ISLAM AND SCIENCE: A REVIEW ARTICLE

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Religion is relevant to the chief concerns of our century. It can no longer be assumed with impunity that religion was a primitive superstition outgrown by civilised, rational man. One has also to take into account the fact that contemporary mind is science-ridden and for it science has become a sacral mode of knowing, the court of ultimate appeal for what is true, occupying today almost exactly the place that Revelation enjoyed in the West in the Middle Ages and in the East fairly recently. Through a misreading of science, our contemporary mindset suffers from a loss of faith in transcendence, in a reality that encompasses but surpasses our quotidian affairs. The loss is considered to be serious, and also (ironically) unnecessary, for our loss of the Transcendent World has resulted from a conceptual mistake. We assume that the modern world has discovered something that throws the transcendent world into question, but that is not the case. It is not that we have discovered something. Rather, we have lost sight of something. For reasons that are completely understandable but nonetheless regrettable, we have unwittingly allowed ourselves to be drawn into an enveloping epistemology that cannot handle transcendence.

Science studies the empirical world. Religion seeks to understand and bind us to the entire scheme of things in which God is pre-eminent. There can not be any conflict between the two if, and when, each sticks to its proper task. A conflict arises when either oversteps its proper limits. Religion does this if / when it interferes with science's attempts to understand the empirical world, the physical world of nature. Science oversteps its limits if / when it claims to be able to access, and give definitive answers (without the help of religion) to ultimate questions, such as who are we, how did we get here, what is the meaning of life, and is there life after death? Historically, both have overstepped their proper bounds. In the West, theologians were guilty of this

when (in the 16-17th centuries) they interfered with scientific pursuits. Now the shoe is on the other foot. Today, most of the transgressions come from science's side.

Muzaffar Iqbal's latest work *Islam and Science* is informed by the awareness that the impact of issues at the interface of science and religion reverberates worldwide and across disciplines and the forces driving this impact are diverse: accelerated development of science and technology; globalization of scientific culture; religious responses to new scientific visions of the universe; and ethical concerns prompted by biotechnology and environmental threats. It is also informed by the fact that scientists and religious intellectuals are trying world over to tear down the cultural walls that have served to quarantine their respective disciplines and address these challenges together and that the science and religion dialogue draws scientists, theologian, philosophers, ethicists, historians and religious leaders into a single community of scholars. It realizes that a religious science may not be possible but we can have a science that is completely compatible with religion. Science may dispense with religion but human beings cannot. The rightful provinces of activity of science and religion can be distinguished so that they should complement each other— fit together like the pieces of a jigsaw puzzle— in providing us with a comprehensive view of whole of reality insofar as such a view is humanly attainable. This was the case with the Islamic civilization until its encounter with modern science and its worldview in circumstances that, to say the least, were not favourable.

Islam and Science takes a long sustained look at the relationship between Islam and science. With that end in view Muzaffar Iqbal has told the story of Islam and science from its beginning, through its entire vicissitudes, leading up to the present arena of debates and debacles where contending trends and agendas collide and a new nexus, a liberated discourse awaits to emerge. He has told it intelligently and in a thorough going manner with the benefit of hindsight which makes it possible to rise above the level of immediate practical responses and to consider the issues at stake with clarity of vision and objectivity. Years of research and hard work in his chosen domain of scholarship come to fruition with *Islam and Science* which is informed, first and foremost, by the realization that as a transplant, modern science raises a different set of questions for the Islamic tradition from that which forms the

core of the discourse between Christianity and modern science, though there is bound to be some overlap. These questions are also different from those which arose naturally within the Islamic scientific tradition during the centuries when it was a living tradition. These new questions require a new methodology and a new language of discourse. It is also informed by the vision that Islam and Science discourse cannot attain any degree of authenticity without its roots going back to the Islamic scientific tradition. What was Islamic in the Islamic scientific tradition? How was this tradition rooted in the Qur'anic worldview and whatever happened to it? How does modern science differ from the Islamic scientific tradition? Equally important are the epistemological considerations concerning the status of the Qur'an in relation to modern science and the nature and meaning of the so-called scientific verses of the Qur'an. Similarly, the Islamic understanding of the physical cosmos, God's relationship to the created beings and the Islamic concept of life and its purpose are essential to any meaningful discourse on Islam and science.

First three chapters of the book, "The Beginning", "And these Are the Signs (The Qur'an and the Order of Nature)" and "Making of the Tradition", address the issue of the development of the Islamic scientific tradition and provide an excellent overview of its genesis, unfolding and eventual flowering. He starts with giving us an idea of the intellectual milieu of the early Islamic community, permeated as it was with the Qur'anic data and the formulation of the core religious sciences, which provided the cradle for the nascent Islamic scientific tradition— through the social revolution it brought about— and offers valuable information and fresh insights about the origins and early development of the Islamic scientific tradition. The first flowering of this tradition is then traced back to this social and intellectual background of *Kalam* issues, the Qur'anic data on creation and the order of nature leading to the Qur'an and science nexus, to explain the "sudden" appearance of a small group of scientists and scholars who were dealing with rather advanced theories. He rightly points out that the doctrine of *Tawhid*, the fundamental principle of Islam, acted as a prism through which all theories passed in order to test their validity but adds an interesting observation that, "It is also noteworthy that the Islamic scientific works, profoundly influenced by the Qur'anic worldview as they were, seldom mention the so-called scientific verses of the Qur'an in a direct sense. Numerous examples can be cited".

"Likewise, he says, "during the entire period of Islamic scientific activity which lasted well into the fifteenth century, we see no evidence of any scientific research program directly motivated by the desire to "prove" the scientific verses of the Qur'an through science. There is no record of such profane use of the Divine Book. This is so that the cultural milieu that gave birth to the Islamic scientific tradition was so thoroughly infused with the Qur'anic worldview and the cosmologies based on its message that there was no need for any artificial and external imposition of the Qur'anic verses on the scientific works. When al-Ghazali mentions various natural sciences in relation to the Qur'an, his method, context and purpose is entirely different from the twentieth century extraneous and ornamental use of the Qur'an as a way of Islamization of modern science."

"Making of the Tradition" is seen to have taken place amidst a rich flow of diverse cultural, philosophical and scientific currents. Built on the metaphysical foundations provided by the Qur'an and rooted in the very heart of Islamic revelation, it received the first flow of intellectual currents from the *Kalam* discourse that reflected on the Qur'anic description of God and sought ways to comprehend the Divine in human terms. Then came a torrent from the ancient centres of learning – philosophical ideas, religious beliefs, scientific facts and theories. Amidst this influx of diverse crosscurrents, the emerging tradition matured rapidly.

Important stages of this process are then spelled out in detail with a special treatment of the translation movement that flourished among these diverse cultural and intellectual currents. While explaining the contours of the tradition Muzaffar has steered clear of the pitfalls of both "reductionism" and "precursorism" that often make inroads into otherwise well informed discourses. Reductionism, in this context, refers to the "view that the achievements of Islamic scientists were merely a reflection, sometimes faded, sometimes bright, or more or less altered, of earlier (mostly Greek) examples; Precursorism, on the other hand, reads the future into the past, with a sense of elation. In the final analysis, it may be said that the historians of science are still not able to reconstruct with confidence a complete mosaic of all he currents of thought, scientific facts and the theories that came into the Islamic civilization through the highly complex phenomena of cross-cultural transmission but they are certainly able to assert that this was not a passive

reception of material into one civilization from another. Rather, it was an enormously complex but creative process that transformed the material in the very act of appropriation.

The historical background of this transformation of received materials is then skilfully portrayed through its roots, branches and connections and the final assessment of the making of the Islamic scientific tradition is no less comprehensive. "Assessed in the most general terms, the Islamic scientific tradition can be seen as having passed through the following major phases:

1. A formative period under the umbrella of Islamic religious sciences;
2. A quick maturation through the massive infusion of data, information and theories from the Greek, Indian and Persian traditions;
3. A phase of careful assessment, recasting and Islamization of the received material;
4. A gradual realization that there was something fundamentally wrong with some of the major concepts that had been received from other traditions;
5. appearance of "doubt literature" which pinpointed major scientific and philosophical problems with the received material and suggested fundamental changes; and
6. A slow process of withering."

He realizes that these six phases do not lend themselves to clearly differentiated periods because the Islamic scientific tradition covered a vast geographical region and all branches of science. What may appear to have matured in one place and time may only have begun to take roots in another region and, in many cases, the phases merged into each other, slowly and, often, imperceptibly. Their individual hues and colours only became distinct after enough time had passed from the previous phase.

His description of the fourth and the fifth phases is interesting as it brings to light the less known fact that the fourth and the fifth phases were characterized by the appearance of a new genre in the Islamic scientific literature: the *shukuh literature* i.e. the literature of doubt. Most of this "literature of doubt" is still inaccessible to the historians of science but what

has been studied shows that this genre, starting in the 9th century, was in full vogue in the 11th century. After hinting at its links with the European tradition, which again sheds new light on this obscure area of study, the author moves to explore, in the fourth chapter "Islam and Science Nexus", the connections that the Islamic scientific tradition had established with the fundamental doctrines of Islam. These connections form the core of what was Islamic in this tradition. It is important to note that these connections often remain buried under the pure scientific data with which most scientists dealt in their research but they are never absent. This subtle guiding of the scientific enterprise, as it were, had profound impact on the direction of the scientific research in the Islamic civilization as well as upon the fascinating process of the transformation of the philosophical and metaphysical underpinning of the Greek, Indian and Pahlawi scientific traditions— a transformation that made them Islamic. This is an important point often ignored or sidestepped in these discussions. Before the rise of modern science, the Islam and science discourse existed within the larger intellectual tradition of Islam and although there were many foreign currents that ran through the warp and weft of the tradition, it remained integrally linked to the Islamic worldview. This situation was to drastically change with the withering of the Islamic scientific tradition and its eventual replacement with the modern western science. These fundamental changes have altered the parameters of the Islam and science discourse and demand a different kind of exploration. Muzaffar has explored these new and emerging facets of Islam and science discourse in chapter ten. In this chapter, "Islam and Science Nexus", his exploration is directed to the relationship between Islamic and science before the rise of modern science and he has formulated important questions about the Islam and science nexus that need to be addressed in order to gain a clear idea of the nature of this nexus. What was Islamic in the Islamic scientific tradition? How did it differ from the Greek, Persian and Indian scientific traditions from which it had received a large amount of scientific data as well as theories? What were the major issues in the Islam and science discourse? Who participated in this discourse? He then draws an outline of the fundamental nexus that existed between Islam and the science it inspired taking into consideration the entire span of the Islamic scientific tradition during which this relationship saw a considerable change in many respects. He also takes into consideration the whole geographical range— from Spain to Afghanistan— covered by the Islamic scientific

tradition and explores the dynamics of the relationship between Islam and science at various historical junctures, situating his discussion within the broader social, cultural and historical milieu in which science— as a social activity— found expression. The first important point he has noted, under the title "The Internal Links", in this exploration is the very absence of Islam and science as a differentiated discipline in the Islamic intellectual tradition. No one thought of "Islam" and "science" as two separated entities that had to be related to each other through an external mechanism. This fundamental aspect of the tradition is neither accidental nor does it point to any gap in the intellectual make-up of the Islamic tradition. Rather, Muzaffar observes very rightly, it points to a profound understanding of the nature of science and its relationship to Islam. This relationship emerged naturally and because the scientific tradition was thoroughly rooted in the worldview created by Islam, no one ever thought it necessary to create an external apparatus to relate the two. This also explains for the readers why, contrary to the contemporary practice, we find no decorative uses of the Qur'anic verses in the pre-seventeenth century Islamic scientific works. He has given several examples. To quote only one, "al-Khwarazmi's famous Algebra starts with the customary invocation, *In the name of Allah, the Most Beneficent, the Most Merciful*, followed by a paragraph in which he expresses thanks to God for this bounties and for God's mercy upon human race in guiding it by sending Prophet Muhammad. After this paragraph, he describes the purpose of composing his book as being '[a book] on Calculating by [the rules of] completion and Reduction, confining it to what is easiest and most useful in arithmetic, such as men constantly require in cases of inheritance, legacies, partition, law-suits and trade and in all their dealings with one another, or where the measuring of lands, digging of canals, geometrical computation and other objects of various sorts and kinds are concerned…..' after this short introduction, he then goes directly to the subject matter." The same pattern in followed in all other major scientific texts. Although they are all firmly rooted in the Islamic worldview, no overt effort was made to lace them with the Qur'anic verses. Perhaps another reasons for this is the fact that science in the Islamic civilization was part of a larger tradition of learning that arranged different disciplines in a hierarchical structure like the branches of a tree.

Many aspects of this "Islam and Science Nexus" discussed by Muzaffar deserve special attention but we shall mention only one here. Muzaffar brings to our notice that, as in many other domains of Islamic Studies, the science religion discourse is also permeated with "Goldziherism" surfacing most often in "Islamic versus foreign Sciences" typology. Muzaffar's treatment reveals that Goldziher's thesis cannot be validated as a careful reading of the extant material *within* the context of the Islam's normative tradition shows that his backward reading of isolated texts to validate pre-conceived ideas neither sheds light on history to enhance our understanding of the subject matter nor yields solid scholarship. In his words, "it merely clouds the intellect." Islam and Science Nexus is further elucidated by looking at other aspects; "The Naturalization Thesis", Linguistic Affinities and Transformations," "Links with the Qur'anic Cosmological Sciences," "Science-Philosophy Nexus", "Ghazalian Synthesis", "Teleology: God, Cosmos and Science", "Science, Technology and Society".

The sixth phase mentioned above is explored in chapter five, "Withering of the Tradition" because the withering of the Islamic scientific tradition presents many unresolved and enigmatic challenges to historians of science. Why did the Islamic scientific tradition suffer such a fatal collapse after centuries of sustained flowering? Why did it die? How and when? In a narrow sense, these questions belong to the discipline of history of science and not to a work on Islam and science but because the relationship between Islam and science was fundamentally altered by the decline of the Islamic scientific tradition, he could not have ignored this phase of history without seriously compromising the integrity of his inquiry, especially its historical dynamics, or impairing the understanding of its impact on the relationship between Islam and science. Here is how he formulates the question:

> "There can be no two opinions about the fact that the Islamic scientific tradition withered and eventually died, at least in a practical sense, even though some remnants can still be found, especially of the Islamic medical tradition which is still a living tradition in some parts of the Muslim world, notably in the Indian subcontinent. Therefore, the first task that can establish our inquiry within a framework is to assign a date to the occurrence of the decline of the Islamic scientific tradition. But as soon as we attempt to do this, we run into difficulties that arise both

from the conceptual framework of the question as well as from the paucity of resources?

Conceptually, what do we mean by the withering, decline or death of a tradition? Obviously, it could not have been a sudden event that happened on the fourth day of the fifth month of a particular year. Hence, we should be searching for a period of time, rather than a particular date. But even in this case, we must ask: Will this period of time, which we hope to find, be universally applicable to all branches of the Islamic scientific tradition at once and in all regions of the Muslim world? After all, we are dealing with a tradition that lasted longer than the Greek or the Latin medieval or, even then modern science, as George Sarton once remarked, and that was spread over a very large geographical region. A third related question is: Did the tradition come to a cul-de-sac where it died a slow and agonizing death over a "period of time" or were there attempts to cure the malady? If yes, where were these attempts made, by whom, and did they produce any results?

In addition, we must also ask a few other related questions: Was the withering of the Islamic scientific tradition an isolated phenomenon or was it part of a general decline of the intellectual tradition to which it belonged? If it was part of a larger process of decline, then how did this larger process start and at what stage of its decay did it affect the scientific tradition? Where and when did it begin? Why? What were the social, political and economic circumstances that were responsible for this general intellectual decline, which must have spread to a large geographical region with tremendous force? Were there any early signs and corrective measures?"

Various answers to "The When Question" have been examined. Muzaffar observes that, George Sarton, in his *An Introduction to the History of Science,* "sets the eleventh century as the end of the vigour of the Islamic scientific tradition, with the twelfth century, and to a lesser extent the thirteenth century, as being the centuries of transition of the vigour to Europe. But the discovery of new texts pushed this boundary further and eventually the idea of a Golden Age was seriously challenged". Other facts discovered lately also corroborate the same conclusion. The Why Question has also been tackled in an illuminating manner, analyzing it from the perspective of the History of

Science and from the perspectives from the Sociology of Science. Muzaffar observes that in most of the studies, judgements passed on the scientific achievements of the previous civilizations are invariably based on the developments of modern science. This creates many historiographic problems and entails the danger of unconsciously slipping from the historical fact into the Whiggish view of history as if the final purpose of the cultivation of science in the other civilizations was merely to create modern science. "This approach has had two quite opposite, but equally regrettable, results," says Berggrren, "The first is a treatment of medieval Islam as a civilisation deserving of attention only for its role as a channel through which the great works of the Greeks were carried safely to the eager minds of the European Renaissance. The emphasis falls on the two great periods of translations, that into Arabic in the ninth century and that into Latin in the twelfth and thirteenth centuries, and the developments of the intervening centuries provide little more than a series of anecdotes about one curious result or another that was proved by an occasional great figure."

Muzaffar has some very pertinent remarks to offer on the general domain of sociological treatment of the "Why" question which operates on the hypothesis that the Scientific Revolution of the European type was the only possibility left to all other scientific traditions for their further development. He has examined it with reference to the question "Why did the Scientific Revolution not take place in Islam" and has successfully shown that most of the studies have embedded biases in their methodology that they apply to the question and thus suffer from the same defects, the most glaring of which is an imposition of modern western concepts on a civilisation whose goals and aims, aspirations and models vastly differed from the modern West.

The upshot is this. All the "internal factors" that could be summarized from the studies of the decline and withering of the Islamic scientific tradition suffer from a general problem: these "internal factors" were already present when the Islamic civilization gave birth to and nourished its scientific tradition. "It is unreasonable think," Muzaffar asks, "that the Islamic legal system, which came into existence in the seventh century before the emergence of the scientific tradition, would first allow a scientific tradition to flourish for six centuries and then become an impediment to the emergence of a "neutral zone of scientific inquiry in which a singular set of universal standards" could be applied"?

On his part Muzaffar has tried to explain the "Why Question" through "Perspectives from Within" situating the question within the framework of the Islamic civilization and de-linking it from the extraneous parameters. He delimits the question to lead us to find the causes for the decline of the Islamic scientific tradition situated in certain social, political and economic circumstances that contributed to the decline; rather than to some "inherent" flaws in Islam itself, which would, ironically, first allow the birth and nourishment of sciences for centuries and then strangle their further pursuit. At this point in his inquiry he draws our attention to the "General Features of the New Empires" and then proceeds to assert that all these considerations taken into account, suggest certainly not a case of a civilization at its lowest ebb! The least one can gather from this data is that there existed, during these three centuries, a set of unique circumstances common to all three centuries, a set of unique circumstances common to all three empires, the Indian Timuri, the Safavid and the Ottoman. The most striking facets of this set are neither the paucity of wealth, nor weakening of intellectual vigour, but an unusual interest in artistic expression. In his view:

> "It is in the pleasure-seeking high culture of this age, that the real causes of decline are to be found. The courts at Delhi, Istanbul and Isfahan, now captive of their extravagant routines and almost alienated from the realities of the vast empire they controlled, the couriers and the elite families who contributed so much to the decadence and absolutism of the courts and the concentration of wealth in fewer and fewer hands are the indicators of a civilization at the brink of disastrous ruin. The Islamic scientific tradition became a caricature of its past glory in these three centuries and those who had cultivated it, were replaced by those who preferred to seek pleasure in the finite realm of the senses, rather than the splendors of the spirit.
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> When the interlude of the three centuries came to its close, and the high culture and the decadent practices felt threatened by the approach of foreign armies at their doorsteps, it was already too late. The West had achieved a decisive edge over the Muslim world through remarkable advancements in science which were quickly translated into technologies which produced superior weapons, enhanced industrial production and, most of all, a vast reservoir of energy which sought to expand their

> frontiers, both physically as well as intellectually. The future historians of Islam must divert their attention to these three centuries in order to understand the causes of decline and the withering of the Islamic scientific tradition. Those who have sought "internal causes" in the very foundations of Islam have misled these efforts for too long and with disastrous results. It is time for a total new orientation and a new search."

It is also important to mention that before it faded from the Muslim lands, a large part of the Islamic scientific tradition had been transmitted to Europe. This transmission of the Islamic scientific tradition and the subsequent transformation is an integral episode in the emergence of a new Islam and science discourse and this is the focus of his next chapter "Transmission and Transformation". The relationship between the Islamic scientific tradition and modern western science forms a crucial link in the exploration of the contemporary Islam and science discourse. Fortunately, the transmission of the Islamic scientific tradition to the West is not as obscure a subject as the transmission of the pre-Islamic traditions to the Islamic tradition. Likewise, the paths leading to the appropriation and transformation of the material received by the West are also more amenable to scrutiny, though many texts have not been studied yet and many questions remain unresolved. Muzaffar has made this part of the inquiry into the process of transmission and transformation of the Islamic scientific tradition in Europe within the larger historical context that it may yield fruitful results. He gives us a brief description of the European scientific tradition and finally explores the ultimate fate of the received material. Here, as before, he has very useful insights that he brings to bear upon t subject. Contrary to the prevalent views he has reminded the readers that the Dark Ages of the West were, after all not so "dark" as often portrayed. He then goes on to note, with regard to "Reception of the Islamic Scientific Tradition" that the received Greek and Islamic tradition first became the dominant intellectual force in the medieval West and then gave way to a new and opposing force out of which grew the worldview that was to produce modern science. Similarly he observes that, contrary to the commonly held notion prevalent in the works of many Muslim scholars, it was not the Islamic scientific tradition that had arrived in Europe to take it out of its so-called Dark ages—if anything like that ever existed. It was the inner dynamics of the European

civilisation that had created a particular need that was fulfilled by making use of the material from the Islamic scientific tradition. Even a cursory glance at what was translated makes this point abundantly clear and undoubtedly shows that the European intellectual tradition was looking for a particular type of material; that it was not interested in the Islamic tradition *per se*: rather, in the course of its development, it needed to recover its own antiquity; it found it in Aristotle's Arab home and recovered it. In this process, it came across Ibn Sina, Al-Kindi and Ibn Rushd and took them as well— not as representatives of the Islamic scientific tradition but as commentators of Aristotelian corpus. He also notices here that those whose works were translated were translated because of their importance for Aristotelian studies and not for their contributions to the Islamic scientific tradition. In order to understand the true meaning of this translation movement and its impact on the subsequent developments Muzaffar has tried to reconstruct the intellectual milieu in which these translations arrived, first as a trickle and then as a torrent. Until the twelfth century European intellectual life was relishing a peaceful but fervent expansion of the educational system. During the early part of the twelfth century, recovery of the writings of the Latin Church fathers, a few translations of Greek works (Plato's *Timaeus* and parts of Aristotle's *Logic*) and a few new translations both from Greek and Arabic quietly flowed into the main stream of the new educational activity. Next stage was "Transformation". The Islamic scientific tradition provided a large amount of data and theories to the European tradition but all of this was appropriated and eventually transformed. It was this transformed tradition that gave birth to modern science. No doubt this transformation is intimately linked to the internal dynamics of the European civilisation, but the famous "continuity debate", which has received a lot of attention within the history of Western science, links this process to the transformation of the material received from the Islamic tradition. This debate revolves around the crucial issues of "continuity" and "discontinuity" of modern science with the medieval science. One group of historians of science claims that modern science is the natural outcome of an internal process of growth of science in which the medieval science was but one step in a continuity that goes back to antiquity. The opposite camp holds that modern science has nothing to do with its medieval precursor. In between these two extremes lie a host of intermediate positions. Muzaffar agrees with Alaxandre Koyré, that what the founders of modern science did was neither

refinement, nor improvement of what they had inherited; they had to actually "destroy one world and to replace it with another. They had to reshape the framework of our intellect itself, to restate and to reform its concepts, to evolve a new approach to Being, a new concept of knowledge, a new concept of science." For example, the new metaphysics of the seventeenth century was to construct a mechanical "world of lifeless matter, incessant local motion, and random collision," to use David Lindberg's expression. The new metaphysics thus ….. "stripped away the sensible qualities so central to Aristotelian natural philosophy, offering them second-class citizenship, as secondary qualities, or even reducing them to the status of sensory illusion"; this was, indeed, a real transformation. For the explanatory capabilities of form and matter, it offered the size, shape, and motion of invisible corpuscles— elevating local motion to a position of pre-eminence among the categories of change an reducing all causality to efficient and material causality. Muzaffar has aptly pointed out that the transformation of the Islamic scientific tradition in Europe was also associated with the European reassessment of Islam and the civilisation it produced. In the process of its re-awakening, European civilisation not only reclaimed Greek and Roman intellectual tradition, it also received a vast reservoir of knowledge from the Islamic tradition. In the first phase it appreciated the Islamic tradition but once it had passed that phase it made a reassessment and saw little commendable in the Islamic tradition. This attitude was to solidify with the appearance of Francis Bacon. "The sciences which we possess come for the most part from the Greeks," he wrote in *Navum Organum*, "for what has been added by Roman, Arabic, or later writers is not much nor of much importance; and whatever it is, it is built on the foundations of Greek discoveries." He goes on to say:

> "For only three revolutions and periods of learning can properly be reckoned; one among the Greeks, the second among the Romans, and the last among us, that is to say, the nations of Western Europe, and to each of these hardly two centuries can be assigned. The intervening ages of the world, in respect of any rich or flourishing growth of science, were unprosperous. For neither the Arabians, nor the Schoolmen need be mentioned; who in the intermediate times rather crushed the sciences with a multitude of treatises, than increased their weight."

This verdict was to be repeated in all fields of learning, until it was engraved on the European conscience. Almost every historian of science and philosopher from this period has left a testimony of disrespect. Interestingly, the invalidation of Islamic learning was not merely a result of the advancements in European science but it was based on a genealogy of learning from the remote antiquity to the present time in which the contribution of the Islamic tradition as a whole was seen as no more than a phase of history in which the Greek learning was "parked" in the Arab lands, where it was corrupted and mutilated. This tradition of censure first appeared among the humanists and was built upon by the historians of philosophy in the seventeenth century.

"Winds of Change" chapter seven of the book, is a telling critique of the changes wrought in the Islam and science discourse during the eighteenth century. It was a century in which the winds of change acquired a ferocity that would leave nothing intact in the whole fabric of Islamic civilization, including its tradition of learning. It would inaugurate an era in which the Islam and science discourse would go through its first great transmutation. But this transmutation would only be a small part of a much greater calamity that this century before the deluge would bring to the entire Muslim world. From an Islamic perspective, this sterile century, so fatefully synchronized with the appearance of certain events on the world history that made it more than a passing lapse, became the beginning of the great collapse that would alter the geopolitical map, uproot established empires and bring about total collapse of the Islamic scientific tradition.

Science religion discourse that took shape during the course of that critical century remained the reigning paradigm until the present time. This paradigm crystallized in the "catching up syndrome" that had already made its appearance all over the Muslim world. Briefly stated, this syndrome is a myopic statement that summarizes the cause of decline of Muslim power by ascribing the loss to falling behind Europe in science and technology. As a corollary, it suggests that as soon as Muslims catch up with the West in science and technology, all will be set aright.

Henceforth, Islam and science discourse was overshadowed by the "catching up syndrome". Those who held centre-stage would bring in the whole weight of the religious tradition, along with its primary source— the Qur'an and the Sunnah— to support their program by emphasizing that

these two sources support acquisition of science. Another aspect of this changed nature of discourse would manifest itself in the rise of mounds of apologetic literature that would attempt to prove that all modern scientific discoveries can, in fact, be traced back to the Qur'an and Sunnah. In the course of time, there would appear institutions sponsored by governments for just this purpose and international conferences would be held to promote a discourse focused on proving modern science through the Qur'an and the divine nature of the Qur'an through modern science. Muzaffar has briefly traced the developments which led to the changes in the discourse during the two and a half centuries between 1700 and 1950 a period that would bring almost all the Muslim world under a colonial yoke and has given us an overview of the "Instruments of Change" which destroyed old institutions, disrupted centuries old social patterns of life, and replaced old languages of discourse with new and alien languages which could be understood by only a small percentage of the population. All of this led to a total collapse of the Islamic scientific tradition and this, in turn, completely transformed the nature of discourse between Islam and science; from being a discourse within the tradition, it became a discourse between Islam and modern science— a tradition that was rooted in a different civilization. "Routes of Transformation" are informative. Nothing is more significant for the understanding of the present phase of the relationship between Islam and science than the period of colonization of the Muslim world. It was during this period that the Muslims as well as their scientific tradition encountered modern western science in the traditional lands of Islam, Dar al-Islam, Moreover, it was an encounter in which Muslims were decidedly at the receiving end; their political strength had already been sapped and they were subjects of a vast ruling apparatus that treated them like second class citizens. Just prior to their colonization, the vacuous remains of their own tradition had seen a large scale effort of reform and revival that had emerged throughout the Muslim world during the eighteenth century.

Until then, the Islam and science discourse had been rooted within the larger Islamic intellectual tradition; now it acquired a new dimension because one of the two entities of the discourse, science, had a matrix situated outside the Islamic tradition. The arrival of this foreign entity, which was premised on its own philosophical and religious foundations, was not like the arrival of the material from the pre-Islamic civilizations into the Islamic scientific tradition because that material had come into the Islamic scientific tradition

because that material had come into a living tradition, through an active process of appropriation. The new science, on the other hand, came to a tradition that was neither actively seeking it, nor was able to appropriate it into its own matrix. As a result, there emerged a completely new phenomenon that produced novel effects previously unknown. This is what Muzaffar has termed "The Colonial Cut" the title of his next chapter. He has analyzed it from various angles and in different regions as the subtitles suggest, "Science in the Service of the Empire", "Institutional Collapse", "Other Regions", "Major Transformations" etc.

This fundamental transformation of the Muslim societies through the replacement of their basic institutions, models, ideology, and in most cases, language of learning was achieved through certain methods that were uniformly applied to all Muslim societies. Following the conquest, assimilation or annexation, the colonized societies were subjected to a reign of terror. Old and established families were uprooted. Leading figures were executed or exiled, ruling classes and people of wealth and fame were made targets of special retribution. The continuity of institutions was disrupted and in many cases, they were destroyed in both the physical and the functional sense. After this period, which varied in length in different societies, new institutions were planted, a new administrative system was designed, and in time a new elite was created this elite group was more than willing to cooperate with the colonial rulers. Products of the new educational system, these people had little or no knowledge of their own history and heritage. The four fundamental changes were (i) the political transformation, (ii) the change in the status of Arabic language, (iii) the replacement of the education system, and (iv) the establishment of Western institutions. These developments pushed the Islamic tradition of learning into the background through violent political, economic and social changes.

The inner mechanisms of reform were not allowed to play their rightful role because of the European intervention. The colonizers often pitted one segment of society against the other. In the course of the nineteenth century, they were able to subjugate almost all parts of the Muslim world. This was a powerful blow from which the Muslim world has still not recovered. The colonization of the Muslim world shattered the inner fabric of the Islamic tradition and brought it face to face with a foreign civilization at a time when it was at its weakest state. Thus, the western civilization managed to carve a

portion of Islamic space as its own territory. This produced a small Muslim elite within these societies that turned its face away from the Islamic tradition and looked toward the Western civilization for intellectual nourishment. But no matter how intensely it attached itself to the Western civilization as long as it kept its faith, it had to return to the sources of spiritual guidance and solace that have always been the focus of the faithful. This created an inner tension that still reverberates in the social, political, and intellectual struggles.

Needless to say, the Islam and science discourse was deeply affected by all of this. It was the beginning of a new kind of discourse between Islamic and science in which science was no more the integral unit of the Islamic tradition but a science of the brave new world, a science that had broken away from all traditions and was an autonomous and powerful entity, independently and defiantly charting its own course, complete with a theology of nature and a worldview competing against other worldviews.

Chapter nine, "The Colonized Discourse", describes the this great chasm between the pre-colonial Islam and science nexus and its post colonial caricature which is not the result of any specific theory of science, but that of a radical recasting of the foundations of science since the seventeenth century.

It was during the colonial era that the Islam and science discourse accumulated a heavy overlay of extraneous issues which had never been part of the traditional discourse. There are three important facets of this new discourse that keep it hostage to the legacy of the colonial era: it is inextricably linked to a feverish demand for the acquisition of Western science— which, in turn, is laden with a whole range of issues in the realms of education and modernity; its apologetics; and a deep layer that is the product of the cultural schizophrenia which characterizes the post-colonial Muslim world. Hundreds of works deal with the issues related to various aspects of Islam in the Modern world. In almost all cases, these works posit the challenge of modernity with a social and cultural context and invariably find the question of Islam and science as an integral part of the discourse on modernity.

Muzaffar has shown that this has led to the emergence of the new Islam and science discourse in a realm that is not its own. These three facets cast such a deep shadow on the new discourse that it is almost impossible to separate it from this burden. This heavy overlay expresses itself in various

attempts to "Islamize" modern science and in the extensive literature that attempts to prove the existence of various modern theories in the Qur'an.

He also notes that unlike the Islam and science nexus that had developed naturally in the eighth century and which grew in various schools of thought and produced a vast corpus of literature, the new discourse is strained, laboured and carries the burden assigned to Islam in the discourse; the legitimization of the modernists agenda. It is also important to note that most of the champions of the new discourse were neither scientists nor 'ulama', but reformers, who wanted Muslims, especially the young Muslim students to acquire Western science.

"The Reformers' Discourse" was formulated in terms of mutual complementarity of the "work of God" (nature) and the "Word of God" (the Qur'an). It was marked by their desire to show that modern science had nothing against Islam and its sacred text and the entice Muslims to acquire modern science. Hidden in this two fold agenda was a desire to bring the Muslim world out of its sorry state; the path was the acquisition of modern science. Almost all reformers translated the Arabic word *'ilm* (knowledge) as "science" (meaning modern science) and framed their discourse on the necessity to acquire knowledge upon which the Qur'an insists and which has been made obligatory for all Muslims by the Prophet. This reduction of the word *'ilm* was conveniently used to produce a new strand of Islam and science discourse which Muzaffar has reviewed in its different manifestations. "In Search of a Modus Vivendi" both Sayyid Ahmad Khan and Jamal al-Din Afghani, though poles apart in their background, training, religious and intellectual perspectives, nevertheless agreed on the need for acquisition of Western science to stop further decline and disintegration of the *dar al-Islam*. They also saw little in Western science that was not just science; they perceived no implicit worldview, philosophy and metaphysical assumptions in science. For them, science ruled the world. "There was, is, and will be no ruler in the world but science".

Muzaffar criticizes Afghani for his erroneous view— which is still held by many Muslims— based on the presumed objectivity of modern physical science. He failed a realize the distinction between the metaphysical underpinning of the sciences to which al-Ghazali's was referring and those of modern science. This rhetoric found new expressions in the next generation of Muslim intellectuals, many of whom were deeply influenced by Afghani,

though each in his own way and not without significant departures from Afghanis courageous stand against colonization.

They did not see science as being culture specific. They believed that modern science can be, rather should be, learned and it can be learned without adopting western values. The underlying assumption was that the secular worldview of the modern West had no inroads into the philosophy, structure, operation and results of the natural sciences. They thought modern science can be imported without any ethical components of Western culture. Because they did not see any incongruity between modern science and Islam, some of them tried to create a semantic bridge by consciously employing the language used in natural sciences in their works on the Qur'an. They also gave birth to a rationalistic discourse that had a strong overlay of modern science.

Last part of the chapter nine is devoted to the analyses of the Case of Turkey in terms of the Islam and science discourse and a critique of Arab scientific journalism that also contributed significantly to the developments in the discourse on Islam and science. His remarks provide a general survey of the various trends of the new discourse. They show that during the colonial era, the discourse on Islam and science became hostage to numerous extraneous considerations. Economics, local and international politics, individual influences, education, state power and many other factors continue to influence the direction of this discourse. Another facet of this colonized discourse emerged in the form of the scientific exegesis of the Qur'an. This genre made its appearance toward the end of the nineteenth century, spread rapidly and then waned in the final decades of the twentieth century, leaving behind residual secondary works. Chapter ten deals with the question of "The Scientific Exegeses".

Muzaffar observes that:

> "The colonized Islam and science discourse that emerged in the nineteenth century made its most daring attempt to securely lodge itself in the Islamic tradition by finding a niche in the very heart of the tradition: the Qur'anic exegesis. Perhaps it was in the very nature of things that instead of seeking roots in the Islamic scientific tradition, the proponents of the new discourse sought legitimacy and sanction for their program in the Qur'an: for they would have found nothing in the

Islamic scientific tradition that could justify their agenda. …. Islamic scientific tradition never sought legitimacy for science by directly invoking the Quranic text in support of its various findings; it operated within the metaphysical and ethical universe of Islam and within a hierarchy of knowledge wherein it had a legitimate place as a birthright. It was linked to all other branches of knowledge that had emerged within the Islamic civilization through an organic relationship that had evolved over time. Most of all, it was linked to the central vertical axis of the Islamic civilization which held all of its diverse manifestations in historical time with a reality that was atemporal and transcendental.

It is because of this secure and natural linkage that we do not find Muslim scientists who practiced science in the framework of inquiry that was anchored in the Qur'anic metaphysics seeking support for their science in the text of Qur'anic, or worse, attempting to "prove" the divine origin of the Qur'an through science; both of these phenomena only emerged in the final decades of the nineteenth century when the Islamic scientific tradition had already withered."

It present state is described as follows:

"By now, the genre seems to have exhausted all verses of the Qur'an that can be shown to contain specific information and knowledge of a scientific nature. This voluminous tafsir literature has also given birth to a large amount of secondary literature, books, articles, television productions, audiovisual and web-based material. Some authors have produced lists of all "scientific verse"; others have classified these verses according to their applicability to various branches of modern science, such as physics, oceanography, geology, cosmology…..

While the trend of writing scientific tafsir seems to have abated, publication of secondary literature the Qur'an and modern science is one the rise. In addition to proving the existence of specific scientific knowledge in the Qur'an, some of these works have also created a sub-branch of this scientific exegesis, *al-I'jaz al-'ilmi*, the scientific miracle, which treats its subject on the same lines as those on which the classical tafsir literature dealt with the theme of the inimitability of the Qur'an."

The general typology of this genre of literature is that it links specific verses of the Qur'an to specific data and theories of science to prove (i) that the Qur'an is really a book of God, revealed to the Prophet of Islam because such specific scientific information was unknown during his life and (ii) that the Qur'an contains all scientific knowledge and it is for science and scientists to discover this knowledge. This approach is encumbered with an emotional, psychological, even political, baggage and has been opposed and challenged by serious scholarship. But its mass popularity remains incontestable. However this trend did not go unnoticed from religious authorities. Muzaffar cites a representative critique by Maulana Ashraf ali Thanvi (d. 1943), who pointed out various errors involved in subjecting the Qur'anic verses to scientific interpretation. "As soon as people hear or see any new finding of science by the Europeans," he wrote, "they try in one way or the other to posit such finding as a connotation of some verse of the *Qur'an*. They reckon this as a great service to Islam, a cause of pride for the *Qur'an*, and a sign of their own ingenuity."

He has successfully shown that this enterprise of *tafsir al 'ilmi* is vulnerable on the ground that science is changeable, and that it is wrong to interpret the Qur'an in the light of a knowledge that is always changing. It is an unsound enterprise because in spite of the voluminous literature so far produced in the name of *tafsir al 'ilmi*, nothing has been shown to be rooted in the centuries of scholarship that has existed in the Islamic tradition. This literature is filled with attempts to show that everything in the contemporary world– from microbes to telegraphs – can be shown to originate in the verses of the Qur'an. Likewise, it reads all major scientific theories– from Big Bang to theories of evolution– in the text of the Noble Qur'an. It also attempts to build a case for the origin of all contemporary sciences in the Qur'an. Thus, it finds the origins of modern astronomy, physics, chemistry, botany, zoology, geology, geography, anthropology, sociology, economics, and psychology in the Qur'an. It is motivated by a wish to demonstrate compatibility (*muwafaqa*) between the Qur'an and modern Western science. Consider the following in this respect: "it is also unsound on the grounds that it is not consistent with the treatment of the rest of the Qur'anic data. For instance, the Qur'an makes a very specific prediction in the opening verses of Chapter 30, The Romans. It states that the Romans, who had been defeated by the Iranians, would turn the tables on Iran within three to nine

years. This predication was fulfilled but no one claimed that the Qur'an contains specific and detailed knowledge of all historical events…. if the Qur'an is said to contain the knowledge of the ancients and those who came in the latter times (*'ilm al-awwalin wa'l-akhirin*), then this should be true of history no less than of science. But if it cannot be claimed that the Qur'an is a repository of all events that would ever happen in historical time, it can also not be claimed to be a repository of all the scientific inventions and discoveries that would ever be made."

The next chapter "The New Nexus" analyzes the problems and pitfalls of the contemporary discourse, identifies obstacles and considers the ways this discourse could be liberated from its present predicament. He observes that all expressions of Reality and all paths to it must remain connected to each other through a central nexus which is the unitive function. This unique aspect of the Islamic perspective on modern science renders many contemporary typologies irrelevant to the discourse. Muzaffar quotes a very insightful remark from Werner Heisenberg in this regard:

> "since it is true that the results of modern physics do touch such fundamental concepts as reality, space and time, the confrontation may lead to entirely new developments which cannot be foreseen. One characteristic feature of this meeting between modern science and the older methods of thinking will be its complete internationality. …. "such remarks should not be misunderstood as an underestimation of the damage that may be done o has been done to old cultural traditions by the impact of technical progress. But since this whole development has for a long time passed far beyond any control by human forces, we have to accept it as one of the most essential features of our time and must try to connect it as much as possible with the human values that have been the aim of the old cultural and religious traditions."

But this is not realized by most of those who are at the helm of the affairs. It is frequently assumed by a majority of reformers and politicians, and even by some scholars, that the Muslim societies can overcome their economic, political and social problems by importing western science and technology without importing any of the philosophical and ethical values that lie behind this science and its products. This facile assumption is based on another assumption: The supposed objectivity and neutrality of modern science.

These are very important issues as the contemporary Islam and science discourse is often construed in terms of these two opposing trends, one calling for an all-out embrace of modern science by imparting upon it a universality by superimposing claims of it being a value-free, objective and enterprise, even an integral constituent of progress and an essential need for survival. The other trend emphasizes the philosophical underlay of modern science and seeks to show the damaging effect to this worldview not only for the Islamic way of life but for the whole human habitat, which is already suffering from a colossal and irreversible environmental devastation. The former attempts to sanctify its agenda through the agency of religion by appealing to the religious duty to acquire knowledge from whichever source it comes, the latter seeks nothing short of a total re-structuring of science in an effort to re-establish its severed ties to Ultimate Reality from which all existent things come and to which they return.

Muzaffar has also examined the responses that Muslim scholars/scientists have offered with regard to the question of liberating the Islam and science discourse and presented us with a clear view of their respective merits and inadequacies. To conclude, we would like to summarize his suggestions on the creating a "New Nexus".

Throughout his book Muzaffar has emphasized that the discourse on Islam and science is not merely an academic exercise for the Muslims. More than a century has passed since the early nineteenth century reformers chose a doomed path for the resurrection of Islamic civilization. A century is a sufficient time to learn. Heisenberg's perceptive remark cited above is not only an axiom; it is an experiential truth for the Muslim world. One cannot resurrect a dead tradition by infusing alien blood into it. By now, it has become exceedingly apparent to a large number of Muslim scholars that the malaise from which the Muslim world is suffering cannot be cured by merely importing Western science and its products; on the contrary, this has only aggravated the situation by creating numerous new problems. So, what is the solution? What are the ways open to more than one billion Muslims who live on this planet to find their rightful place in a world dominated by modern science and its numerous products without losing all sight of their spiritual tradition? How should Islam be related to modern science? What are the new modes through which one can find an expression of this discourse that is

intelligible to even those who are not open to the spiritual truths in which such a discourse has to be rooted by necessity?

Another aspect of the discourse that has become apparent is that modern science cannot be "Islamized" by sprinkling Qur'anic verses over its theories. This realization has fundamental implications for the Islam and science discourse as well as for the Muslim world in its search for a modus vivendi. It is true that at the practical level, it has become impossible for any civilization to remain unaffected by modern science and the force and extent of penetration of modern science into other cultures will continue to increase. But it is also true that in spite of the loss that such an infusion entails, it is still possible for the representatives of traditional civilizations to fortify their civilizations by recourse to the primary sources.

What is needed is not the solution prescribed by the colonized minds of the nineteenth and the early decades of the twentieth century, but a true revival of the Islamic tradition of learning which will then give birth to a process of appropriation of modern science, something akin to what was accomplished during the eighth to eleventh centuries, though the new methods of appropriation, transformation and naturalization will be, by necessity, different from the one which had emerged in the previous case.

These perspectives then need to be articulated vigorously and with integrity, always remaining true to the fundamental truths of the Islamic tradition. With a persistent effort at different levels-ranging from limited exploratory interactions between scholars to public forums-the new nexus will become central in the discourse and the profane efforts to prove the revealed text by modern science or to find one to one correspondence between the two will disappear.

Likewise, the revival of the severed ties with the Islamic tradition is a *sine qua non* for understanding the relationship between Islam and modern science. Without these ties re-established at the most fundamental level, nothing can be achieved. It is this re-established nexus that will help to make the discourse a vibrant and living entity, capable of sorting and processing material as well as having enough force to destroy the colonial legacy by liberating hearts and minds.

Although it is still too early to articulate the exact paths through which modern science will be appropriated and naturalized within a renewed Islamic understanding, it is important to point out two major aspects. First, this process will take place within a more general process of revival of Islamic tradition of learning. This is only possible through a large-scale effort to re-educate Muslims in the various sciences that deal with the language of revelation. Without this grounding, nothing can be accomplished that can have any significant impact on the general process of revival.

The second aspect is related to the Qur'an and science. The language of the Qur'an does not allow a semantic transference to the language of modern science. Thus, it is futile, rather absurd, to find telephones, microbes and the Big Bang in the text of the Qur'an. What is relevant, however, is the metaphysical teachings of the revealed Book which remain, by their very nature, ahistorical, timeless and forever true. It is this metaphysical framework that needs to be applied to modern science, and indeed, to all knowledge, whatever its source. This is neither a simple process, nor should this be the case.

This is also not a task that everyone can undertake. It requires institutions where a small number of scholars can be trained who are rooted in the spiritual universe of the tradition but who are also intellectually equipped to understand specific branches of modern science. Fortunately, there is already a large number of Muslim scientists now living in the West and working in some of the most advanced laboratories of the world; they are well suited to undertake this task, provided they receive formal training in Islamic sciences with the understanding that their education of modern Western science is both an asset and an impediment. It is an impediment because their formal training and personal experiences of a life lived in a non-traditional environment have created numerous cognitive patterns, peculiar habits of mind and a certain clouding of the intellect that act as black holes. But, we affirm that a mirror remains a mirror, no matter how much dust may have settled on it, for a well-scrubbed mirror holds back nothing. Likewise, a new generation of 'ulama' with enough understanding of modern science is emerging on the scene; the future of the discourse will be determined by these two groups.

In short, *Islam and Science* is a stimulating and rewarding study. Formulating new questions, constantly offering fresh perspectives, correcting erroneous notions that have been accepted unquestioningly and providing needed correctives to much muddled thinking on the basic issues surrounding the Islam and science discourse, it is a very welcome addition to the growing body of authentic literature on the subject.