

1. INTRODUCTION

The history of Muslim science - its epoch, stagnation, and decline - has been of much concern to the present-day Muslim Ummah. While it is of great concern to the Muslim Ummah, it has also been of considerable interest to the non-Muslim historians of science. However, this concern (or interest) has been rather a recent development. Toby E. Huff writes¹: Until quite recently little attention had been given to the existence of Arabic Science and to the fact that it lies in a direct line leading to modern science'. The history of Muslim science cannot be studied in isolation; this is part of the history of mankind. One does witness a kind of continuity in human endeavours of all societies, the coming generation learning and borrowing from the earlier generations. Indeed, such borrowings have always been adapted to the philosophical and sociological value-system of the particular society.

While Europe was plunged into the Dark Ages, the Muslims took up the ancient European science – the Greek and the Hellenic heritage – in right earnest, without any inhibition of any kind. Before one talks about the ancient and prehistoric fund of knowledge which were acquired and then developed by the Muslims, one would like to discuss the philosophical and social structure of the Muslim society in the years of its political ascendancy. In particular, one would like to discuss them in the context of what have aroused the debate on issues such as :

- i. Who were those people in the Muslim world who initiated this study?
- ii. What was the urge behind these endeavours?
- iii. How was this received in the society?
- iv. What was the institutional framework in which such study gathered momentum for advancement?
- v. How long was the Muslim preeminence in science and technology sustained?
- vi. How, when, and why the Muslim epoch in science and technology started to retrograde and finally decline ? These and many other issues deserve the attention of modern scholarship in order to develop the future pathway to get it back on the rails again. In this respect, the human history is a great resource to learn from.

2. SOME NEW WAYS OF LOOKING AT HISTORY OF CIVILIZED MAN

The history of mankind has been written from two perspectives. Most histories are the accounts of the civilizations and cultures – their rise and fall. However, a recent work, *Guns, Germs, and Steel* by J. Diamond, traces the human history since 50,000 years back when, according to the author, the first leap forward took place in the evolution of mankind, but a suitable starting point from which to compare human historical developments on the different continents has been reckoned by him as 11,000 B.C. The theme is essentially an extension of the theory of evolution: if man came to being as a product of evolution from its animal ancestors, must not its history be also studied as the manifestation of the natural process of evolution that is largely determined by the natural environments – capricious as it has often been that forced the animal world to adapt itself in the changing environment it lived in. Diamond thus considers the human history as a science, much like other sciences and presents an agenda for future work to establish its status as a science: 'The challenge now is to develop human history as a science, on a par with acknowledged historical sciences such as astronomy, geology, and evolutionary biology'². He is aware, however, of the difficulties in determining the parameters that delineate the trajectory of the human history. He has identified four major factors, but he invites further studies, for he states³:

"A historian who had lived at any time between 8500 B.C. and A.D. 1450, and who had tried then to predict future historical trajectories, would surely have labeled Europe eventual dominance as the least likely outcome, because Europe was the most backward of those three Old World regions for most of those 10,000 years. From 8,500 B.C. until the rise of Greece and then Italy after 500 B.C., almost all major innovations in western Eurasia – animal domestication, writing, metallurgy, wheels, and so on – arose in or near the Fertile Crescent."

Diamond's theme that the environmental factor, i.e. 'geographic determinism', has had been the main player in determining the course of the history of mankind is a question mark even to Diamond himself, for he says⁴:

"But mention of these geographical differences

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invites among historians the label 'geographic determinism' which raises hackles. The label seems to have unpleasant connotations, such as that human creativity counts for nothing, or that we humans are passive robots helplessly programmed by climate, fauna, and flora. Of course these fears are misplaced. Without human inventiveness, all of us today would still be cutting our meat with stone tools and eating it raw, like our ancestors of a million years ago. All human societies contain inventive people. It's just that some environments provide more starting materials, and more favourable conditions for utilizing inventions, than do other environments."

Diamond's concluding words are, however, more relevant for the modern researchers who would still like to view the world history in the light of the endeavours of human societies to mould the course of history to their advantages, physical, moral, and spiritual. Thus, is not the human history different from the evolutionary history of the living beings prior to the coming of man! Diamond says⁵:

The histories of the Fertile crescent and China also hold a salutary lesson for the modern world: circumstances change, and past primacy is no guarantee of future primacy. One might even wonder whether the geographical reasoning employed throughout this book has at last become wholly irrelevant in the modern world, now that ideas diffuse every-where instantly on the Internet and cargo is routinely air freighted overnight between continents. It might seem that entirely new rules apply to competitions between the world's peoples, and that as a result new powers are emerging – such as Taiwan, Korea, Malaysia and especially Japan.

Based on his concept of 'geographical determinism', Diamond explains why the power (economic, political, and technological) shifted from its Fertile Crescent base to western Europe, the supremacy of which is predicted to be sustainable because of its climatic factors – plenty of rainfall sustaining agriculture and forest. Thus, while Diamond dismisses the racial or genetic factors as the plausible reason for supremacy, he nonetheless finds the geographical reasons for the West dominance. Quite a few modern writers assert that modern science has found its home in the Western because of its particular cultural ethos which promotes 'neutral spaces' for free-thinking, unfettered by any consideration of religious, social,

and political prejudices, and they are of the opinion that the Muslims, Chinese, and Indian societies do not provide the 'neutral spaces' for free-thinking⁶. One would have thought that modern science should mean the current science of any particular time in any particular society. However, when these authors speak of modern science, they mean something else; they identify the distinguishing features of modern science as follows⁷:

The breakthrough that allowed freedom of scientific enquiry is undoubtedly one of the most powerful intellectual (and social) revolutions in the history of humankind. As the paradigmatic form of free enquiry, science has been given a roving commission to set all the domains of thought aright. Science is thus the natural enemy of all vested interests – social, political, and religious – including those of the scientific establishment itself. For the scientific mind refuses to let things stand as they are. The organized skepticism of the scientific ethos is ever present and always doubtful of the latest (and even the long-standing) intellectual consensus.

This concept of modern science vis-à-vis its supposedly incompatibility with the cultural ethos of the Muslim society deserves an in-depth study which would be attempted in the relevant chapters of this book. However, to turn to the main theme of this book, we would like to recount very broadly how the Muslims were drawn in to take up science seriously and how they fared since the beginning of the Muslims ascendancy to world power up to as late as the beginning of the scientific revolution of the West in the seventeenth century A.D., roughly a period of about a thousand years. To start with, it must be understood that the Muslim ascendancy to political domination was not for material gains as such. Some Western scholars of history try to regard this as a means to political dominance with the zest for riches and as a diversion to avoid internal conflict.

3. DISCUSSION OF TOYNBEE'S VIEWS

Toynbee says⁸:

"Even so, the combined power of Medina and Mecca might not have been strong enough to re-subdue the rest of Arabia if the dead Prophet's Khalifa (Caliph, successor), Abu Bakr, had not opened up for the insurgents an attractive alternative to rebellion."

Either on his own initiative or at the suggestion of the Islamic State's informal steering committee by which he had been elected, Abu Bakr invited the insurgents to turn their arms, under the Islamic state's leadership, against the two empires that adjoined Arabia on the north. Both empires had emerged exhausted from the deadly Romano – Persian war of 604-28; they would be an easy prey for an assault delivered by the united forces of the whole of Arabia; and, though both empires were now economically ruined in the eyes of their own subjects, they were still a rich prize in Arab eyes. Abu Bakr was here taking his cue from Muhammad himself. He was soliciting loyalty by rewarding it with opportunities for acquiring loot – for which the poverty-stricken Arabs had an insatiable appetite. This combination of allurements with coercion succeeded in deflecting the Arab insurgents from rebellion to foreign conquest.

All the same, Toynbee admits that 'the speed and range of the Islamic state's conquests are amazing'⁹. One would wonder if a community is not committed to loftier ideals, could it ever accomplish the feat which has been so amazing! Is there any earlier evidence of such feat in the history of the earlier Arabs? Could the poverty-stricken people with poor resources and organization, do what they accomplished?

Here one would like to very briefly recount the state of Arabian societies prior to Islam. The Arabs of the Arabian Peninsula were divided into two distinct regions, the south (Yemen) and the north (Hijaz and Najd). The south was well-developed and held a distinct political organization, culture, and language that for centuries helped it to dominate the region, while the north Arabia had mostly nomadic people, often getting subdued by the south Arabs, yet taking pride in their Arabic language. However, by 600 A.D. Yemen was fully taken over by Abyssinian kings, thus leaving the Yemeni Arabs lost of all earlier prides. How demoralized the Arabs of the north were, can be gauged by the Abraha's invasion of Mecca in the same year (but prior to)the Prophet (SAW) was born: The Meccans offered no resistance to Abraha's army, and had it not been for the miraculous ruination of the elephant riding Abraha's army by the swarm of the tiny birds—Ababeel, the history of north Arabia would have been very different¹⁰.

One would wonder whether Toynbee had not been aware of the Muslim rules of conduct in warfare –

there is to be found no parallel of these rules in the history of mankind. One must not confuse the war booty of the Muslim conquests with the loot and plunder that has had been the order of the day of other peoples and communities, except of course the faithful followers of earlier prophets. Toynbee further on says that the 'Muslim Arab garrisons in the subject territories were not missionary minded': he says¹¹:

"For the Islamic Empire's subjects, conversion to Islam was attractive financially as a possible means of acquiring the Muslim establishment's relatively favourable fiscal status: but, just because this status was less onerous, the Islamic Treasury opposed conversions and sought when conversion occurred to nullify their fiscal effect".

This perspective is just not tenable. Islamic conquests have been given the Islamic law's sanction only to carry the message of Islam : indeed, forcible conversion is forbidden in Islam. It must be understood that the Holy Quran and the Prophet's (SAW) traditions made it obligatory for every Muslim to carry the message of Islam. The people of the Books should not find it difficult to appreciate it in the light of the life and teachings of the prophets given in their own holy scriptures. Toynbee obliquely admits that the Arab conquests were motivated by the Prophet's guiding words in their conquest and management of the conquered lands: he writes: 'The Arab conquests were also facilitated by the directive, in the Quran, that people of the Books were to be tolerated and protected if they submitted to the Islamic government and agreed to pay surtax'¹² : he further writes, 'The Arabs left the collection of the taxes payable by their non-Muslim subjects in the hands of the existing native fiscal officers'¹³ ; '...but the native fiscal authorities, though now compelled to do their work in Arabic, were allowed to remain in office; they were not replaced by Arab's'¹⁴.

The strict discipline of the Arab soldiery, their proper management and control from the central command, their confinement to cantonments assuring minimal contact with the conquered people, their impeccable lifestyle attracting the non-Arab settlers show how cautious they were in carrying the message of Islam – coercion for conversion was strictly forbidden.

4. THE ADMINISTRATIVE AND TECHNOLOGICAL SYSTEM OF THE 2ND CALIPH, UMAR IBN AL KHATTAB

The above brief account of the Muslim conquests indicates the open-mindedness of the Muslims to face new challenges with vision and that they were receptive to new knowledge. Obviously they had no earlier experience of large-scale warfare and the management of conquered lands. Admittedly they developed competitive war machinery, their management and control, management of communication, use of geographical information, the logistics of the supply of food, establishment of civil administration and so forth. They may have learnt some of the skills from others, but their indigenous inputs in these arts and technologies were mostly original – Caliph Umar (RA) is reported to have been the pioneer in some three dozen areas of civil management, international relations, and pertinent technologies for the benefit of the then society and state. Here under are given some of these:

Administration:

- i. Judiciary;
- ii. Finance;
- iii. Standing army and Defense;
- iv. Population census;
- v. Jail Administration;
- vi. Police and intelligence department;
- vii. Establishment of cantonments;
- viii. Financial support to poor non-Muslims;
- ix. Waqf institution;
- x. Management of mosque.

Technologies:

- i. Calendar;
- ii. Survey of land;
- iii. Irrigation
- iv. Architecture and civil engineering;
- v. Assessment of river resources;
- vi. Breeding of quality horses;
- vii. Teaching institution

It is surprising, nevertheless, to find some authors alleging the Muslims – at least the earliest Muslims – to be against scholarship and learning. Mehdi Nakosteen writes in his book 'History of Islamic Origins of Western Education'¹⁵:

The phrase, Muslim scholarship and learning, is

misleading if it implies that the faith created the scholar and determined the depth or scope of his scholarship. Nor can we refer to the scholarship under Islam as Arabian unless we imply only that it used Arabic as its medium of expression, a medium which by the end of the eleventh century was effectively challenged by the new Persian language after its revival by Firdowsi. Actually, the first Muslim conquerors were in no way patrons of learning.

The Umayyads, the first Muslim dynasty, ruling during the first century of expansion were too preoccupied with the conquest, consolidation, and administration of a vast multi-national and multi-cultural empire to be concerned with the needs of the mind'.

Further on he says that:¹⁶ 'they either burned or drowned many of the Hellenistic works in Alexandria and the Pahlavi works in Zoroastrian Persia': When Amr ibn al-Ass, after conquering Egypt, saw the voluminous library in Alexandria, he sought the advice of the Caliph Umar (RA) as to what he should do with it, to which the caliph replied:

"As to the books about which you are inquiring, if there is to be found in them information which is in agreement with the Book of God (the Quran), such information is already available to us, and if there is in them materials that are contrary to the Book of God, there would be no need for them. In any event, proceed with their destruction."

Based on Qifti's account, Nakosteen writes that 'the books were distributed to the bath houses of Alexandria which kept them heated for six months'. A similar account is given by him about the libraries in Persia – these books were drowned in water under the instructions of Caliph Umar (RA)¹⁷.

Now returning to Nakosteen's statement, one would say that, in reporting such accounts, scholarship demands caution. W. Dampier has to say the following in this context¹⁸:

"About the middle of the third century, the famous Museum, or the place dedicated to Muses, was founded in Alexandria. The four departments of literature, mathematics, Astronomy and medicine were in the nature of research institutes, as well as schools, and the needs of them all were served by the largest library of the world, containing some 400,000 volumes or rolls. One section of the library was destroyed by the Christian Bishop Theophitus about

A.D.390, and, after the Muslim conquest in the year 640, the Mohammedans, whether accidentally or deliberately is uncertain, destroyed what the Christians left. History is replete with such sweeping statements such as Nakosteen's. Who would believe that the people who conquered the vast empires of the time and provided in the conquered lands the egalitarian system of governance – unknown in that time -- could not be 'concerned with the needs of mind'. The pioneering innovations of Caliph Umar (RA) speak volumes for his great vision. And how could he (the caliph) advise against the Prophet's teaching whose tradition say that 'it is obligatory for Muslims, men and women, to acquire knowledge', and furthermore another tradition says that 'what-ever new knowledge a Muslim comes across, he should take it as his lost heritage'. Notwithstanding these glorious instructions to Muslims, what do historical records say? Mehdi Nakosteen himself mention, on the authority of Nadeem's *Al-Fihrist*, that the Umayyad rulers did have an interest in medical and alchemical works¹⁹.

5. MUSLIM INTEREST AND COLLABORATIVE ATTITUDE IN THE DEVELOPMENT OF SCIENCE

Even earlier to this, there are evidences of Muslims' interest in promoting learning and technologies. Muawiyah (RA), the Governor of Syria during the days of Caliph Umar (RA), is reported 'to relax in book after his business of the day'. Nicholson says²⁰: "He consecrated a third part of every night to the history of Arabs and their famous battles; the history of foreign peoples, their kings, and their government; the biography of monarchs, including their wars and strategies, and method of rule; and other matters connected with Ancient History". He also called Abid b.Sharya in his court and asked him to write the history of Arabs. This book was written up and entitled 'The Book of the Kings and the History of the Ancients'²¹. (It is said that the writer mixed fiction with facts, but this is besides the point). Muawiyah (RA) was also the first to organize Muslim Navy for warfare: In 669 Muawiyah (RA) built a fleet, and in 674 -8 he besieged Constantinople by both sea and land; but this seizure turned into a disaster for the Arabs²².

In another place Nakosteen himself says²³: 'The old theory that the early Muslims were enemies of learning and science and that except in their own Quran and tradition they showed no toleration of

the beliefs and intellectual treasures of other nations is without historical basis".

The point now is who these early Muslims were, and to differentiate between the Muslims of different geographical origins. Naive though this question may appear, many historians of science have tried to differentiate the Arab Muslim's science from the non-Arab Muslim's science, emphasizing that the great name in the Muslim science were non-Arabs, such as Avicenna, Al Haytham, Al Biruni and so on. While many authors speak of Arabic Islamic science (Nakosteen even speaks of politico-religious nationalistic identifications, such as Persian Islam, Hispania Islam, Egyptian Islam), it must be appreciated that Islam was a culture which integrated all people from different nationalities to form one nation – the Muslim nation. Brian Stock says²⁴:

"Nor is it true, as some claim that the most distinctive contributions to science were made by outsiders. Of course, many of the leading scientists were not Arabs. Al-Biruni and Omar Khayyam were Persian, Al-Farabi a Turk, Avicenna from Bukhara, Jabir ibn Hayyam a Sabeen, Masha'allah a Jew, and the Bakhtyisha family Nestorian Christian. Yet modern notion of nationality must not be misplaced. Islam extended into a new environment and a wider geographical framework, a principle well-known in the Roman Empire, namely, the conferring of citizenship upon men from different background who shared a common single cultural and political allegiance. What they added was religious unity. In patronizing science, Baghdad, Cairo, Cordova did nothing that Rome's Alexandria, and Perganum had not done. They just did it under a new banners and on a bigger scale."

Indeed, the first converts to Islam were Arabs, but even this earliest community of Muslims – the companions of the Prophet (SAW) – comprised people from Abyssinia (Bilal Habashi (RA), Emperor Najashi), Persia (Salman Farsi), Rome (Suhaib Roomi), and people converted from Judaism and Christianity. After embracing Islam, they had only one identification – Muslims. This fraternity was so all-embracing that, centuries after, the students from Spain would come to Baghdad for studies, and the scientists from Spain collaborated with the scientists of the eastern zone (Baghdad) in scientific projects – an outstanding example is in Astronomy. Ibn al-Haytham's rejection of Ptolemy's theory-- in the words of Ibn al-Haytham²⁵, 'the arrangements proposed for planetary motions in the *Almagest*

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(are) 'false' (his own words) and that the true arrangements were yet to be discovered'-- led to what was the formulation of a proper 'scientific project' that was carried out by the great minds of Muslim astronomers both in the western (Spain) and eastern (Baghdad) centres of Islam. In Andalusia (Spain), a century after Ibn-al-Haytham, Arab thinkers independently led what has been called a revolt against Ptolemaic astronomy²⁶. The Tusi couple was a great achievement, which 150 years later, reappeared in the works of Copernicus – the similarity between the two is amazing, to say the least.

How long did the preeminence of the Muslim Science continue? The earlier perception that it definitely declined after the eleventh century is no longer sustainable. There is ample evidence that it continued upto the seventeenth century. Huff says²⁷: "considered altogether, in mathematics, astronomy, optics, physics, and medicine, Arabian science was the most advanced in the world. In different fields it lost the lead at different points in time. But it can be said that until the Copernican revolution of the sixteenth century, its astronomical models were the most advanced in the world". In the field of medicine, the works of Rhazis and Avicenna were still in use in the medical curriculum of Europe : 'They were still insisting upon and getting new translation of Muslim medical works ... and Muslim pharmacology was respected in Europe until the nineteenth century²⁸. Al-Batani's work on veterinary Sciences, and Ibn Khuldun's al Muqaddimah – a great work on sociology – also speak of the preeminence of Muslim scholarship up to as late as the 14th century. About Ibn Khuldun's Muqaddimah, it will be pertinent to quote from Encyclopedia Britanica²⁹.

"But the greatest Arab historian and one of the most penetrating thinkers about historiography in any time or place was undoubtedly Ibn Khuldun."

The Introduction (al-Muqaddimah) to his Kitab al-ibar, a universal history (began in 1375) is, in A.J. Toynbee judgement (1934), "the greatest work of its kind that has ever yet been created by any mind".

6. THE PERIOD OF DECLINE

Viewed against the above observations about the primacy of Muslim science and scholarship that continued much beyond the eleventh century, one finds a very strange observation about the possible

reason for the retrogradation of Muslim science after the eleventh century. In a footnote, Huff makes the following observation³⁰.

"A likely explanation of it, however, is to be found in the pattern of conversion to Islam over the centuries. For the first several centuries of the Islamic empire, the percentage of subjects who were Muslims in many areas of the empire remained less than a majority. It was not until about the tenth century that the pre-existing communal structures of the non-Islamic peoples were weathered so that widespread conversion to Islam took place. Accordingly, the tenth century marks a turning point when rates of conversion soared, and with this new wave of conversion to Islam, the percentage of freethinkers who were not fearful of the corroding effects of the foreign sciences also dramatically declined, and this dynamic probably had negative consequences for the pursuit of the natural sciences and intellectual life in general. Although there will be those who will challenge this hypothesis, it has, I believe, the virtue of being consistent, not only with the fact just noted but also with the additional fact that even today there is no Islamic equivalent to a Hong Kong, a Singapore, a Taiwan, or, much less, a Japan among the Islamic countries of the world, despite the fact that at least six of them have enormous oil wealth, including the per capita richest, Brunei, which could be directed toward this goal were it considered desirable."

There are two aspects of these observations, first that the Muslim civilizational glory faded out just after the tenth century, and secondly that the Muslim society was intolerant to free-thinking and intellectual enterprise. Both these view points are contrary to facts. The political primacy of Muslims continued as far as the early twentieth century – the Ottoman Empire came to an end after the First World War. Toynbee writes:

"For a century and a half, 1555-1707, three great Islamic empires – the Ottoman, Safavi, and the Timurid Mughal – co-existed with each other and embraced, between them, the greater part of the Islamic world."

The Ottoman empire was the oldest of the three empires; it had suffered the onslaught of the Mangols, but then eventually recovered its place under Murad IV(623-40) by recapturing Baghdad from the Safavis in 1638, and 'in 1768 Ottoman Empire still held Bosnia and Belgrade and

exercised an effective suzerainty over the two Romanian principalities to the north of the lower course of the Danube. In fact, the Ottoman Empire emulated its predecessor, the East Roman Empire, in its ability to recuperate from disasters that had looked as if they were irretrievable³¹.

Even Andalusia survived until the late 15th century when it was finally run over by the Christian united Kingdom of Castile and Aragon. Cordova, Baghdad, Cairo, Damascus, Granada, Delhi, Agra, Basra and many other cities were known for centuries to be at the zenith of cultural and commercial glory. Hong Kong, Singapore, etc., emerged very late. It is too early to say how the presently rich Muslim states will fare in future – it is hardly 50 years since they became rich. Admittedly the Muslim political ascendancy started moving downhill since the seventeenth century – some six hundred years after the tenth century. And can it be that political ascendancy was achieved without any support of intellectual enterprises! This aspect, indeed, still needs to be investigated. The financial/monetary crises in the Ottoman empire, as against Europe's adventures on the seas discovering the new world – thus bringing riches – is a cogent factor for the decline of the Muslim political power. Obviously financial bankruptcy could not sustain intellectual activities, more on this we would talk in later chapters.

The other aspect of Huff's observation is more important for in-depth study. This, in fact, is related to the Muslim Scholasticism. One must, at the very outset, understand that Muslim scholasticism has been completely different from Christian Scholasticism. First, Jesus (AS) did not found the Christian state. The handful of the first followers of Christ had hard time in preserving their identity and the book containing the divine message given by Jesus (AS). The early Christian faith – the Judo-Christianity – was on the verge of extinction when 'Saint Paul saved Christianity from setting down as a Jewish Sect doomed to early extinction, and preached it as a world religion. When it grew and spread, it came in touch with Greek Philosophy, 'and the chief work of the early fathers of the church lay in combining that philosophy with Christian doctrines³². First, Origin (C. AD 185-C-254) tried to establish conformity of ancient science with the Christian faith. Origin's most fundamental tenet was the unchangeableness of God which involved the eternity both of the Logos and of the world: however, in his days the doctrine was fluid. The

Council of Church condemned Origen's theology in 553. The history of the synthesis of knowledge, the Greek philosophy and Christian faith, is a long one. To quote Dampier,³³ 'Catholic doctrine was formulated by dispute and "showed why" our creeds are not only statement of belief, but peacens of triumph over defeated heretics and heathen'. The development of Canon law to regulate the killings under the cover of Inquisition was based on Roman Law. Surprisingly, many of the ideas of Greek philosophy – even those which had no empirical basis, and were simply hypothetical – were adopted as a matter of faith in Christianity, such as, the geocentric theory of the cosmos, or the concept that things cannot be created out of nothing. It is a long history of why and how many scientists were condemned and executed as heretics.

The Western civilization lauds about its world-view of modern science, which is, to quote Huff³⁴: 'in addition to subscribing to the notion of laws of nature, modern science is a metaphysical system which asserts that man, unaided by spiritual agencies or divine guidance, is single-handedly capable of understanding and grasping the laws that govern man and the universe'. This is an expression of the audacities of man : ' whether or not is it true that God made man in his own image, it is certain that man makes gods in his³⁵.

7. THE INTERACTION BETWEEN SCIENCE AND ISLAMIC THOUGHT

Let us now return to the Islamic Laws. The Prophet (SAW) himself founded the Islamic state; his companions numbered about a hundred twenty-five thousand; the Islamic state expanded at an unprecedented rate, and the Muslim ascendancy to political and intellectual power continued for more than a thousand years. As early as the first century Hijri, one finds a surge of academic activities to elaborate, compile and codify the Islamic laws to provide guidance for the benefit of individuals and the state. These laws were based on Quran and the Prophet's (SAW) traditions. The principles of (i) tafseer, making commentaries on Quran, (ii) hadith, compilation and interpretation of the Prophet's tradition and (iii) fiqh, enacting laws (jurisprudence) were developed. These activities were also supported by the state. There is a mistaken view that Ilm-e-Kalam was developed after the Muslim came across the Greek philosophy, in order to synthesize the Islamic laws with Greek knowledge and philosophy. In fact, Kalam began when

disputation arose in interpreting the 'mutashabihat' verses of the Quran. IIm-e-Kalam provided the rational basis for their correct interpretation. Indeed, when the Muslims came across the Greek and Hellenic knowledge and philosophy as a result of the great translation work carried out in the time of Abbasi Caliphate, some Muslim minds were influenced by the Greek philosophy, particularly on metaphysical issues. The Greek philosophers had been trying to get to the 'Truth' through philosophical discourses. As far as the Muslims were concerned, the Truth was Allah, the Creator, and the belief in Him was part of faith. So this part of the Greek philosophy was of no relevance to Islam. IIm-e-Kalam, however, was further developed to counteract philosophy, developing its own system of logic, and thus effectively contending what was diabolical from Islamic point of view. To quote Huff³⁶ : 'By the fourteenth century, however, the Islamic religious philosophers (mutakallimun) appear to have risen sufficiently to have fully defeated philosophy, thereby putting Kalam in the ascendancy in Sunni lands'. This is where Ashairi's work and later Ghazali's work are important*. The Mutakalamin (so-called Islamic philosophers in the sense of Western perception of philosophy) never tried to reconcile the Muslim faith with Greek philosophy. In fact, the metaphysical part of Greek Philosophy had no place in Islamic belief. Albeit, some Muslim natural philosophers, among them Avicenna was a scientist, Averroes an astronomer –cum-Jurist), while maintaining that the knowledge and injunctions given in the Holy Quran need not be proved or disproved by dialectical methods (they are words of Allah), they did falter in some of their writings, for example, Averroes considers the world as eternal – 'ambiguity and inconsistencies are not absent in Averroes statements'³⁷. If Allah is the Creator – which of course He is – and has made human beings accountable for their deeds (the concept of reward and punishment is associated with this accountability), then indeed it is but logical that He should say what finds His approval or disapproval, and because He is All – Knowing we cannot say that His words in the Scriptures lost currency with the passage of time. This is what Islamic laws tell us and this has been the essence of all divine scriptures—fortunately (indeed by divine will) only the Holy Quran has survived the heavy hand of corruptibility at the hands of misguided humans. Never was any foreign precept, conjecture or belief adopted as a matter of faith in Islam. It is a

fact that the kind of killings done in the Christian world are not known in the Muslim world. Generally the Muslim society was quite tolerant – for example, the doctrine of Motallazites that said that 'Quran was not the words of Creator, it rather was His creation', though professed by the Caliph, Mamun, and his court Ulama, was not implemented as a creed of the Muslim populace, and when a countryman appeared out of the blue to contend this doctrine (in the face of the State's law which made such a contender liable to death punishment, should he lose the debate with the court Ulama), he won the debate, and not only that his life was spared but the State's law in this respect was also abrogated.

Was there any urge in the Muslim society to take up philosophy and science ? Yes, indeed: one finds in the Holy Quran a number of verses inviting humans to look around and study the working of the nature, for indeed therein there are signs for those who believe. In surah Al-Jathiyah, for example, it says:

"Lo! in the heavens and the earth are portents for believers, and in your creation, and all the beasts that He scattereth in the earth, are portents for a folk whose faith is sure. And the difference of night and day and the provisions that Allah sendeth down from the sky and thereby quickeneth the earth after her death, and the ordering of the winds, are portents for a people who have sense".
(45:verses 3-5).

The first purpose for 'observing and pondering on the working of the nature' is that it strengthens one's belief in the Creator, i.e. Allah. The second reason is that all these have not been created 'in vain,' nor would one find 'disorder' in their working: the stars move on the set path; the day and night alternate; the life follows a pattern of birth and death; the nature provides all that is required for the sustenance of life, and so on. This aspect of the Quranic injunction has two dimensions, one that it reaffirms the belief in the Creator, and secondly that it invites men to find the order in the working of the nature so that one may harness them for use – another aspect to which many other Quranic verses also draw attention, namely that all the physical world, the heaven and the earth, have been made subservient to humankind. In Surah Al-Jathiyah it says:

* For a short History of IIm-e-Kalam, See chapter VI—under 'IIm-e-Kalam' and tasawwuf (spiritualism)' of Ibn-e-Khulduns (urdu translation by Mumtaz Raghbir Rehman) Muqaddimah .

“Allah it is who hath made the sea of service unto you that the ships may run thereon by His command, and that you may seek of His bounty, and that haply ye be thankful; And hath made of service unto you whatsoever is in the heavens and whatsoever is in the earth; it is all from Him. Lo! Herein verily are portents for people who reflect” (45:verses 12-1). Thus a Muslim need not delve in finding the ultimate Truth, i.e. Allah – this is part of the belief of a Muslim. Indeed, a Muslim should look into the mystery of creation in order to strengthen one’s faith and harness it for the benefit of the society (This is physical science). This would explain why the Muslim scholars advised against philosophy – in fact, the metaphysical part of philosophy is what has been discouraged in Islam. This does not mean that the study of philosophy, as such, has been discouraged; it is the stated purpose of it that ‘it will lead to the Truth,’ which is just a waste of time for the Muslims. Indeed, there have been quite a few notable philosophers amongst the Muslim community who are regarded as great minds of scholarship. In short, Muslims have an urge to study physical sciences and technology as a consequence of their belief. If this was not so, how could the Muslim society produce such great minds in science and technology; a brief survey of this will be given in later chapter of this book. And now the question is how the Muslim society at large reacted to this widespread Muslim interest in science and technology? To quote Brian stock³⁸. If one looks over the field of Muslim science as a whole, the most remarkable feature is not the frequently emphasized appearance of a handful of universal minds – Al-Kindi, Al-Khwarizmi, Al-Razi, Al-Farabi, Al-Biruni, Avicenna, Alhazen, and Avroes – but, rather that science in one or another form was the part-time or full-time occupation of so large a number of intellectuals.

Thus, one can see that the Muslim community at large was quite receptive to, in fact enthusiastic about, science and technology. The institutions of learning that the Muslims established – the madrasahs, Bait-ul-Hikmat, Libraries, etc. – would be discussed later. Then the debate is whether the Muslim intellectuals had any preference for either science, or technology, or arts and crafts. The interest in arts and crafts has been present in all societies in all ages. We see people of the same profession forming guilds. We would not like to delve here in the debate on what some regard as the culture of secrecy in professional knowledge

prevalent in the intellectual activities of the Muslims in the Middle Ages.

The debate whether science and technology went together, as Needham seems to suggest, particularly with reference to Chinese technology which, in his opinion, was the most developed upto the 15th century in comparison with the West, needs to be studied in the context of Muslim science and technology. Needtham holds the view³⁹ that ‘no meaningful distinction can or should be made between science and technology in history’. Science as is known today is ‘systematic and theoretical knowledge about how the world is and how it works’⁴⁰. From this point of view, science and technology in the West became intimately connected towards the end of the nineteenth century. However, we do find science-based technologies developed by the Muslims in the Middle Ages. For example, great advances were made in metrology: accurate balance for specific gravity measurements and for making time-measuring devices; survey instruments for geodesic measurements; jet propulsion for making torpedoes; new versions of sails for ships; navigational instruments; fractionation of petroleum products, and so on. Indeed, the most outstanding works were in the fields of pure science, such as mechanics (laws of motion), mathematics, astronomy, optics; and most importantly in introducing the inductive method of scientific reasoning (observation, generalization, hypothesizing, enacting laws); Leonard de Vinci and Bacon came centuries later than Ibn Haytham who was the one who systemized inductive logic in Muslim science. To conclude, let us turn to the most important question: what prospects Muslims have for once again being in the frontline of science and technology. We purposely avoid calling it ‘modern science and technology’, because of our reservations about its precepts as advanced by its modern thinkers. The Western Science today is neither international nor intercivilizational in character, for its access to less-developed countries is being aggressively denied by the Western nations, and its secrecy is covetely guarded – even the patent literatures are purposely made ambiguous in disclosing technical details. Thus the present Western science is neither international nor inter-civilizational.

8. SOME THOUGHTS ON THE FUTURE

Will the Muslims have to forgo their cultural

(religious) ethos to attain primacy in modern science? This issue will come up while discussing the factors of the decline of Muslim science. The first response to this question would, however, be that Muslims cannot afford to disown their cultural base. The God-consciousness of the Muslim society will never think this way. The seventeenth-century scientific revolution of the West had the stated purpose that any philosophical/scientific investigation need not be carried out under the larger domain of philosophy – a limited study of the part of the domain of knowledge was also important⁴¹. Thus natural philosophy dissociated itself from philosophy, and made great strides – the end-result is that physical science is now delving in philosophy, and in the words of Dampier, ‘But, now or later, intelligible mechanism will fail, and we shall be left face to face with the awful mystery which is reality⁴².’

How would a modern rationalist – frankly, an atheist – respond to Dampier? Professor Dawkins is a great exponent of atheism: in one of his lectures, delivered at an American university, he responded, with the impunity of an obsessed mind, to a questioner who was hurt by his curt reply to his questions and had complained that he (the speaker) was insulting him; to this he responded that he was not insulting him, he was insulting God. In a debate organized by the ‘Time’ magazine (Nov.5,2006 issue) between him and Professor Francis Collins, he wound up the debate as follows:

“My mind is not closed, as you have occasionally suggested Francis. My mind is open to the most wonderful range of future possibilities, which I cannot even dream about, nor can you, nor can anybody else. What I am skeptical about is the idea that whatever wonderful revelation does come in the science of the future, it will turn out to be one of the historical religion that people happen to have dreamed up. When we started out and we were talking about the origins of the universe and the physical constants, I provided what I thought were cogent arguments against a supernatural intelligent designer. But it does seem to me to be a worthy idea. Refutable – but nevertheless grand and big enough to be worthy of respect. I do not see the Olympian gods or Jesus coming down and dying on Cross as worthy of that grandeur. They strike me as parochial. If there is a God, its going to be a whole lot bigger and a whole lot more incomprehensible than anything that any theologian of any religion has ever proposed.”

The response from Prof. Dawkins does say one thing for sure: even after some 2500 years of philosophical scholarship the ‘Truth’ has yet not been discovered, and that there may be a possibility of science revealing God, much more grand and bigger than any theologian of a religion has proposed so far. His scepticism is understandable, but his assertion that God revealed by future science would not be the One believed by any known religion of today is also a dogmatic thinking. The grandeur that beats all imagination can be found in the concept of Allah that the Muslims have – incomprehensible (a mystery but a reality), yet resplendent in the awe-inspiring but immensely enthralling vistas that unfold themselves, with increasingly greater grandeur, at every step taken by the penetrating minds engrossed in science and technology. He certainly is not in the image of man: this is the distinguishing feature of the Muslim faith. There is every hope, therefore, that the Muslims would rise again and attain primacy in science which hopefully would be truly international and responsive to the needs and aspirations of the humanity at large. Unfortunately, the present-day Modern Science is neither international nor inter-civilisational.

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