



**Foundation for Science
Technology and Civilisation**

The Emergence of Scientific Tradition in Islam

Author: Prof. Alparslan Acikgenc
Chief Editor: Prof. Mohamed El-Gomati
Vice Editor: Dr. Salim Ayduz
Production: Savas Konur

Release Date: December 2006
Publication ID: 627

Copyright: © FSTC Limited, 2006

IMPORTANT NOTICE:

All rights, including copyright, in the content of this document are owned or controlled for these purposes by FSTC Limited. In accessing these web pages, you agree that you may only download the content for your own personal non-commercial use. You are not permitted to copy, broadcast, download, store (in any medium), transmit, show or play in public, adapt or change in any way the content of this document for any other purpose whatsoever without the prior written permission of FSTC Limited.

Material may not be copied, reproduced, republished, downloaded, posted, broadcast or transmitted in any way except for your own personal non-commercial home use. Any other use requires the prior written permission of FSTC Limited. You agree not to adapt, alter or create a derivative work from any of the material contained in this document or use it for any other purpose other than for your personal non-commercial use.

FSTC Limited has taken all reasonable care to ensure that pages published in this document and on the MuslimHeritage.com Web Site were accurate at the time of publication or last modification. Web sites are by nature experimental or constantly changing. Hence information published may be for test purposes only, may be out of date, or may be the personal opinion of the author. Readers should always verify information with the appropriate references before relying on it. The views of the authors of this document do not necessarily reflect the views of FSTC Limited.

FSTC Limited takes no responsibility for the consequences of error or for any loss or damage suffered by readers of any of the information published on any pages in this document, and such information does not form any basis of a contract with readers or users of it.

FSTC Limited

27 Turner Street, Manchester, M4 1DY, United Kingdom

Web: <http://www.fstc.co.uk> Email: info@fstc.co.uk

THE EMERGENCE OF SCIENTIFIC TRADITION IN ISLAM*

Prof. Alparslan Acikgenc**

The epistemological ground of science can be deduced from primarily its cognitive nature. A tradition, on the other hand, is a social phenomenon, which springs from the social constitution of our nature and as such cannot be deduced from the cognitive aspect of science. This shall lead us to distinguish the cognitive, or rather the epistemic ground of science from its social aspect. In fact, these two aspects of science spring from two aspects of man, which must be somehow reflected in all human activities as well; epistemological and sociological. We do not mean, however, that all aspects of man are reducible to these two alone; on the contrary, our aim, being rather pragmatic, is to show that science as a human activity must manifest such characteristics of man which will be examined here as the social and epistemological grounds of science. This is also the case with the concept of science in Islam. Without developing these two grounds of scientific activities we cannot investigate how a scientific tradition emerged in Islam.

A scientific tradition is actually the foundation upon which sciences are built within a certain civilisation (or society). But this proposition leaves us with a dilemma that is theoretically circular. This is because our position in this essay presupposes that in a civilisation no learning activity can be characterised 'scientific' unless there is already a body of knowledge defined as 'science' within that particular civilisation. This being the case, since any tradition of learning or an intellectual tradition can be described as 'scientific' only after the existence of sciences, scientific tradition is required for the emergence of sciences, but sciences are required in turn for the emergence of a scientific tradition. Our disapproval of the use of the adjective 'scientific' for the intellectual activities prior to the emergence of sciences is defended on the basis of a totally new concept which we would like to introduce here as *scientific consciousness* that is required by the systematic nature of our mind. We shall try to expose this in order to resolve the apparent circularity in our theoretical foundation.

By the systematic nature of our mind, we mean that mental function which forms an organised unity in order for the mind to be able to carry out its operations. As we proceed from infancy to adulthood, this mental unity is established gradually, forming itself into an architectonic unity that we call 'worldview.' Therefore, when we try to acquire knowledge our mind grasps that knowledge within this unity which has already been shaped in the mind. In this way, if a specific subject of inquiry is investigated for a long period with an uninterrupted chain of investigators, which will be called here 'scientific community' (or the *ulama* within Islamic civilisation), the knowledge accumulated therein will be perceived gradually within a disciplinary unity. When this awareness emerges in the minds of the scholars involved in that activity they become conscious of the fact that subjects or problems of learning they have been investigating constitute a specific discipline, which is then given a certain name designating thus a particular science. It is such

* A Shorter version of this article was presented at the "XXth International Congress of History of Science," 20-26 July 1997, Liege, Belgium.

** Prof. Alparslan Acikgenc is the Dean of the Art and Science Faculty, Fatih University, Istanbul, Turkey.

awareness that we shall entitle 'scientific consciousness' which is the natural result of the constitution of our mind. If scientific consciousness belongs thus to our mind as a natural characteristic, then it cannot be conventional, simply on the basis of the fact that it is primarily cognitive. But a tradition is almost totally conventional and social; hence, if there is such a thing as scientific tradition, then we may infer from our analysis so far that science is at once conventional and universal; the former ensuing from the ways and manners adopted by the scientific community in question, and the latter from the epistemological character of our mind.

Both aspects of science can be expressed here as 'epistemology' and 'sociology' of science. Our essay, therefore, will start from an epistemology, which will endeavour to demonstrate the epistemic ground of our scientific activities. Then, we shall try to clarify the sociology within which such epistemic activities are carried out. From this background the history of the rise of Islamic scientific tradition will be evaluated.

I

Our mind can operate only within a conceptual unity which it builds for itself throughout our life. Using a Kantian term, this mental structure can be referred to as "architectonic unity," but in a general sense, we shall refer to it as *worldview*. When a worldview is articulated into a sophisticated conceptual scheme there will emerge in it another structure enveloped by the doctrinal concept of knowledge, which lays down an adequate epistemological ground to carry out learning activities. When this takes place, the scholars involved will develop a technical vocabulary and a specific language for such activities. The network of these concepts and the vocabulary that emerge prior to the existence of sciences we term 'conceptual scheme' (or 'pre-scientific conceptual scheme').



Figure 1. A class at the Gazanfer Aga Madrasa founded in 1566. *Divan-i Nadiri*, Topkapi Palace Museum Library, H. 899.

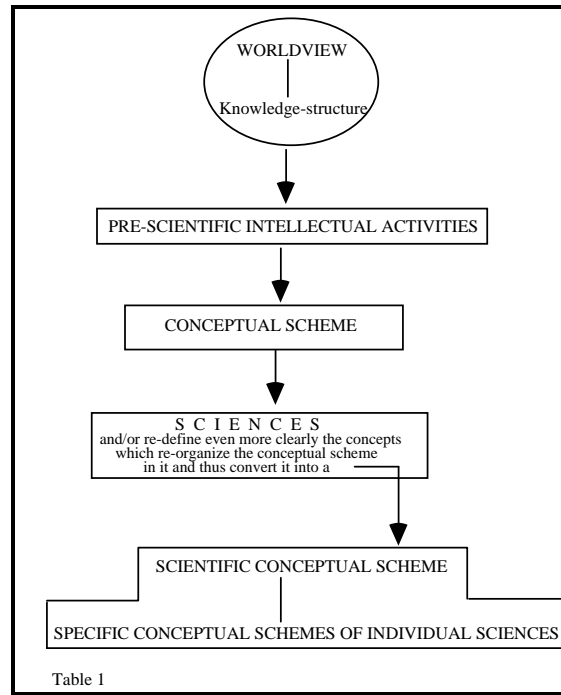
If it is the knowledge-structure in a worldview that primarily supports our intellectual activities in the epistemological sense, then the first thing that such a structure will have is a sound definition of knowledge which not only puts a great emphasis on this concept, but also yields in the minds of the members of that *intellectual community* (or the pre-scientific community) a general framework of a theory of knowledge. This means that the primary concept that provides the epistemic ground of any pre-scientific conceptual scheme, and as such is a doctrinal notion, is the concept of knowledge. This is because science itself is fundamentally a knowledge seeking activity; if no solid ground is established for this knowledge-seeking activity, it will remain as a mere natural curiosity to know, and hence, can never emerge as a disciplinary approach that yields a coherent body of knowledge which we now call 'science.'

The concept of knowledge then is the fundamental doctrinal element in any pre-scientific scheme. But when we examine the past scientific activities, we can see that the concept of knowledge yields the concept of truth, for the primary aim of any science is true knowledge, which in turn leads to the concept of method because we would like to know *how* such true knowledge, in other words, *scientific* knowledge can be attained. Therefore, knowledge, truth and method are three essentially interconnected concepts that must be developed first as a general ground within the knowledge-structure, and then as a fundamental technical term in the pre-scientific conceptual vocabulary. Moreover, as the learning activities continue, scholars will gradually begin to make a distinction between 'merely personal opinions' and 'technical opinions,' as a result of which emerges the concept of *theory*. It is these four fundamental concepts that gradually yield in the mind of scholars an awareness that the body of knowledge that they are investigating actually constitutes a discipline because it leads to an organised and systematic body of knowledge, which eventually yields the concept of *science*. Hence, the awareness that a body of an organised systematic knowledge constitutes a discipline is entitled here 'scientific consciousnesses.' As a result of this, disciplines either traditionally acknowledged by the community of the scientists as having a *name*, such as the name of *kalam*, in the Islamic scientific tradition; or they are actually *given* a name by one prominent member of the scientific community, such as Aristotle's classifying and naming each science.

The scientists thereafter develop the body of general scientific nomenclature and scholars based on the already existing pre-scientific conceptual scheme, constitutes what may be called 'scientific conceptual scheme,' and as such, it includes in general five fundamental concepts: knowledge, truth, method, theory and science. These are the general concepts that every scientific tradition in history has so far developed; but besides these fundamental doctrinal scientific concepts, each scientific tradition developed in its scientific conceptual scheme many other such concepts. We shall give the following example from the Islamic case, without discussing them in this context: *ilm, usul, ray, ijthad, qiyas, fiqh, aql, qalb, idrak, wahm, tadabbur, fikr, na`ar, Hikmah, yaqun, wahy, tafsir, tawil, alam, kalam, zann, haqq, batil, sidq, kidhb, wujud, adam, dahr, samad, sarmad, azal, abad, khalq, khulq, firasat, fitrat, tabiah, ikhtiyar, kasb, khayr, sharr, halal, haram, wajib, mumkin, amr, iman, and iradah.*

A scientific activity is primarily a cognitive activity and as such it must be examined from an epistemological perspective, as we have done here. It is also for this reason that such activities spring primarily from the constitution of our mind, which works within three frameworks that it has built for itself. The first two frameworks have already been identified as the worldview and the scientific conceptual scheme. The third one is also a scientific conceptual scheme but one that is used in a specific discipline, and as such it can also be called a 'specific scientific conceptual scheme.' This scheme emerges more sharply once each

discipline is named and thus its subject matter and method have clearly been defined. We may show this epistemological process on the following table.



The specific scientific conceptual scheme, as the specific framework, includes in itself the nomenclature of a specific science. Obviously without such a nomenclature no science can be developed. For example, the network of the technical terms and scientific concepts used in Aristotle's physics constitutes its specific framework. The general scientific conceptual scheme as the inner framework of his physics is the network of scientific concepts and the way they are conceptualised within the Greek scientific tradition of his time; the general framework, as his worldview, is the Aristotelian system. Let us give another general example from the Islamic scientific tradition: the technical vocabulary and the theological concepts utilised in *kalam* are the specific scientific conceptual scheme of *kalam*; the web of the general scientific vocabulary that is utilised in all Islamic sciences is the scientific conceptual scheme as the inner framework of *kalam*; and finally the Islamic worldview is the general framework of it.

II

Since the scientific process may sometimes take years, usually generations of scientists are involved in its development. As a result, not only a group of scholars at a particular time, but also rather a group of generations of scholars in a sequence of time periods may be involved in the scientific process. If there is no uniformity in the social construction and epistemological tools of these scientists, no uniformly organised body of knowledge can emerge from their activities to be called 'science.' If, on the other hand, there is uniformity between these scholars, then they can be treated as a community, since at least one significant aspect of a community is uniformity; especially if this uniformity is of a social character, then we can talk of a community with a fair justification. For example, if the community at large uses a term in its everyday

meaning, the community involved in scientific activities does not employ it as such; it thus shifts its meaning to a conceptual awareness. The aim and organisation of the scientific community is, therefore, different from the aims and organisation of the society in which it emerges. The most important distinction between the scientific community and its society lies in the distinction between the worldview and the scientific conceptual scheme of the scientific community of that society, which emerges within that worldview; hence, what the worldview is for its society, the scientific conceptual scheme is for its scientific community within that society. In a sense, we can say that the scientific conceptual scheme is like the worldview of the individual scientists of a scientific community. Hence, the scientist may share the same dominant worldview of a society with any other individual within that society, but besides that the scientist has also acquired and elaborated two more frameworks needed for his scientific activities; the general and the specific scientific conceptual schemes. As a result, mutual interaction between the worldview and its scientific conceptual scheme becomes necessary.



Figure 2. Kapi Agasi Hüseyin Ağa Madrasa, built in 1488 as a octagon building, Amasya, Turkey.

It is through the worldview of the group of scholars working under one scientific tradition that gives science its social character; such a group of scholars constituting a unity in outlook and scientific conceptual scheme is called 'scientific community,' or *ulama* in the Islamic scientific tradition. Our definition of scientific community or *ulama* leads us to ascribe all social aspects found in scientific activities to this community rather than directly to science. We may, therefore, lay down the following characteristics of a scientific community in general: 1. methodological aim, 2. scientific ideals, 3. formal linkage, and 4. marginal ideals.¹ Of course, particular scientific communities will have more characteristics than what we have enumerated here. For instance, in the Islamic case, the scientific community, called *ulama* or formerly *fuqaha*, has characteristics that other scientific communities do not have, because of the Islamic worldview and the worldview of the other scientists.

A scientific community is a necessary element for the emergence of a scientific tradition, and hence, prior to it. In fact, for the existence of a scientific tradition a scientific community is required with a long history. When the initial group of scholars begin to work on certain issues, they attract students who are interested

¹ For a detailed exposition of these characteristics of scientific communities see the present author's *Scientific Thought and its Burdens*

in their knowledge seeking activity in the way they carry out it. In this way, a *group* is formed because of their knowledge-seeking activity. It is possible to cite two characteristics that belong primarily to the group of scholars which their fellows of the same society do not have: first is that the group of scholars are those who are interested in knowledge-seeking; second but more importantly is that their interest in knowledge-seeking is in a way that is more systematic and methodical, which distinguishes them from the same activity that may be manifest by everyday people; therefore, that which brings scholars together as a group is the methodological aim of their activity, not the daily needs of life. In fact, the daily needs of life bring them together with their other fellow beings into the same society, but not into the scientific community.

It must be clear that the aim and objectives of the scientific community is different from that of the general society in which it emerges. Its primary aim is knowledge seeking, which is an aim that is very broadly identified here to include all scientific traditions. It is possible for the Islamic tradition, for example, to have other aims as well. To pinpoint all the characteristics of a scientific tradition requires research within that tradition. This characteristic of the scientific community is what identifies science as a cognitive activity that thus necessitates its definition in terms of discipline. The common objective of the scientific communities is the search after truth. In fact, it is this drive for truth that attracts most members of the scientific community, though it may be more idealised in certain traditions, such as the ancient Greek scientific tradition.

This aim to pursue knowledge and having the objective of searching for truth leads the group of scholars to organise their community in accordance with the needs and requirements of their activity. Once such an attempt is made, a cognitive organisation is usually achieved in almost all scientific communities. The *cognitive organisation* is required by our epistemological nature; if all humans acquire knowledge in the same way then there will necessarily be similarities because of their epistemological nature. *Cognitive organisation* means setting up the necessary means and the tools needed for not only executing their search for knowledge and truth, but also teaching the knowledge they acquired and the ways in which they thrived to search for that knowledge. In this way an educational initiation prepares and thus passes on the scientific tradition developed by the earlier members of the scientific community. The scientific community, therefore, acquires another methodological aim in that most members, if not all, accept the fact that their knowledge-seeking activity must have a method. It is this characteristic together with the scientific consciousness that conventionally gives rise to identify their activity as science.

We, therefore, distinguish the scientific community from its society with respect to their aims and organization; all characteristics that distinguish both groups of people from each other are expressed here as 'methodological aim,' because, as we have shown, they are primarily related to the cognitive aspects of the activities of the members of the scientific community which involves their method. But the scientific community usually idealises these aims, which do not belong as characteristics to the society in general. There are, therefore, certain scientific objectives which may change from one scientific tradition to another, such as the fact that there are impersonal criteria, impartiality and even certain moral ends that are attached to scientific inquiries. All such objectives that are idealised in a scientific tradition can be referred by a general name as 'scientific ideals.' Since the term *science* is strictly applied to the product of the activities of a scientific community in the sense of discipline, scientific ideals cannot be applied to science, but only to the scientific community and their usual practices, the product of which is science.²

(Istanbul: Fatih University Publications, 2000).

²Merton applies the scientific ideals to science as a social institution but identifies them as 'disinterestedness.' First of all, there is no

We cannot count scientific ideals in a general way because each scientific community depending on their own scientific tradition may have a different set of ideals. But the following may be enumerated as scientific ideals that belong to some scientific traditions with a varying combination; passion for truth, quest for knowledge, benefit for humanity, disgust for plagiarism, sincerity for impartiality, request for and high esteem of originality, scientific objectivity and even commitment for the scientific method acquired from the former masters.

Science, as we see it, is the product of also a master-student relationship which is linked in an unbroken chain of successors and follower to produce a tradition. It is this self-maintained continuity that we call 'formal linkage' as a characteristic of the scientific community. It is indeed the scientific community that prepares the ground for such a scientific continuity which thus enables the establishment of a scientific tradition at the same time. The formal linkage as a characteristic of scientific communities is based like the others upon the epistemological make up of our faculties of knowledge. For instance, we do science in the way we learn from our instructors, just as we live in the way as we *learn* from our environment including our parents and social surrounding.³ Since formal linkage is also a necessary element in the rise of a scientific tradition, no scientific community can avoid dispensing with it. The establishment of such a link requires a well-organised teaching system and an educational institution. Such establishments make its product, i.e., science, seem as a social institution. On the contrary, it is rather the community involved in such activities together with all its establishments that must assume the social character. It is for this reason that we ascribe the formal linkage to its scientific community.

There is also a set of rudimentary characteristics which appears peripheral to scientific activities, such as scientific career and education should be open to talents, scientific activities must be supported not only financially, but socially and politically as well. All such idealised principles of a scientific community we term 'marginal ideals.' Just like the scientific ideals, marginal ideals also vary from one scientific tradition to another. Nevertheless, since they are not based on the epistemological nature of our faculties, they are not necessary requirements for the emergence of a scientific tradition, but rather they are complimentary to the necessary ones. They may as such speed up the process of the emergence of such a tradition. Islamic scientific tradition has the most marginal ideals than any other scientific tradition; a fact which contributed to the speedy development of a scientific tradition in Islamic civilisation.

When after a long period of time, subjects investigated accumulate in such a way that they cause many problems in handling them systematically, since it is the nature of our mind to perceive things within the unity of a system, the scholars of that scientific community cannot continue their investigation unless they begin to organise, systematise and thus to classify the findings of their community. If they achieve this

institution called science; however, there may be in a society an institution that is governed by the scientific activities and thus can be called a 'scientific institution.' Science has only four characteristic elements; subject matter, method, a body of theories and accumulated knowledge. Secondly, it is clear that all these elements are intimately related to our epistemological constitution and thus are cognitive, not social. Therefore, these ideals cannot belong to science, but rather to the scientific community as defined here. See Robert K. Merton. *The sociology of Knowledge: Theoretical and Empirical Investigations*, ed. by Norman W. Storer (Chicago & London: The University of Chicago Press, 1973), 275.

³This learning cannot be transcended totally, but only minimally which is what we call 'originality.' Therefore, *originality* is a break from the tradition and it cuts off the usual continuity of a scientific tradition. On the other hand, since originality itself is the product of the continuity implanted within the formal linkage, there is a superimposed formal continuity that governs the very process of originality itself. Therefore, when such originalities are continually attached through the formal linkage, a new scientific scheme is produced in individual sciences; a process that may take hundreds of years; for example, the Ptolemaic and the Copernican models in astronomy; Aristotelian dynamics and the Newtonian mechanics in physics; the Ash'arite atomism and the existentialist theory of creation by the Sufis in Kalam.

then they will see that each subject of study constitutes a specific *discipline*. If, however, they cannot achieve this, then no science can emerge out of those learning activities of that community. For by science we understand primarily a discipline, which is distinctly something other than a human activity; it is rather the product of an activity. This means that science cannot be defined as behaviour, as some behaviourists tried to do. A scientific behaviour is, therefore, not science, nor is a scientific activity science. Science is only a body of knowledge produced by such activities that it eventually constitutes a discipline, which has a specific method, an accumulation of theories and discoveries.

When a tradition of learning thus produces a classification of its subjects of investigation, each subject is named in this classification and thus is identified as a specific discipline. This process as it begins from the first master of a tradition and continues unbroken until sciences emerge is to be called here 'scientific process' which seems to exhibit stages. First, as we have seen, the first master lays down certain principles that make up the initial cultural mores of that scientific community, which acquire a general acceptance by the subsequent followers who in turn carry on this tradition to their students. This way the scattered and discrete studies begin to acquire a unity. The body of collected knowledge thus acquires the status of a discipline. Then, in this process, a scientist gives a name to that discipline, according to either its subject matter, or its method. A discipline is, therefore, a study with a certain method, but not necessarily a well defined and clear-cut subject matter, although the purpose of the study does assign it a general and loosely defined subject matter. But a science is a discipline with a well-defined subject matter, method, theories and an accumulated body of scientific knowledge.

When a body of knowledge acquires the status of a discipline, it may also begin to accumulate theories formulated according to its method, and thus become a candidate to be called a science. It is this developmental stages of a body of knowledge into a unified discipline, and then into a science that we call 'scientific process.' This process can be taken as a social phenomenon, but not governed primarily by social regulations, rather by the cognitive and conceptual rules, called 'scientific principles,' laid down by the community of the scientists involved. On the other hand, since it is also a process of acquiring knowledge, it is, in this sense, primarily governed by the human epistemological constitution. We distinguish, therefore, primarily three stages in the scientific process through which sciences emerge:

1. The stage of problems, where scattered and discrete studies of various problems are carried out for a period of time,
2. The stage of disciplinary tradition, where a tradition arises as a result of conventional consensus among the scholars; general subject matter and method are determined,
3. The stage of naming this scientific enterprise.

If we observe what is customarily called science, we shall see that it is what emerges as a result of the third stage of the scientific process. It is for this reason that sociology of science must consider the epistemology through which science emerges, though the process itself may cover many social phenomena as well, as such it falls within the proper domain of the subject matter of the sociology of science. Therefore, scientific process can provide a guideline for the study of science in relation to society. We have tried to show that the scientific process as depicted here represents only the stages of the emergence of a subject of investigation as a science, and as such it does not deal with its later developments after the

emergence of sciences. Moreover, it must have become clear that scientific process primarily derives from the constitution of our faculties of knowledge. Yet it is regulated through the tradition developed by a group of scholars, the *ulama* (scientific community),⁴ involved in knowledge-seeking activities, and have a certain "set of cultural values and mores"⁵ governing their activities.

III

Accordingly, we need to show in the first place that the Islamic worldview as it emerged out of the Revelation was suitable for the emergence and development of sciences in Islam. In order to show this we must attempt to outline the early Islamic worldview as unfolded by the Prophet through the guidance of the Qur'an. We shall now try to expose how the early Islamic worldview was *quasi-scientifically* constructed, which eventually led to scientific progress right from the first century of Islam. But I will do this according to the framework that explains how a community is transformed into a civilisation in which a congenial environment is prepared for sciences to emerge.

1. The Theoretical Framework

First of all, there must be some conditions at the social level with all its aspects for the rise of learning in a given society. Since these conditions are the causes for the rise of learning within a certain social and cultural context, they can be called "contextual causes" for the rise of sciences. These contextual causes first lead to a pre-scientific tradition of learning and intellectualism and if the society is able to provide some suitable ground for the development of a worldview which acts as the conceptual ground for the emergence of sciences. It is possible to distinguish certain contextual causes as more rudimentary and hence, necessary for the emergence of any kind of scientific activity; we shall refer to such necessary elements leading to the rise of a scientific activity as 'nucleus contextual causes.' All other peripheral elements that help the nucleus contextual causes lead to the emergence of a scientific tradition can be termed 'marginal contextual causes.'

A nucleus contextual cause is a dynamism which manifests itself at two levels: first is at the social level, which causes certain unrest and stirring within the society as if the whole structure of the society is re-shaping itself and thus every social institution is affected by this dynamism, but most importantly, the political and educational institutions are re-organised as a result of this unrest; second is at the level of learning and it is this dynamism which causes a lively exchange of ideas on scientific and intellectual subjects among the learned of the community. For instance, in case of Islam we explain how it was internally generated by the thought of the Qur'an through its dissemination within the first Muslim community. But it is possible to find a universal rule (or rules) governing the generation of that dynamism. For the 'nucleus contextual causes' of intellectual progress is a *natural* phenomenon, and therefore, it is

⁴We may note here that almost all sociologists dealing with science never take into account the epistemology of science. If we do not consider how we acquire scientific knowledge how can we deal with its sociology? For instance, Robert K. Merton notes, "the subject-matter of the sociology of science is *the dynamic interdependence* between science, as an ongoing social activity giving rise to cultural and civilisational products, and the environing social structure." *Social Theory*, op. cit., 585. Science, as a discipline, cannot be depicted as a social activity; if we take every human action performed within a society to be necessarily a social activity, then actions done without any relation to a social context must necessarily be considered as such. Scientific activities of a community of scientists can be social, but its product, as a discipline can have only social aspects, because of the fact that such activities are carried out within a mental framework, which is the dominant worldview of that society.

⁵I borrow this phrase from Robert K. Merton, see *op. cit.*, 268.

deeply rooted within the human dispositions. In fact, for that reason it must be included in the meaning of the Qur'anic concept, *'sunnatullah*.⁶ Accordingly, we distinguish two phenomena as corresponding to our nucleus contextual causes: the first is moral dynamism; and the second is intellectual dynamism, both of which fall within the domain of *sunnatullah*.

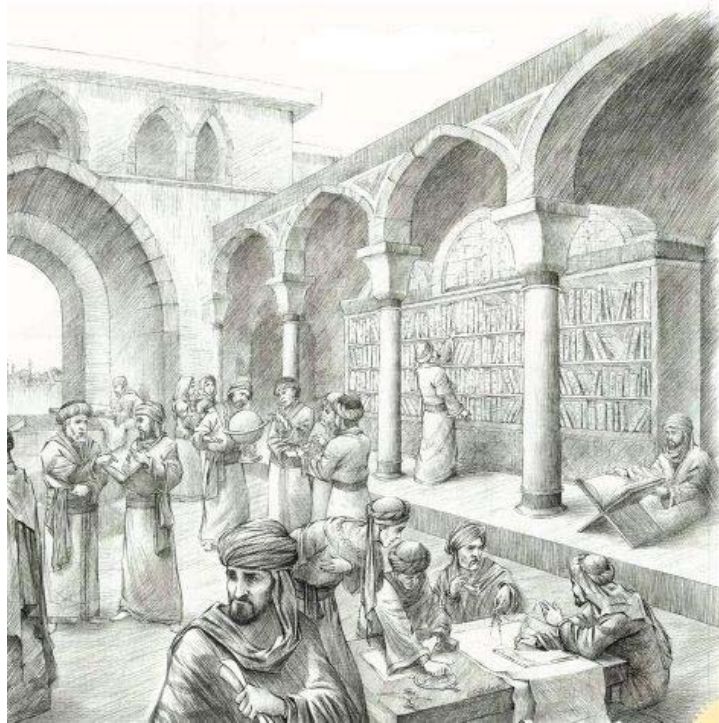


Figure 3. An artistic impression by Ali Amro showing the House of Wisdom in Baghdad.

With respect to moral dynamism, it is possible to divide the members of a given society into three groups: 1. the morally sensitive people; 2. the common mass; 3. the selfish or immorally sensitive people. Among these three classes, the morally and immorally sensitive are somehow dynamic. For the former class struggles to restore morality and good order in the society, whereas the selfish remain indifferent to this end by spending their dynamism to their own ends. The masses, on the other hand, are driven to either side, which may lead to a struggle on behalf of both sides to defend their ends that may or may not result with intellectual dynamism. This is because nucleus contextual causes are not the only ones needed for such a development that can be attained only when all other conditions are also present. But if the morally sensitive class becomes victorious and draws the masses towards that end, then intellectual progress can take place as the second phenomenon of the nucleus contextual cause, i.e. intellectual dynamism, begins to emerge. We may observe this in the Greek civilisation: for example, if there were not in each case a new and fresh outlook, the intellectual dynamism would have not flourished and thus the flair of Greek intellectualism would have died out long before Plato. Moreover, just because there is hardly any original

⁶Since we claim that the nucleus contextual causes of any intellectual progress are natural, i.e., "*sunnatullah*," we thereby accept that it will be the same universally in every society. But the way they are manifested in a given society will definitely vary from society to society, due to the fact that cultures, temperaments and inclinations of societies are different. Moreover, by "natural" we mean "an essentially inert characteristic or a trait *given* or *activated* by God," referring thereby to nature as "something that is created." It is in the sense that we must use the Qur'anic term "*sunnatullah*" to express any contextual cause of intellectual progress that is natural.

theory and doctrine after Aristotle, the Greek intellectualism began to decline right after him. The same is also true for both the Islamic and Western civilisations, but the way this intellectual dynamism, as a *sunnatullah*, is manifested in all these societies vary.

It is the 'dynamism inherent within originality and novelty' (of ideas and doctrines) that is what we call 'intellectual dynamism.' For originality inherently possesses dynamism, and as such it can contribute essentially to the rise of intellectualism. In fact, originality is invigorating, fascinating and enlivening; it is just like the re-awakening of a land from the demise of winter. It is so full of life that God describes Himself as "ever original" (*kulla yawm huwa fi sha'n*, 55/al-Rahman, 29).

Intellectual dynamism is reflected immediately to the society, which is then set into a process of scientific advancement provided that there are no impediments in the way of mutual companionship between the learning activities and the community. But this does not mean that once there are original theories and philosophical systems, then such a progress will necessarily take place. The reason for this is the other condition of the society, namely, moral dynamism, which must conform to the originality of intellectualism and thus enable it to flourish. Otherwise, intellectual progress will soon die out, which is the case of Greek intellectualism after Aristotle. If our view here concerning the course that intellectual progress of a civilisation takes at its rise is granted, then the opposite course will be the natural process of decline, which means that as long as the contextual causes are kept alive the civilisation will continue to live and progress.⁷

It is possible now for us to elucidate how moral and intellectual dynamism may take place as social phenomena. The moral unrest within a particular society demonstrates a struggle mainly between two classes of people; the morally sensitive and the selfish class. The masses remain as the middle class between the two. When the struggle is taking place, although it is only between the morally sensitive and the selfish, it is immediately passed on to the masses, which become the battleground of the good and evil forces. Some of the masses are thus won to the moral side, and yet others to the selfish front. This moral struggle is a *sunnatullah* and thus there is no human society in which this struggle cannot be found in one form or another. When the morally sensitive people have the sufficient vigour, dynamism and energy, they win to their side an adequate number of the masses and thereby produce intellectual and social dynamism. When the moral struggle between the two groups continue with a victory of the moral class (for this struggle never ends with a victory, but always continues in different forms as long as the society exists), the morally sensitive individuals either produce intellectuals or are themselves intellectuals who formulate original ideas, doctrines and systems by introducing fresh and novel definitions of key concepts that are

⁷One should not interpret our claim with regard to the intellectual dynamism that even if there are original and fresh ideas, theories or doctrines it may still not lead to intellectual progress; for it is possible that there may be originality without necessarily leading to intellectual progress, because as we have already pointed out, we are examining the causes of intellectual progress individually. But within society these causes produce the desired end only when they are altogether present. Most importantly, these contextual causes cannot exhaustively be enumerated for all societies. They may be, for example, ten such causes needed in case of the Greek civilization, but this number may be eighteen for another society. Hence, although the number of the nucleus contextual causes as necessary elements may be fixed for all societies, the general number of contextual causes (i. e., the nucleus and the marginal contextual causes taken together) cannot so be determined in a decisive manner. In fact we can give examples from the Western case showing that there were thinkers with original ideas and even with novel philosophical systems which did not lead to intellectual progress. Two famous examples are Boethius (d. 524 or 5) and John Scotus Erigena (d. ca. 877). In both of these cases we do not find any continuity of ideas or doctrines after their death, although they both put forward with sufficient vigor original theories. This is because other elements required for intellectual dynamism were not present and, as a result, we do not see any other individual furthering their systems to construct new and original doctrines or systems. Because of this, the origin and the rise of Western philosophy cannot be searched in their philosophies. They shall remain and be studied as 'isolated cases' within the history of Western philosophy.

moral and scientific or otherwise. This way a lively exchange of ideas and alternative views come into existence within the society; a phenomenon which is necessary to produce intellectual dynamism.

We have already identified the secondary contextual causes as marginal. The moral struggle, which is essentially a strife between the good and evil, may either directly give rise to social dynamism, or to intellectual dynamism first, which, then, in turn produce social dynamism. Hence, although in certain cases social dynamism may precede the intellectual one, it does not mean that social dynamism is a nucleus contextual cause. For the activity in question is of a cognitive nature, viz., and science. Therefore, it is still a secondary contextual cause with regard to the nature of the activity in question. But it is this social dynamism that usually leads to an overall activity within the society, which we call 'institutional dynamism'. These are many, but we may mention primarily three in order to show their significance in the emergence of sciences and scientific progress: educational, political and economic dynamisms.

Usually a great reform and re-organisation in accordance with the knowledge produced by the intellectual dynamism is required of all the educational institutions, if the society is to produce intellectual progress. Usually there seems to be a relation, although not a necessary one, between the political body and the educational reform. Either the political body brings about the educational reform at the request or directions of the intellectuals or intellectuals themselves take the initiative and produce educational dynamism, which may in turn lead to a re-organisation of the political body and thus produce a great political mobility within the political institutions. These activities, which also include the legal undertakings, can be called 'political dynamism'. Among these institutional dynamisms, we must mention also economic activities. Similar reformations take place in the economic institutions yielding thereby to improve the prosperity of that society and this activity can be called 'economic dynamism'. All these institutional dynamisms do not necessarily develop together within the same period of time and thus helping each other become dynamic reciprocally; or following a different pattern of sequence in every intellectually progressed society.

Since social dynamism is not found at the foundational level, it cannot be included among the nucleus causes. But it must be recognised as a marginal contextual cause. When the nucleus contextual forces are at work, a tremendous social mobility and dynamism, as we have shown, begins. It is the dynamism of individuals working together to lead the society as a whole to a morally better situation that we call 'social dynamism,' which in turn leads to the re-organisation and betterment of social institutions. It is this reformative and enlightened effort at the organisational level that we named 'institutional dynamism'. When all these contextual causes come together, then they lead the society to intellectual progress. But besides contextual causes different societies may exhibit some other different causes of intellectual progress; such is the case with Western philosophy which has Islamic influences also as a cause for the rise of Western intellectualism. Whereas in the Islamic case, the causes are found only within the society, although after the development of Islamic intellectualism in the first century of Islam (i.e. 7th. century A.D.) it came under foreign influences, especially that of the Greek philosophy and science, which it did help improve its intellectualism further. We may now observe this in the rise of Islamic scientific tradition.

2. Contextual Causes Leading to a Pre-Scientific Tradition of Learning

When the new Muslim community faced certain serious challenges, it was set on a tremendous dynamism with all respects. These challenges came in the first place from the very culture in which Islam was born, a

moral challenge brought about by the decadent aspects of the *Jahiliyyah* culture; second, there was a literary challenge posed by *Jahiliyyah* poetry; and more importantly, third, with the rapid expansion of Islam into other civilisations, another challenge was felt from the scientific and philosophical front which was brought about especially by the Hellenistic civilisation.

All these intellectual challenges could not and cannot be faced without some kind of efficiently trained scholars, who may be called thinkers in a scientific sense. Our claim then amounts to saying that the intellectualism of the first century of Islam provided an adequate ground, which is called the *contextual causes* for the rise of scientific activities, for the emergence of a scientific tradition in Islam. Both the speculative challenge of previous civilisations, more particularly the *Jahiliyyah* culture, and the Qur'anic encouragement for reflection on the nature of man, his moral and religious responsibility as the *khalifah* on earth and on the universe, must have led the early generations of Muslims to speculate upon certain problems. As they dealt with these questions, the Prophet enlightened them under the guidance of the Revelation. This is the unfolding process of the construction of the Islamic worldview.

It is, therefore, not unlikely that the speculative challenges of early civilisations and the Qur'anic encouragement for reflection were overlooked by the early generations of Muslims. It is plausible, therefore, to infer that, from the very beginning, Islamic civilisation was based on *rational* thinking⁸ which was guided by the Qur'anic teaching; and in this vein the very early Muslim generations began to explain, supplement and rethink the speculative allusions of both the Qur'an and *hadith*. This early intellectual milieu of Islam was dominated by the Islamic worldview developed by the Prophet through the guidance of the Revelation.

As we have argued, the fundamental metaphysics of the Islamic worldview had already been constructed by the Qur'an while the Prophet was still in Mecca. Therefore, a substantial number of the scientific terminologies to be utilised later were contained in the Meccan *surahs*, for these terms are mostly contained within the fundamental structures of the Islamic worldview. Therefore, even if the Qur'an and the *hadith* in the technical scientific sense did not use these scientific terms, since they were put into the Islamic worldview as fundamental concepts, this prepared the way for their scientific employment. Of course, in the Medinan period terms of different fields, such as most of the terminology in the fields of law and political philosophy, were developed and thereby integrated into the composition of the Islamic worldview. But the fundamental structure of this worldview had already been established in Mecca. But in this context it is important to show how a body of knowledge comes to be established as a science because in this way we shall see the process through which a scientific tradition is established. In order to do this, we shall first demonstrate from the history of sciences the process that is involved in this phenomenon.

We have tried to show that science is established within three mental frameworks: first is the worldview (of the scientist), which is the conceptual environment within which scientific activities are cultivated; second is the network of a well-defined body of scientific concepts, entitled 'context' (of sciences), or more properly called 'scientific conceptual scheme'; and the third is the network of technical vocabulary and the outlook resulting from such a network of concepts within a specific science. This is because science is not an activity that is carried out on a general plane; on the contrary, a scientific activity is always concerned with a particular problem with almost no relation to other scientific problems, unless there is a problem pertinent

⁸For a detailed discussion of the concept of rationality in the Islamic perspective see the present author's "Transcendent Rationality, Ibn Rushd and Kant: A Critical Synthesis," *Alif* 16 (1996).

to solving it. Therefore, the scientific conceptual scheme, together with its environment, is not sufficient to further scientific progress; there is the need for a more specific scheme as well in a specific science so that the problems of that science are articulated within that scheme. Since our mind cannot operate without a scheme, we affirm that this is true not only insofar as the general operations of the mind are concerned, but also of the specific ones. Hence, if a human being wants to place even a biological phenomenon such as walking into a conceptual context, he must have a worldview so that he can situate it into such a scheme; in the same way, if one were to investigate the phenomenon of walking scientifically one would have to consider this problem within a worldview and also within a scientific as well as a biological scheme. The former is the general scientific scheme, which is already identified here as the inner framework of sciences and the latter is the biological scheme, which we can identify as the 'specific scientific (conceptual) scheme.'

It is possible to identify the general scientific conceptual scheme as the 'scientific tradition' if it is manifested within a certain civilisation and thus takes the name of that civilisation. This is because a tradition by its very nature requires a community (of scholars). Therefore, the Islamic scientific tradition is the manifestation of the Islamic scientific conceptual scheme in the Islamic civilisation. As such it is primarily the general scientific conceptual scheme with its community, but since this scheme cannot be without its environment, the Islamic scientific tradition necessarily includes the Islamic worldview. Hence, the Islamic scientific tradition is the Islamic environmental context handed down from one generation of scientists, i.e. the *ulama*, to the next.⁹ But since in sciences we are primarily concerned with the scientific schemes, we may in this context ignore the worldview and thus consider the Islamic scientific tradition as only the general Islamic scientific conceptual scheme. Therefore, on this basis we can postulate that the specific scientific conceptual scheme is developed primarily within a scientific tradition.

Historically it is possible to illustrate that the Islamic worldview was established in Mecca in its fundamental outlines (of course, later this worldview was broadened through intellectual and scientific activities). Second, in Medina with the leadership of the Prophet, the early Muslim community developed a knowledge-structure within that Islamic worldview. This knowledge-structure was so sophisticated that it eventually led to the rise of a scientific tradition towards the end of the first century of Islam. Finally, in the second century, the accumulation of knowledge in different branches of learning gradually began to emerge as individual sciences, such as *hadith*, *tafsir*, history, *fiqh* and *kalam*. The physical sciences were mostly borrowed from the Greeks in the third century. The Muslims as sciences, such as algebra and chemistry, subsequently established even some of these branches of learning.

As we have pointed out, after the Prophet moved to Medina, the Revelation, which he received, was more concerned with other structures of the Islamic worldview, and among these the knowledge-structure is the one that concerns us here. This means that he began setting up certain institutions that became the model of education in later Islamic history. The School of the Bench, known as Ashab al-Suffah, or Ahl al-Suffah (i.e., the People of the Bench) is only one of these educational establishments which was founded by the Prophet himself in Medina at the long, covered portico of the Mosque. Those companions who belonged to this School were engaged only in study and worship. They did not work and most of them even did not get married until the Prophet's death. Some of them kept their pace of life in scholarly work and in the

⁹Obviously, the community of scientists involved in the Islamic scientific tradition is Muslim scientists, but it must also be pointed out that non-Muslim scientists are also included in this community if they accept and work within the same tradition, which was the case, for example, with Zakariyya al-Razi, Hunayn ibn Ishaq, and Maimonides.

preservation of the Prophet's traditions throughout their life. The Prophet provided their livelihood mainly from the booty acquired from expeditions, so that they would not interrupt their study.¹⁰ Suffah was originally set apart for the lodging of newcomers and those of the local people who were too poor to have a house of their own. But soon it acquired the character of a regular residential school where reading, writing, Muslim law, the memorising of chapters of the Qur'an, *tajwid* (how to recite the Qur'an correctly), and other Islamic sciences were taught under the direct supervision of the Prophet, who took pains to see to the daily requirements of the boarders.

The Prophet was so much concerned with the education of Muslims that when some Meccans were taken prisoners by him after the victory of Badr, he asked those among them who were literate to teach ten children of Medina how to write.¹¹ Sometimes this was done in exchange for their freedom. Ubadah ibn al-Samit says that the Prophet appointed him a teacher in the school of Suffah for classes in writing and in Qur'anic studies.¹² Therefore, the School of the Bench cannot be represented just as a welfare house of the Prophet, as this is the impression left by some classical sources.¹³ The main purpose of establishing the Suffah was to preserve the intellectual heritage of Islam. Studying and memorising the Qur'an and *hadith*, spending most of their times in meditation and worship, following the Prophet during the day wherever he went in order to observe what he did and said so as to record his traditions--in this sense, the School of the Bench performed the task of the Prophetic archives, and thus became the first seat of the Islamic scientific tradition. But in most of their archival activities the members relied mainly upon their memory. Some of them, such as Abu Hurayrah, and his disciple Hammam ibn Munabbih, wrote on pages which are still extant.

There is sufficient evidence that Suffah was not the only school in Medina. Ibn Hanbal, for example, records that at a certain time, "a batch of 70 students attended the lectures of a certain teacher in Medina, and worked there till morning."¹⁴ In fact, there were at least nine mosques in Medina at the time of the Prophet. Professor Hamidullah states that each one of these mosques served simultaneously as a school, and that "the people inhabiting the locality sent their children to these local mosques. Quba is not far from Medina. The Prophet sometimes went there and personally supervised the school in the mosque of that place. There are general dicta of the Prophet regarding those who studied in the mosque-schools. He also enjoined upon people to learn from their neighbours."¹⁵

In order to understand this tremendous social phenomenon, we need to elaborate only one aspect of this early Islamic worldview which provided the adequate mental environment for the subsequent flourishing of sciences. First of all, the concept of *ilm* was introduced as a fundamental element; the significance attached to it proves this point:

¹⁰Ibn Sa'd gives the following names as members of this School: Ab, Hurayrah, Ab, Dharr al-Ghifari, Wathilah ibn al-Asqa, Qays ibn Tihfa al-Ghifari, 'Abd al-Rahman ibn Ka'b al-Asamm, etc. Al-Hujwiri mentions 34 names in his *Kashf al-Mahjub*; trans. R. Nicholson (Leyden and London, 1911), 81.

¹¹Ibn Hanbal, *Musnad* (Istanbul: Cagri Yayinlari, 1992), 1(21): 247; Ibn Sa'd, *Tabaqat al-Kubra*, 2; 1: 14.

¹²*Sunan Ab, Dawd*, trans. Ahmad Hasan, op. cit., 2: 972.

¹³The members of the Bench were mostly very poor; see 2/al-Baqarah, 273 which makes a remark about them revealing their miserable situation; also see the relevant verse in Muhammad al-Zamakhshari's *al-Kashshaf* (Beyrut: Dar al-Kutub al-Ilmiyyah, 1995), 1: 313.) The school of Suffah provided instruction not only for those who lodged there, but also during the day scholars and casual visitors attended it in large numbers. But there were among them very rich personalities such as Ab, Lubabah, who donated a balcony to the Masjid al-Dirar, see Waqidi, *Kitab al-Maghazi*, trans. by J. Wellhausen (Berlin: Druck und Verlag von G. Reimer, 1882), 410.

¹⁴Ibid.

¹⁵M. Hamidullah. "Educational System in the Time of the Prophet," *Islamic Culture*, 13 (1939), 53-55.

Amongst His servants, only the scholars [ulama] are God-fearing. (35/ al-Fatir, 28)
Are those who know, to be considered equal to those who do not know? Only prudent men reflect [on this]. (39/al-Zumar, 9)
God will raise in rank those of you who believe and those who are given knowledge. (58/Al-Mujadalah, 11)

Many more verses in the Qur'an can be given to this effect; it suffices to cite the fact that the Prophet was even asked to supplicate "O my Lord! Increase my knowledge" (20/ *Ta Ha*. 114). The scholars are honoured by being mentioned in rank next to the angels: "God is the witness that there is no deity except Himself, and so are the angels and those endowed with knowledge, standing firm on justice" (3/*Ali Imran*, 18). In conjunction with this, the following *ahadith* can be cited:

Among the signs of the Hour (ashrat al-sa'ah-Doomsday) are the decreasing of knowledge and the appearance of ignorance. (Al-Bukhari, "Kitab al-Ilm," 71).

God does not take away knowledge by wresting it from the people, but takes it away by the death of the scholars (ulama) until no scholar is left. People begin to accept the ignorant as leaders. When they are asked, they furnish information without knowledge. They thus go astray and lead the people astray. (Al-Bukhari, "Kitab al-Ilm," 86).

He who is asked about something that he knows but conceals it will have a bridle of fire put on him on the Day of Resurrection. (Ab, Daw,d, Sunan, "Bab al-Ilm," 3650)¹⁶

If anyone travels on a road in search of knowledge, God will cause him to travel on one of the roads of Paradise, the angels will lower their wings from good pleasure with one who seeks knowledge, and the inhabitants of the heavens and the earth and the fish in the depth of water will ask forgiveness for the scholar (alim). The superiority of a scholar over a pious (zahid) is like that of the moon on the night when it is full over the rest of the stars. The scholars are the heirs of the Prophets who leave neither money nor property behind, but only knowledge. He who takes it, takes an abundant portion. (Ab, Daw,d, Sunan, "Bab al-ilm," 3634; also in al-Tirmidhi, "Ilm," 19, al-Nasa'i, Taharah, 112, Ibn Majah, Muqaddimah, 17, Ahmad ibn Hanbal, Musnad, IV, 239)

An intellectual (faqih) is more vehement to the Satan than one thousand devout persons (abid). (Ibn Majah, "Muqaddimah," 222)

If God wants to do good to a person, He makes him an intellectual (faqih) in religion. (Al-Bukhari, "Kitab al-Ilm," chapter 14)

It is clear that Islamic worldview begins with an immense emphasis on the concept of knowledge. Of course, in this respect *ilm* is not the only term included in this emphasis, although we have concentrated on it. It seems that in this connection, two terms go together in early Islam: *ilm* and *fiqh*. Both terms refer to knowledge, although the former expresses exact, precise and definite knowledge, while the latter signifies, as we shall show below, *scientific*, and hence knowledge of the rational kind. That is why *ilm* is used by

¹⁶Translations of the *ahadith* from the *Sunan* of Ab, Daw,d are adopted from Ahmad Hasan's translation *Sunan Ab, Daw,d* (Lahore: Sh. Muhammad Ashraf, 1984).

both the Qur'an and *hadith* to refer to revealed knowledge which is definite and absolute.¹⁷ The Prophet's prayer for Ibn 'Abbās uses both terms in exactly the same signification indicated respectively here: "O God, grant him the understanding of religion and instruct him in interpretation" (*Allahumma faqqihhu fil-din wa allimhu al-tawil*).¹⁸ As it is, clear *ilm* is used to refer to knowledge which is either revealed or related to that which is revealed. But this does not eliminate its usage in the literal sense:

We have given them a book (i. e., Revelation) and explained it with knowledge as a guidance and mercy for people who believe. (7/al-A'raf, 52; also see 4/al-Nisa,' 157; 6/al-An'am, 119; 27/al-Naml, 15-6; 31/Luqman, 20)

If anyone acquires knowledge of things by which God's own pleasure is sought, yet acquires it only to get some worldly advantage, he will not reach the smell of Paradise. (Ab, Daw,d, Sunan, "Bab al-Ilm," 3656)

When *ilm* is revealed it is absolute and thus is identical with the Revelation; but when it is attained by man, it cannot be identical with Revelation. Therefore, the general usage of *ilm* by both the Qur'an and *had-th* refers to the knowledge attained by man. The usage *bi ghayri ilm--* without having any knowledge (6/*al-An'am*, 119; 31/*Luqman*, 20, and so on), then, means "*ilm* devoid of revelational content when it should not be so devoid." Hence, the general meaning of *ilm* is intimately linked in the knowledge-structure of the Islamic worldview with its usage in the sense of Revelation.

The ones who do wrong follow their own whims without having any knowledge. Who will guide someone whom God has let go astray? They will have no supporters. So keep your face set straight to the true religion, God's natural handiwork along which He has patterned mankind. There is no way to alter God's creation. That is the correct religion, though most men do not know. (30/al-Ra'd, 29-30)

It is clear that the moral dimension is what the Qur'an is trying to impart and that if this moral dimension is divested of knowledge, it may lead to disastrous results:

Those who have stupidly killed their own children without having any knowledge and forbidden something God has provided them with, have lost out through inventing things about God; they have gone astray and not been guided...Who can be more harmful than the one who invents a lie about God to mislead people without having any knowledge. (6/al-An'am, 140, 144)

Therefore, the Qur'anic approach qualifies knowledge with a moral dimension which is provided again by the revelation; the attitude of indifference is thereby excluded from the Islamic worldview. Hence, knowledge is not conceived to be neutral to values, it is inherently linked with values; and thus it can be harmful or useful --as the Prophet prayed: "O God, I seek refuge with You from the knowledge which is not useful."¹⁹ Moreover, this aspect of knowledge can be observed in the following verse as well:

¹⁷For this usage, see the following verses: 2/*Al-Baqarah*, 120; 3/*Ali 'Imran*, 61; 6/*al-An'am*, 119, 140, 143; 11/*H,d*, 14, 49; 13/*Al-Ra'd*, 37, 43; 19/*Maryam*, 43.

¹⁸*Kashf al-Khafa' wa Muzil al-Ilbas*, Isma'il ibn Muhammad al-'Ajluni (Beyrut: Mu'assasat al-Risalah, 1985), 1: 220-1.

¹⁹Muslim, "Kitāb al-Dhikr," 73; Ab, Daw,d, "Witr," 32, and so on.

They learn what is harmful and not useful to them. (2/al-Baqarah, 102)

The knowledge that is useful is understood as either Revelation itself, as we have seen, or as knowledge derived directly from Revelation, or as knowledge in the general sense, namely as acquired by man, but which can be reconciled with Revelation and thus be based upon it. Therefore, the Qur'an wishes to qualify knowledge; in fact, its aim is to guide knowledge in general; that is why revelational knowledge is collated with it at this point. Knowledge in general is no longer left aloof, but it is suggested to be invested with revelational values which constitute its moral dimension. Once general knowledge is thus invested, it becomes *illuminated knowledge*, which is no longer knowledge that is not useful. The Qur'an delicately infuses all these values into the knowledge-conception of the Islamic worldview. First it states, "The true knowledge is with God alone" (46/*al-Ahkaf*, 23), then points out: "above all those who possess knowledge is an All-knowing" (12/*Yusuf*, 76). Moreover, it categorically declares, "God knows you do not know" (2/*al-Baqarah*, 216; see also 3/*Ali Imran*, 65-6).

In this way, a morality of knowledge is also developed as a part of the Islamic worldview. Knowledge unqualified is considered as though it is not knowledge at all; hence, the phrase "without having any knowledge." For when the Qur'an accuses those people with this allegation, it cannot obviously mean that those people had no knowledge at all; in fact, "they knew only the external look of the worldly life, but they were totally unaware of the life to come (*al-akhirah*)" (30/*al-R,m*, 7). That is why their knowledge is as if *non-existent*. Therefore, unilluminated knowledge is superficial in itself and as such it can be equated with *ignorance*.

As all these conceptions concerning *ilm*, *fiqh* and other knowledge-related terms were developed, a doctrinal understanding gradually began to emerge within the Islamic worldview; it is this comprehensive doctrinal understanding that we call the 'knowledge-structure' of the Islamic worldview. As we have seen, this conception emphasises knowledge with an utmost care, without even leaving it with a mere emphasis, for it also states that "seeking knowledge is an obligation for every Muslim" (Ibn Majah, "Muqaddimah," 17, 224). Moreover, besides this emphasis, a framework is also given together with the doctrinal understanding of knowledge. Considering also the Qur'anic encouragement to examine and understand the universe and the nature of certain related problems, it becomes inevitable that as a result of all these comprehensive knowledge-seeking activities, a network of concepts emerges, the Islamic *conceptual scheme*.

As this conceptual scheme emerged, the Prophet was also educating his new community in accordance with it. All these educational activities led to the emergence of a group of scholars (a pre-scientific community) who handed down the Prophetic tradition of teaching and searching for knowledge to the next generation of scholars who became their students. Of course, the early generation of scholars were naturally very simple in their ideas concerning special sciences, although they were extremely sophisticated in their knowledge of religion and related issues, primarily because of the guidance of Revelation. Soon, as a new generation of scholars began to take over this scholarly tradition, the desire for learning increased; as a result, a group of scholars with a sophisticated scientific mentality emerged. Among them, we can give the following names: Qadi Shurayh (d. 80/699), Muhammad ibn al-Hanafiyyah (d. 81/700), Ma'bad al-Juhani (d. 84/703), Sa'id ibn al-Musayyab (d. c. 91/709), 'Urwah ibn al-Zubayr ibn al-'Awwam (d. 94/712), Ibrahim Nakha'i (d. c. 56/717), Aban ibn 'Uthman (d. 100/718), Mujahid ibn Jabr (d. 100/718), 'Umar ibn 'Abd al-'Aziz (d. 102/720), Wahb ibn Munabbih (d. 110, 114/719, 723), Hasan al-Basri (d. 110/728), 'Ata' ibn Abi Rabah (d. 114/732), Hammad ibn Abu Sulayman (d. 120/737), Ghaylan al-Dimashqi (d. c. 123/740), al-

Zuhri (d. 124/742), Wasil ibn 'Ata' (d. 131/748), Ibn Ishaq (d. 151/768), Ja'far al-Sadiq (d. 148/765), Ab, Hanifah (d. 150/767), al-Awza' (d. 158/774), Hisham ibn al-Hakam (d. 179/795-6), Malik ibn Anas (d. 179/796), Abu Yusuf (d. 182/799), Sufyan al-Thawri (d. 161/778), al-Shafi'i (d. 204/819), and so on. As a result of the learning activities of these scholars soon various schools of thought emerged, such as the Madenese School, the School of Kufa, the School of Basrah, and also such schools as the Khariyyah, Qadariyyah, Murji'a, Shi'ah, Jabriyyah and Ash'ariyyah. Some of these schools emerged as a result of the socio-political upheavals within the Muslim community. It is exactly such events which change the course of contextual causes in a given society. We must, then, acknowledge such social forces that may affect the course of scientific process.

It is, nevertheless, primarily through the efforts of these scientists and many others that a sophisticated technical vocabulary gradually emerged towards the end of the second century of Islam. This technical vocabulary, having a scientific character, included, among others, the following: *'ilm, usul, ra'y, ijihad, qiyas, fiqh, 'aql, qalb, idrak, wahm, tadabbur, fikr, na'ar, Hikmah, yaqin, wahy, tafsir, ta'wil, 'alam, kalam, nutq, zann, haqq, batil, sidq, kidhb, wujud, 'adam, dahr, samad, sarmad, azal, abad, khalq, khulq, firasah, fitrah, tabi'ah, ikhtiyar, kisb, khayr, sharr, halal, haram, wajib, mumkin, amr, iman, iradah*. Who can claim that these pre-scientific terminologies were not contained in the Islamic worldview? For they all had a basis in the Qur'an as well. In fact, they were available not only as everyday terms, but also as concepts with sophisticated and rich meanings that made them available for later technical scientific usage. The purpose of our exposition is to demonstrate that all these technical terms formed a sophisticated web of concepts until the end of the second century of Islam which eventually led to the rise of individual sciences within this pre scientific tradition (in approximately the 830s). Then out of this, scientific activities emerged the Islamic scientific tradition. As we still need to do more historical research to bring out materials, we cannot go into a detailed exposition of this. We shall rather concentrate on certain key terms only, which will sufficiently prove our case in this context, in order to exhibit the emergence of the early Islamic scientific tradition.

3. The Emergence of Islamic Scientific Tradition

According to our definition of a scientific tradition, we can say that the Islamic scientific tradition is the manifestation of the *Islamic scientific conceptual scheme* within the Islamic milieu. We can show this by examining the scientific meanings attached to the scientific concepts as they begin to emerge in the early Muslim community. In order to do this we shall select only the most fundamental concepts in Islamic science, as they are situated within the Islamic scientific conceptual scheme.

We are informed, for example, of al-Zuhri to have said that a sound theory (*al-ra'y al-hasan*) is a good piece of knowledge.²⁰ Ibn 'Abbas reports from the Prophet that he said: "As though I see the women of Ban, Fahr circumambulation around the Khazraj (tribe) while shaking their buttocks; they are the polytheists. This is the first polytheism of this community. By God, their wrong theory (*su' ra'yihim*) shall eventually lead them to exclude God from predetermining good, just as they had already excluded Him from predetermining evil."²¹ Of course, it may not always be possible to find an equivalent translation of a scientific term of a scientific conceptual scheme, coined for a specific meaning within a certain worldview in

²⁰See Ahmad Hasan, *Analogical Reasoning in Islamic Jurisprudence* (Islamabad: Islamic Research Institute, 1986), 8.

²¹Ahmad ibn Hanbal, op. cit., 1 (21): 330.

another scientific conceptual scheme. This is the case with the concept of *ra'y*, which does not have an exact corresponding term in the Western scientific vocabulary; except that the term 'theory' is used very much in a meaning close to the term *ra'y*. This is attested also in the report of Ibn Sa'd who states that when 'Ata' ibn Abi Rabah was asked concerning his judgment whether it was *'ilm* or *ra'y*, he replied that it was *'ilm*, if his judgment is derived from a precedent, i.e., *athar*; otherwise, it was implied that the judgment in question was grounded upon *ra'y*.²² This means that *'ilm* is understood as a definite piece of knowledge which is either directly taken from a revealed source, or derived from it on the basis of a precedent practice of the Prophet. But *ra'y* cannot be *'ilm* in this sense because it is the view of an individual on a certain problem. Hence, *ra'y* actually means 'theory' in the Western scientific terminology. Not only does a theory, i. e., *ra'y*, mean 'provisional opinion,' it also expresses a rational argumentation because a scientific theory is based on reasoning. This understanding of *ra'y* is also clear from the following usage; "*ni'ma wazir al-'ilm al-ra'y al-hasan*" (what a good minister of knowledge is the correct theory)²³. Moreover, since reason is not authoritative in the absolute transcendent realm, the Prophet says that "if one interprets the Qur'an on the basis of his theory, he has committed an error even if he is correct in his interpretation" (*man qala fi'l-Qur'an bi ra'yih fa asaba, fa qad akhta*)²⁴, since no knowledge can be based on a theory. It is also reported that "sometimes Ibn 'Abbas held a theory which later he abandoned."²⁵ It is clear therefore, that though our Prophet did not use the term to mean *theory* in the scientific sense, he definitely paved the way for such a usage. As a result, gradually the term began to emerge as a significant concept in the Islamic scientific tradition to mean *theory*.

The knowledge based on a rational argumentation is reached as a result of *ra'y*, and such a knowledge was actually defined as *fiqh* in the early scientific tradition. This is clear in the above quotations of the *ahadith* in which *fiqh* occurs. Since such a knowledge is in fact *science per se*, in certain early usage it was used exactly in the same manner, such as the title of a book written by al-Tha'alibi--*Fiqhu'l-Lughah*, i.e., the science of lexicography. Later developments, however, diverted this usage, and perhaps as an influence of the Greek scientific tradition, this usage was dropped and thus replaced by the term *ilm*. Moreover, according to Abi Hanifah, *fiqh* meant "speculative thinking."²⁶ Al-Dhahabi says of Abdullah ibn al-Mubarak that he "recorded knowledge, i.e., *hadith*, in chapters and concerning *fiqh*" (*dawwana'l-'ilm fi'l-abwab wa'l-fiqh*).²⁷ Of course this usage of the term has a basis in the Qur'an (e.g., 9/al-Tawbah, 122; *li yatafaqqahu fi al-din*), as well as in the *hadith* (see the *hadith* quoted above in relation to the Prophet's prayer for Ibn Abbas). That is why *ilm* was taken by the Traditionists to mean *hadith*.

Ijtihad is also a closely related term in the network of concepts of the Islamic scientific tradition; it means the *effort to search for knowledge through ra'y*. Hence, *ijtihad* is also a scientific effort which is theoretical. For this reason, it is not a definite knowledge, but it must, of course, be based on revealed knowledge. It must be for this reason that the Prophet says: "*fadlu'l-'alim 'ala'l-mujtahid mi'atu darajah*," namely, the scholar who bases himself on true knowledge is a hundred times higher in rank than the theoretical scholar.²⁸ If we want to show the relation of *ra'y* to *ijtihad*, we can say that *ra'y* is the theory which is produced in an *ijtihad*. This is clear in Mu'adh ibn Jabal's interesting usage of *ijtihad* and *ra'y* together in

²² *Kitab Tabaqat al-Kubra*, ed. by Ihsan 'Abbas (Beirut: Dar —adir, 1968), 5: 469.

²³ Al-Darimi, *Sunan*, "Muqaddimah," 30.

²⁴ *Sunan Abi Dawud*, op. cit., 1036.

²⁵ Al-Darimi, op. cit., "Muqaddimah," 52.

²⁶ L. Gardet, "Ilm al-Kalam," *EP*.

²⁷ *Tadhkirat al-Suffa* (Hyderabad: The Dairatu'l-Ma'arif-il-Osmania, 1955), 1: 275.

²⁸ Al-Darimi, op. cit., "Muqaddimah," 32.

the famous *hadīth* of *ijtihād*: *ajtahidu ra'y- la al*; i. e., I shall make my best effort to come up with a theory.²⁹ But *ijtihād* is necessarily based on the Qur'an and *hadīth*, as understood from this *hadīth* as well. It is, therefore, the theoretical knowledge based on the Qur'an and the *hadīth*.

What about the theoretical knowledge which is primarily derived from discursive thinking? The early Islamic scientific tradition used the term *kalam* to refer to this kind of knowledge. As such *kalam* meant 'speculative knowledge.' The earliest reference in this regard can be taken from Hasan al-Basri's (d. 728) letter in which he states that "we initiated the speculative study of *qadar*; just as people initiated the denial of it" (*ahdathna al-kalam fihi*).³⁰ It is also reported that once our Prophet's wife, 'Aishah, heard Hasan al-Basri speaking, and asked: "who is this discoursing with the word of the veracious" (*man hadha alladhi yatakallam bi kalam al-siddiqin*).³¹ In this sense, *kalam* comes very close to the term 'philosophy' as it is used today; i.e., speculative thinking. It is clear why Muslims chose the word '*kalam*' for this kind of knowledge, for *kalam* means 'language' or 'speech' but not in the ordinary sense. It rather refers to the kind of human language which is discursive. In this sense, it comes close to the term 'logos' in the Greek scientific conceptual scheme. It may be translated into English as 'discourse,' but in the technical sense of today's Western scientific terminology, it means precisely 'philosophy.'

It is clear that all these usage determined the scientific vocabulary of the early Muslims. Not only is the meaning of each term clarified, but so is its relation to other terms and the way, viz., method, they ought to be used is also given. For instance, it is possible to think that since *fiqh* is a rational understanding, it may be a kind of knowledge that is to be avoided by Muslims, as indicated in the above *hadīth* that the scholar who bases himself on true knowledge is a hundred times higher in rank than the theoretical scholar, i. e., the rationalist. But another *hadīth* clarifies that rational understanding may be decisive in certain cases (e.g., *faqih wahid ashadd 'ala al-shaytan min alf 'abid*).³² Of course, the Islamic worldview also clarifies in which cases which is to be preferred.

To the concept of knowledge in the Islamic scientific tradition of the Islamic science, the term *Hikmah* also proved indispensable. Mujahid, for example, explains the term *Hikmah* in the verse *wa man yu'ta al-Hikmah fa qad ,tiya khayran kathira* (2/al-Baqarah, 269) as comprising three things: 1. al-Qur'an, 2. *al-'ilm*, 3. *al-fiqh*.³³ Here '*ilm*' refers to the knowledge of Islamic tradition and the Sunnah, *fiqh* was held as a rational understanding on the basis of the revealed sources. *Hikmah*, on the other hand, was understood as knowledge derived rationally from a revealed source, as such it is both *ilm* and *fiqh* at once, but different from independent speculation, which can be understood as *kalam*. That is why al-Tabari reports that *Hikmah* was defined by his predecessors as the Qur'an and its (rational) understanding (*al-Hikmah hiya al-Qur'an wa'l-fiqh bihi*).³⁴

In this way every term which was gradually given a specific place in the Islamic conceptual scheme acquired a technical *scientific* meaning, but always in relation to each other. We see, therefore, already towards the end of the first century, these learning activities gradually enter into a disciplinary stage. At

²⁹Ahmad ibn Hanbal, *Musnad*, 5: 230.

³⁰Julian Obermann, "Political Theology in Early Islam," *Journal of the American Oriental Society*, 55 (1935), 145; Arabic text, Helmut Ritter, "Studien zur Islamischen Fromigkeit I: Hasan al-Basri," *Der Islam*, 21 (1933), 68, lines 10-11.

³¹Ibn al-Jawz, *Al-Hasan al-Basri*, 8-9; quoted by Muhammad 'Abd al-Rahim, *Tafsir al-Hasan al-Basri* (Al-Qahirah: Dar al-Haramayn li't-Tibāah, 1992), 1: 21.

³²Al-Tirmidhi, "Ilm," 13; Ibn Majah, "Muqaddimah."

³³Al-Tabari, *Jami' al-Bayan fi Tafsir al-Qur'an* (Beyrut: Dar al-Ma'rifah, 1980), 3: 60.

³⁴Ibid.

this stage, it is possible to observe the scientific consciousness, as a result of which individual sciences are specifically named and referred to by these names, hence particular sciences begin to emerge after the second century. It is in these sciences that the conceptual scheme is elaborated into a *scientific conceptual scheme*. Therefore, the concepts in this scheme are so related to each other that when they are thus held together, they yield a vision, an insight, and an outlook in the mind of the Muslim scientists; and as a framework in the mind of the Muslim scientists it constitutes what we call here 'Islamic scientific conceptual scheme.' Whatever norms and learning tools developed by the community of scientists working under that scheme is called 'Islamic scientific tradition.' No matter in what field the scientist is working, by the very epistemological constitution of his mind, he will necessarily reflect this tradition; and it is this outlook that characterises a scientific activity as Islamic, since it springs from the Islamic worldview. And again it is in this sense that a scientific activity will render itself as a part of the Islamic science. We may show the emergence of this tradition in a chronological order on the following table.

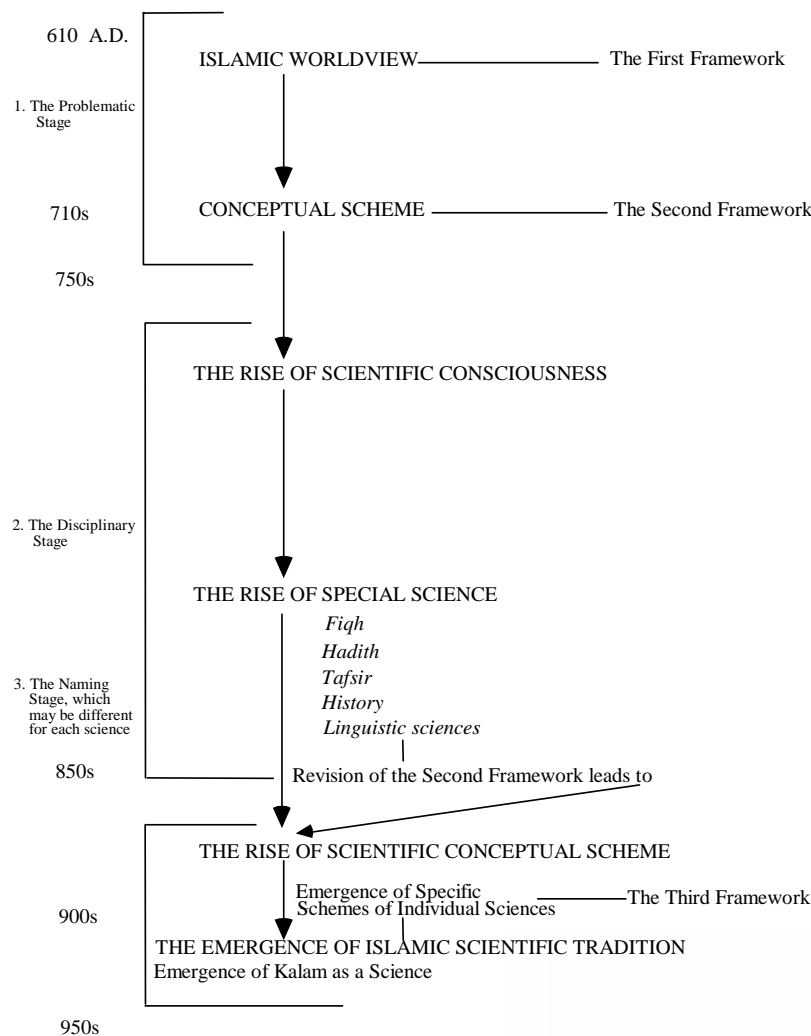


Table 2

REFERENCES

- Acikgenc, Alparslan, "Transcendent Rationality, Ibn Rushd and Kant: A Critical Synthesis," *Alif* 16 (1996).
- Acikgenc, Alparslan, *Scientific Thought and its Burdens* (Istanbul: Fatih University Publications, 2000).
- Ahmad Hasan, *Analogical Reasoning in Islamic Jurisprudence* (Islamabad: Islamic Research Institute, 1986), 8.
- Ahmad Hasan's translation *Sunan Ab, Daw,d* (Lahore: Sh. Muhammad Ashraf, 1984).
- Al-Hujwiri, *Kashf al-Mahjub*; trans. R. Nicholson (Leyden and London, 1911), 81.
- Al-Tabari, *Jami' al-Bayan fi Tafsir al-Qur'an* (Beyrut: Dar al-Ma'rifah, 1980), 3: 60.
- Ibn al-Jawz, *Al-Hasan al-Basri*, 8-9; quoted by Muhammad 'Abd al-Rahm, *Tafsir al-Hasan al-Basri* (Al-Qahirah: Dar al-Haramayn li't-Tib'ah, 1992), 1: 21.
- Ibn Hanbal, *Musnad* (Istanbul: Cagri Yayinlari, 1992).
- Julian Obermann, "Political Theology in Early Islam," *Journal of the American Oriental Society*, 55 (1935), 145; Arabic text, Helmut Ritter, "Studien zur Islamischen Fromigkeit I: Hasan al-Basri," *Der Islam*, 21 (1933), 68, lines 10-11.
- Kashf al-Khafa' wa Muzil al-Ilbas*, Isma'il ibn Muhammad al-'Ajluni (Beyrut: Mu'assasat al-Risalah, 1985), 1: 220-1.
- Kitab Tabaqat al-Kubra*, ed. by Ihsan 'Abbas (Beyrut: Dar —adir, 1968), 5: 469.
- L. Gardet, "Ilm al-Kalam," *ET²*.
- M. Hamidullah. "Educational System in the Time of the Prophet," *Islamic Culture*, 13 (1939), 53-55.
- Merton, Robert K.. *The sociology of Knowledge: Theoretical and Empirical Investigations*, ed. by Norman W. Storer (Chicago & London: The University of Chicago Press, 1973), 275.
- Muslim, "Kitab al-Dhikr," 73; Ab, Daw,d, "Witr," 32, and so on.
- Tadhkirat al-Suffa'* (Hyderabad: The Dairatu'l-Ma'arif-il-Osmania, 1955), 1: 275.
- Waqidi, *Kitab al-Maghazi*, trans. by J. Wellhausen (Berlin: Druck und Verlag von G. Reimer, 1882), 410.