between the current theories, our previous mentalities are effective in our selection. A theist interprets the present facts within one framework and an atheist sees it in another one. In other words, the world view of a scientist gives him orientation in theorizing and in the selection of theories. A few examples can illustrate our point.

Example 1

The unification of the fundamental forces of nature is one of the major occupations of the contemporary particle physicists. For the unification of the electromagnetic force and the weak nuclear force, three physicists received 1979's Nobel Prize in physics jointly (Salam, Weinberg and Glashow). But the motivation of the three was different in following this line of research. Salam believed that the unity of the forces of nature is an indication of the unity of the Ruler of nature, Glashow saw the significance of this effort in its practical utility, and Weinberg was attracted to this idea because of the simplification that it produces.

Example 2

In recent decades, it has been noticed that the emergence of life in the universe depends upon a delicate balance of certain physical factors such as the strengths of the fundamental forces of nature. For example, had the strength of the gravitational force been slightly stronger than the present value, the expansion of the world would have been stopped and the con-

traction would have started. Then, there would have not been any opportunity for the formation of galaxies. On the other hand, had the strength of the gravitational force been slightly less than its present value, the world would have expanded too fast, and there would have not been any opportunity for the formation of stars. In either case, the conditions for the formation of carbon atoms, which are necessary material ingredients of life, would have not been met. Thus, it seems that the laws of physics operate in such a way that they make the development of life possible. This fine tuning of the fundamental constants and forces of nature is called the 'anthropic principle.'

For this principle two explanations are often given: there are infinitely many universes, thus, it is no surprise that one of them has the necessary conditions for the emergence of life; or we have only one universe, and this has a designer at work.

Theist physicists have favored the second interpretation, whereas atheist physicists have supported the first one. For example, Peter Atkins of Oxford University supports the many-worlds interpretation:

> It is possible that this is not the only universe, it is possible that universes are falling into existence while we are speaking at the moment. Somewhere there are trillions and trillions of universes. And it's possible that all these universes have a different mix of fundamental constants. Some have $\Pi = 2$, others have electrons the size of elephants, and so on. Some will give rise to matter, but not life. Others won't even give rise to matter—they will be just another boring universe filled with radiation. You can imagine a whole crowd of billions and billions of universes, and it just happens that one of those (may be more than one, but at least one of those) happened to tumble into existence with a particular mix of fundamental constants that allowed life to develop.[6]

Whereas Roger Trigg, an eminent philosopher of the University of Warwick, supports the theistic interpretation of the anthropic principle:

> I think that it [the anthropic principle] does point to something, like an argument from design. It is a modern argument from design for the existence of God. Now I know that it isn't a knock-down argument; other people may see it differently. Some people talk about an immense number of universes and it just happens that we're in the universe that produced us—we wouldn't be in one that hasn't produced us! But, I think if the answer to a question is an infinite number of universes, one's in great difficulties. I think it's much simpler to believe

> in God who created the one universe, rather than saying there are an enormous number and we just happen to be in the one that's come up in this way.[7]

Of course, the many-world hypothesis is itself nonverifiable as Jastrow has put it elegantly:

> Some scientists suggest, in an effort to avoid a theistic or teleological implication in their findings, that there must be an infinite number of universes, representing all possible combinations of basic forces and conditions, and that our universe is one of an infinitely small fraction, in this great plentitude of universes, in which life exists. Perhaps it is the only Universe within this infinite multitude in which life exists. But I find this to be a rather formal solution to the philosophical dilemma created for scientists by the anthropic principle—a typical theorist's solution. In any case, it is an unstable proposition, because all these other universes are forever beyond the range of our observations; they are outside the borders of the visible universe, and can never be seen. What is forever unobservable and unverifiable, seems to me to be scientifically uninteresting.[8]

It is for this reason that Jastrow, an acknowledged agnostic, admits:

> Thus, according to the physicist and the astronomer, it appears that the Universe was constructed within very narrow limits, in such a way that man could dwell in it. This result is called the anthropic principle. It is the most theistic result ever to come out of science, in my view.[9]

Besides, even the existence of many worlds with different fundamental constants is compatible with theism: God could have created many independent worlds with different characteristics.

Example 3

One reason for the popularity of the steady state theory or the oscillatory model of the universe among some physicists is that these theories provide a ground for a non-theistic interpretation of the universe. As Steven Weinberg put it:

> The idea that the universe had no start appeals to many physicists philosophically, because it avoids a supernatural act of creation.[10]

Fred Hoyle, the celebrated British astrophysicist, rejects the Big Bang model of the universe, because this brings a metaphysical element into the

physical description. Such elements, in his view, are not needed for solving any problem:

> The abrupt beginning is deliberately regarded as metaphysical—i.e., outside physics. The physical laws are therefore considered to break down at $t = 0$, and to do so inherently. To many people this thought process seems highly satisfactory because a "something" outside physics can then be introduced at $t = 0$. By a semantic maneuver, the word "something" is then replaced by "god," except that the first letter becomes a capital, God, in order to warn us that we must not carry the enquiry any further.
>
> Attempts to explain phenomena by means of metaphysical intrusions into the world have always failed in the past. At the beginning of the nineteenth century, it was thought impossible to synthesize organic molecules by normal chemical processes. Nowadays, a whole industry is based on doing so. It is true that phenomena have been discovered in the past that have forced a widening of the physical laws, the discovery of radioactivity, for example, but widening the physical laws does not change their basic logic. Of course, one can argue that the origin of the universe is by its very nature a special case. Although to many this last contention appears respectable, I prefer personally to rely on past experience. I do not believe that an appeal to metaphysics is needed to solve any problem of which we can conceive.[11]

Similarly, Stephen Hawking uses a model of the universe in which space-time is the four dimensional analogue of the surface of a sphere – a surface which is finite and has no boundaries. Thus, admitting that the Big Bang can be identified as the instant at which God created the universe,[12] he concludes from his model that:

> There would be no singularities at which the laws of science broke down and no edge of space-time at which one could have to appeal to God or some new law to set the boundary conditions for space-time.[13]

On the other hand, William Craig, an American philosopher, uses the Big Bang model of the universe as a premise to prove the existence of God.[14] What Hoyle, Hawking, et al. have neglected is the fact that the absence of a temporal beginning for the universe does not necessarily imply the self-sufficiency of the universe and its independence from God.

Example 4

Darwin's theory of evolution claimed that all living things have evolved by natural processes from preexisting forms. This process occurred through a mechanism called natural selection. The theory of evolution has been interpreted both theistically and atheistically. In the atheistic interpretation, natural selection alone is enough to cause the evolution of species. As Richard Dawkins put it:

> Evolution, the blind designer, using cumulative trial and error can search the vast space of possible structures; blind chance on its own is no kind of watchmaker. But chance with natural selection, chance smeared out into innumerable tiny steps over eaons of time is powerful enough to manufacture miracles like dinosaurs and ourselves.[15]

But upon reflection one sees that zoological data alone cannot negate God's role, because from simple experimental results one cannot deduce universal facts. In fact, evolution could be interpreted theistically. As Arthur Peacocke put it:

> I think the theory of evolution has articulated, unravelled and made clear to us how—to put it theologically—God has been creating life and different forms of life. The evolutionary process is one which enables new forms of life to come into existence. But it does not answer the question why should there be such a process at all.[16]

The assumption of a mechanism for the evolution of species does not imply that there is no designer.

It is interesting that several years ago the National Association of Biology Teachers in America described evolution as "an unsupervised, impersonal, unpredictable and natural process" which implied the negation of God. But, in 1997 the foregoing association eliminated the words 'unsupervised' and 'impersonal' from their description of evolutionary processes.[17]

Example 5

The nature of life has always been one of the most perplexing questions. During the twentieth century most of the scientists and philosophers have held that life has emerged during a long evolutionary process and it will ultimately be explained by physics and chemistry. But the question arises as to whether the existence of physicochemical processes negates any non-material aspect. It is obvious that living organisms are made of chemical components and contain various kinds of proteins. It is also clear that some physical laws govern these processes. But this does not prove that there is

nothing beyond physicochemical processes. The difficulty with the materialists' vision is that they restrict the whole reality to what is deducible from physics and chemistry. They think that with the discovery of the mechanism of something they have access to its whole reality. Francis Crick, one of the discoverers of the DNA molecule, who is a hardline materialist, says in his book *The Astonishing Hypothesis*:

> The astonishing Hypothesis is that "you," your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll's Alice might have phrased it: "You're nothing but a pack of neurons." This hypothesis is so alien to the ideas of most people alive today that it can truly be called astonishing.[18]

John Gribbin says the same thing:

> The great triumph of molecular biology is that it has established that there is enough information in human genetic material—DNA—to provide a 'blue print' for the construction, care and maintenance of the human body. No outside agency is needed—except, as Paul Davies stressed, the outside agency of the basics laws of physics.[19]

It is amazing that Gribbin ends his article with the following words:

> The more we learn about the Universe, the more we see how ignorant we really are.[20]

With this admission of ignorance, it is not clear why Gribbin eliminates everything beyond physics, and how the access to one part of nature enables him to deny other parts of it or the supranatural. Charles Townes, the Nobel laureate in physics, believes that biologists are still working at a simple mechanical level[21] and that they have not yet come up against a wall as physicists have.[22] The restriction of the whole reality to the physical domain is a metaphysical decision—it is in fact ontological reductionism.

Example 6

One of the controversial problems of our age is the purposefulness of nature. Modern science has been dealing with the description of phenomena and has ignored teleological considerations in scientific research. The founders of modern science, who were devoted theists, did not deny the presence of telos to the universe, but they did not consider it the job of science to deal with teleological considerations. With the development of sci-

ence and the dominance of the empiricistic outlook, teleology was considered to be an avenue for theism. Therefore, atheists have insisted on denying any kind of teleological considerations. In Atkin's words:

> A gross contamination of the reductionist ethic is the concept of purpose. Science has no need of purpose. All events at the molecular level that lies beneath all our actions, activities, and reflections are purposeless, and are accounted for by the collapse of energy and matter into ever-increasing disorder.[23]

R. Dawkins has the same idea:

> Natural selection, the blind, unconscious, automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind. It has no mind and no mind's eye. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of watchmaker in nature, it is the blind watchmaker.[24]

Can one, on the basis of data obtained from chemistry or molecular biology at the level of molecules or atoms, claim that there is no telos to nature? The answer is no, because this conclusion is not drawn directly from science, rather it is rooted in the metaphysical prejudices of the scientist. It is, in fact, a jump from an epistemological statement to an ontological one, and is a direct result of restricting the whole existence to the material world and the sources of our knowledge to sense impressions.

Example 7

In the past few decades the role of psychological and sociological factors in the formation, interpretation and propagation of theories has become more manifest. Some scholars, like those belonging to the Edinburgh school, have emphasized the role of sociological elements in all aspects of scientific work. On the other hand, some scholars have denied any role for psychological or sociological factors. We think that neither extreme is right, but there is some evidence for the influence of these factors in some cases. In his celebrated 1971 paper on "Weimar Culture, Causality and Quantum Theory . . . ," Paul Forman[25] argued that the movement to dispense with causality in physics, which sprang up after Germany's defeat in the First World War, was primarily an effort by German physicists to adapt their discipline to the values of their intellectual environment. This environment was basically antithetical to scientific enterprise in general and its much cherished principle—the principle of causality—in particular. Forman

thinks that the fundamental problems of atomic physics had a secondary role in the refutation of causality, relative to the sociological factors. Physicist James Cushing thinks that psychological factors are effective in the formation and interpretation of theories, whereas sociological factors are effective in their acceptance and propagation.[26]

The conclusion we want to draw from these examples is that when we are dealing with fundamental problems in science, decision making is difficult within the science itself. It is here that scientists use their metaphysical commitments. In fact, no knowledge is free from these kind of presuppositions, because in the interpretation of scientific data, scientists always make use of various assumptions and these are full of value judgements and non-scientific considerations.

Thus, when we talk about the Islamization of science, we mean paying attention to these extra-scientific elements, and that the whole scheme be seen in the light of the Islamic world view. A researcher familiar with this worldview can distinguish foreign elements. From an Islamic point of view, it is irrelevant whether we have ninety-two natural elements or more. This is left to us to find out, as is the study of many other aspects of nature. In Qur'anic terms:

> Look and find out what is in the heavens and in the earth. (10:101)

Thus, the meaning of Islamic science is not that we extract all secrets of nature from the Qur'an and Islamic tradition, or that we leave aside experimentation and observation. Rather, 'Islamic' science implies that we should see the totality of things within the Islamic worldview.

During the glorious period of Islamic civilization, this line of thought was prevalent. The aim of scientists like al-Biruni or Ibn al-Haitham was to see the signs of Allah in the universe. The same kind of mentality was prevalent among the founding fathers of modern science like Newton and Boyle.

Most of the Muslim scholars who have talked about the Islamization of science or about Islamic science have had this kind of interpretation in mind. As evidence for this claim, we quote from the general recommendations of the First World Conference on Muslim Education held in Mecca in 1977:

> The Islamic concept of science does not impose any restriction or limitation on empirical or applied science except for one limitation which pertains to the ultimate ends on the one hand and their intellectual effects on the other. In the Islamic sense science is a form of worship

> by which man is brought into closer contact with Allah; hence it should not be abused to corrupt faith and morals and to bring forth harm, corruption, injustice and aggression. . . .
>
> Islam embodies a general and comprehensive concept which sustains a self-contained unique and distinctive educational policy. All we have to do is to base our education on this particular, unique and distinctive concept; when it comes to the means by which the end can be achieved, there is no objection whatsoever to the full exploitation of every successful human experiment so long as it is not in conflict with the Islamic concept.[27]

The Role of Worldviews in Guiding the Applications of Science

As we mentioned, scientific activity could be pursued within different metaphysical frameworks. Both a theist and an atheist can do successful scientific work. The difference appears in the goals and results. If scientific work is done within a theistic framework, its practical results are supposed to secure human felicity and welfare. But, if it is pursued within a secular matrix, then there is no guarantee for its being immune from destructive results. The last century witnessed many of the destructive results of science. Dr. Richard Thompson of La Jolla Research Institute in California has elaborated on this subject:

> The understanding of nature as a machine has resulted in much technological progress, but now we find people throughout the world abandoning supremacy—a struggle that culminates in the construction of more and more deadly machines of mass destruction.
>
> It can be argued that this trend of modern civilization has been strongly encouraged by scientific theories that appear to contradict any philosophy of life other than materialism. It may be very difficult to change this dangerous trend. But an essential ingredient for such a change could be the wide dissemination of a valid approach to scientific knowledge that allows for tangible spiritual dimension to human life and is compatible with the ancient understanding that mankind is dependent on a transcendental supreme Being. Such an approach opens up the possibility of directing human energy towards higher spiritual goals and of providing a solid ethical basis for the conduct of our material affairs.[28]

The history of science has shown that value systems affect the orientation of science. In the words of John Brooke, the British Historian of science:

> The direction and application of scientific research clearly can be different under different value systems. And since human values are often organically linked with religious beliefs, the latter can still be presented as relevant to the orientation of science and technology.[29]

In the Abrahamic religions, human beings are God's vicegerents on the earth and are responsible for its prosperity. Thus, in the Qur'an and the Islamic tradition, knowledge which is accompanied by faith is considered a means of prosperity. In Imam Ali's words:

> Knowledge prospers through faith.[30]

The participation of scientists in the projects that have led to the pollution of the environment or the destruction of human beings is a good witness for a science which has not had a proper orientation. According to Dr. Maurice H. Wilkins, the 1962 Nobel Prize winner in Medicine, about half the world's scientists and engineers are now engaged in war programs.[31]

With the possibilities that the science of the twentieth century has provided for humans, e.g., in the fields of genetics and biotechnology, the responsibility of scientists has become more and more crucial, and in our view the fortification of religious commitment is one of the best ways of avoiding mis-uses of science and technology.

Some Ambiguities Concerning Islamic Science

In the last four decades since Islamic science became an important subject, some key issues arose. Here we mention the most serious ones and try to remove ambiguities.

First, for some scholars, the term Islamic science refers specifically to Islamic teaching, i.e., all knowledge directly deducible from the Qur'an and the Sunnah. We believe that dividing the whole spectrum of knowledge into Islamic and non-Islamic knowledge and restricting the Islamic sector to the teachings of Shari'ah is against the Islamic worldview. As the Muslim philosopher Mortaza Muttahari put it:

> Basically, it is not right to divide sciences into two groups: religious sciences and nonreligious sciences. This brings up the misunderstanding that the so-called nonreligious sciences are foreign to Islam. The completeness and finality of Islam requires that any useful science required for the Islamic society be called religious science.[32]

And in the words of Mawdudi:

> It should be borne in mind that Islam, unlike Christianity, does not admit of dividing education into two watertight compartment, that is religious and secular. Islam is not confined to only creed and ethics. Rather, it encompasses the entire gamut of our life. Hence Islamic education cannot be isolated from secular education.[33]

This is also brought up in the recommendations of the aforementioned Mecca conference:

> Thus the sciences of the Shariah (Islamic law) meet other sciences such as medicine, engineering, mathematics, psychology, sociology, etc., in that they are all Islamic sciences so long as they move within the framework of Islam and are in harmony with Islamic concepts and attitudes.[34]

Second, some people say that we have religious scientists, not religious science, because we are dealing with only one kind of science, and this is neither eastern nor western. In response to this view we have the following comments: If scientific books were reflecting purely scientific findings, not being colored by metaphysical commitments and inclinations of scientists, we could in some sense consider science free from worldviews, and attribute the words 'religious' or 'secular' to scientists rather than sciences. But practically, this is not the case, and the presentation of scientific findings is always accompanied by a sophisticated web of judgements including the religious or philosophical prejudices of the scientist involved.

Some important ideas which have had crucial influence on the progress of science are rooted in religious world views. Einstein considered the idea of the comprehensibility of nature to have been taken from the sphere of religion:

> To this [sphere of religion] there also belongs the faith in the possibility that the regulations valid for the world of existence are rational, that is comprehensible to reason. I cannot conceive of a genuine scientist without that profound faith. The situation may be expressed by an image: science without religion is lame, religion without science is blind.[35]

Andre Linde, the celebrated contemporary Russian cosmologist, who is not a theist, believes that the idea of searching for a theory of everything is rooted in the monotheistic religions:

> The whole of modern cosmology has been deeply influenced by the western tradition of monotheism, the idea that it is possible to under-

> stand the universe through one ultimate "Theory of Everything" is an outgrowth of belief in one God.[36]

The history of science shows that some metaphysical principles have had a crucial role in the development of some theories. For example, Einstein mentions that he postponed the announcement of his theory of general relativity for two years, because he saw it incompatible with the principle of causality, and that he announced that theory only after he had become convinced of its compatibility with causality.[37]

Third, sometimes it is said that western societies have pursued a secular science and they have been successful. Why shouldn't the Muslim societies follow the same line? In response to this question we have the following comments:

The major part of science is scientific data, and this does not differentiate the western from the eastern. The discovery of the laws of nature and its secrets helps humans and societies to take care of their needs, and this is also neither eastern nor western. It is in the interpretation of fact and the making of universal theories that world views and ideologies enter the scene.

A temporary success is not a sign of an all-time success. Aristotelian physics was successful for 1500 years and was finally replaced by Newtonian physics. The success of the West in the material dimension does not mean that all of the Western secular ideas are right or that their ultimate success is gauranteed. Secular science has brought up some unfortunate results for mankind, and for that reason some distinguished Western scholars have called for the revival of the spiritual dimension.

Fourth, some scholars consider the job of science to be the description of natural phenomena. In their view, there is no need for going beyond this quest and entering metaphysical speculations. This is true if the job of scientists were only the description of phenomena—e.g., knowing the chemical constituents of water or the light spectrum of hydrogen. Then, the process of differentiating Islamic science from non-Islamic science would not make sense. But in this case, the scientific books would be reduced to catalogues of scientific data—most of which would be scattered data. But, the question arises: is the job of science only the description of data, and should we be happy with empirically adequate theories, or do we want to explain the whole physical world and find out the relation between its parts? Historical evidence shows that the giants of science have never been content with the mere description of phenomena. From Einstein, who was

one of the heroes of science in the early twentieth century, to Witten, who is one of the scientific stars of our time, we hear the same thing: they want to understand nature. As Einstein put it:

> I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element, I want to know His thoughts, the rest are details.[38]

Witten put it in the following words:

> The purpose of being a physicist isn't just to learn how to calculate things, it's to understand the principles by which the world works.[39]

Furthermore, as Polkinghorne has pointed out, predictability has not been the only concern of physicists:

> I have never known any one working in fundamental physics who was not motivated by the desire to comprehend better the way the world is. It is because they yield understanding, though often having low or zero predictive power, that theories of origins, such as cosmology or evolution, are rightly classed as parts of science.[40]

Now, it is obvious that if we want to have a harmonious picture of nature, we have to search for universal theories, and it is here that metaphysical commitments and inclinations come into play and we can differentiate a theist scientist from an atheist one. As Peter Moore put it:

> What is characteristic of modern culture is the narrowing down of the field of science and the development of a 'scientism' which interprets the data of science in accordance with a materialism which is imposed upon rather than derived from this data.[41]

Conclusion

We pointed out that scientific work can be done in a religious (theistic) context or in a non-religious context. These two have many common elements (e.g., in experimentation or theoretical work), but in the long run they are bound to lead to different results both at the practical level and at the theoretical level (e.g. in the construction of universal theories).

Now we want to go one step further, and in the company of Roger Trigg argue that science can gain proper legitimacy only in theistic context.[42] Our argument goes as follows:

First, for doing scientific work, we must accept that the world with which science deals is orderly and lawful. This cannot be deduced from science itself. Rather, we need the philosophical assumption that the unknown is similar to the known and that the data of science are applicable for all times and places with confidence. Without these assumptions we cannot generalize our scientific findings.

Second, the applicability of mathematics to the physical world seems miracluous. Why should the symbols created by the human mind be suitable for unraveling the mysteries of the universe and for giving us control over the physical world? It seems that there is an underlying rational built into the fabric of the universe and that there is a tuning between the human mind and the rest of the cosmos which makes the universe understandable to human beings. Without the existence of these two factors there would be no science.

Third, the question now arises as to why the reality has this built-in order, and why the human mind can comprehend it built-in. One answer would be that this is just the way things are. But, this is not the kind of answer that can give us confidence about the universality of science. A more substantial response is that this is the state of affairs because God made it that way. This is moving on from a metaphysical realism to theism.

Finally, in view of the foregoing considerations, it seems reasonable to claim that science can get its legitimacy in no other context than a theistic one. This is because science requires presuppositions that are only deducible from theism. The history of the development of modern science is a good witness to this fact.

Some Books about Islamic Science

Title	Author	Place of Publication	Year of Publication
Aims and Objectives of Islamic Education		Saudi Arabia	1979
Knowledge for What? Proceedings And Papers of the Seminar on Islamization of Knowledge		Pakistan	1982
Islamization of Knowledge: General Principles and Workplan	I.R. al-Faruqi	U.S.A.	1982
The Concept of an Islamic University	H.H. Bilgrami & S.A. Ashraf	U.K.	1985
Towards Islamic Anthropology: Definitions, Dogma, and Directions	A.S. Ahmed	U.S.A.	1986
Toward Islamization of Disciplines		U.S.A.	1989
Islamization of Attitudes and Practices in Science and Technology		U.S.A.	1989
Tawhid and Science	O. Bakar	Malaysia	1991
The Need for a Sacred Science	S.H. Nasr	U.K.	1993
The Islamization of Science	L. Stenberg	Sweden	1996
Islamic Science: Towards a Definition	A. Acikgenc	Malaysia	1996
The Educational Philosophy & Practice of S. M. Naquib Al-Attas	W.M. Nor Wan Daud	Malaysia	1998

Notes

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22. *The Christian Science Monitor*, July 1998, B4.
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