Qur'an and Science

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In his work *The Structure of Scientific Revolutions*,[1] Thomas Kuhn discusses the obstacles to the acceptance of revolutionary new scientific ideas that suggest a paradigm shift. Such changes in our entire framework of thinking are not restricted to the hard sciences, but affect every aspect of knowledge and learning. This is especially true when we get so accustomed to old ways of doing things that they actually narrow our perspective.

A famous optical illusion shows a picture of a woman.[2] Observers try to decide if it is a picture of a young woman or an old woman. Different people give different answers. Once one learns to look at the picture in a different way, one's perception of the subject changes. For example, if one perceives an ear just to the left of what appears to be the line of the edge of a headscarf, one may perceive the woman as young. If instead one convinces oneself that this is not an ear, but one of her eyes, one sees an old woman.

The important point is that one cannot see both images at the same time, even once one understands how to see the image. Seeing both simultaneously is impossible. This is what happens with a paradigm shift. We are locked into an old way of perceiving. Unlike with cognition, perceptions are immediate. Cognition is a gradual process one labors over to understand something. Perception, on the other hand, is instantaneous -- we cannot control perception in the way we can control the rational faculty. Yet, when the rational faculty is trapped inside a particular paradigm, we are locked into a narrow range of possible understanding. In other words, to have a new way of understanding Islam and glean new insight from the Qur'an, we must prepare to undergo a paradigm shift.

Analyzing Qur'an and Science

Three general approaches can help us when speaking about the Qur'an and science. In any approach we must adhere to the *tawḥīdi* premise, which requires a rejection of the distinction between the sacred and the secular. In other words, for the Muslim, for the one who believes in *tawḥīd*, there can be no contradiction between the revelations of Allāh in the text, the Qur'an, and in the revelation of Allāh in the phenomenological world. Nature is as much the book of Allāh as is the Qur'an. Therefore, any perceived discrepancy is a reflection of the shortcoming of our understanding.

We can categorize and evaluate the variety of approaches to the question of the relationship of the Qur'an to science. The first is metaphoric, the second literalist, and the third procedural. What does the Qur'an teach us about science? We know without doubt the Qur'an contains many allusions to natural phenomena. Some will say these are metaphors that project some deep-seated spiritual truth. Others will say they are literal and bring some knowledge of the phenomenological world. Without completely discrediting the first two approaches, they have

their limitations and can be dangerous. The most important element the Qur'an has to offer is its procedural guidance. One of the most important impacts of Islam on science was its contribution to the development of the methodology of modern science, as we know it today.[3] Understanding why the field of science as it differs today from the ancient Greek methods is very important for Muslims to grasp. Even those unfamiliar with science itself should understand why modern science developed under Islam.[4]

A central component of science is its procedural structure, which contradicts the fundamentalist Christian view of the relationship of science and religion, where science is treated as a separate belief system. There is a procedure to be followed and the Qur'an encourages that procedure. Furthermore, the Qur'an encourages that procedure in the natural sciences and argues for a similar epistemology in our approach to knowledge in general.

The strictly metaphorical approach to the relationship between Qur'an and science can overshadow the fact that, with the passage of time. They do not become false - because the spiritual truth of an allegory is independent of the truth or falsehood of the physical phenomenon from which it is drawn—but rather that as the paradigm from which it is drawn becomes obsolete, the metaphor becomes antiquated. For example, when one says that someone's reputation has spread to the four corners of the earth, the point of this assertion—that he is famous—may be true, but the phrasing is quaint compared to "his reputation has spread around the globe." When the Bible says that Joshua ordered the sun to stand still, we know what it means, but we have a problem with it in a way that people in Joshua's day did not, because they believed the earth stood still all the time and that the sun rotated the earth once a day; therefore he did not order the earth to stop moving, but for the sun to stand still.

In the case of the Qur'an, many allusions that would have been confusing in the prophet's time have become meaningful in our own time. Maurice Buccaille has given an impressive example about the digestion of cows, in that Allāh makes a pleasing and nutritious drink from "between" the regions of digestion and the blood"[5] One living in the time of Muḥammad would likely not understand this reference, and indeed the scholars of the past offered bizarre interpretations of the meaning. Yet Buccaille, a modern physician, states that the membrane of the intestine allows the nutrients to pass from the partially digested matter into the blood stream, where they pass to the mammary glands and are made into milk. The allusion becomes very easy to understand in light of modern knowledge.

A strictly literal approach, on the other hand, ties the eternal truths of the Qur'an to the changing models of science. Scientific theories constantly change and evolve. Science provides intellectual models for understanding the natural world, and those models are never absolute truth. They are always our best understanding at the moment, and they keep changing. One who takes a verse in the Qur'an and says it presents scientific theory puts oneself in a very dangerous position because when that theory is proven wrong and a new theory comes along, those who tied it to religious doctrine will accuse those who rejected the theory of *kufr*. We have seen this in the Christian world. At the time that Christians embraced the Bible they ignored the four corners of the earth statement because they knew the earth was round. Their own Greek science taught the earth was round, and they had no problem accepting the phrase "four corners of the earth" as an antiquated metaphor.

Today, virtually all Christians understand that Joshua could not order the sun to stand still to extend the daylight because the cycle of night and day is due to the turning of the earth, but at the time the Bible was adopted by the Christians, Greek science said the sun did move around the

earth. Thus, when Galileo explained literally why this was untrue, he was accused of heresy. That is a dangerous way to proceed.

The Qur'an is not a scientific textbook. It does not instruct us how Allāh created the universe. It instructs us that *He* designed it, and He *urges us to investigate its construction*. Therefore, the Qur'an is pro-science. While not explaining exactly how the world was made, it encourages us to examine His signs in the heavens and the earth. Particular paradigmatic shifts in the sciences shall demonstrate these points, and we ask how these approaches affect the perception of the relationship of religion and science.

The role Islam played in the development of modern sciences has been explored in great depth elsewhere.[6] There are seven attributes of Islamic civilization that encouraged the development of modern science. Of these seven, six are at least partly from the Qur'an. The seventh relates to the development of hadith science and will be mentioned in passing.[7]

Islam and Modern Science

We should first understand the development of modern science and how it differs from Greek science. Westerners often assert that Muslims preserved Greek science. This is a half-truth. Instead, Muslims *transformed* it. Modern science and Islamic science in its later phases differ greatly from Greek science. The Greeks were rationalists. They believed that one could know scientific truths by reason alone. Aristotle said that a scientist is one who grasps that everything is the way it is because it could be no other way. The problem that some Muslim scholars have with scientists getting involved in religion is that they, the scientists, mistake modern scientific methods for the Greek method of learning – in that natural law is a narrow, absolutist view of the world. This at the very best makes Allāh a slave to nature and at worst throws him out of the picture entirely. If everything is the way it is because it could be no other way, then what is the function of a creator? Indeed, many Greeks believed that things always had been as they are, but the Muslim view is different. The Muslim view is not that everything is the way is because it could be no other way, but that everything is the way that it is because *Allāh willed it to be that way*.

What then are the implications of this assumption? One of the main implications is that *reason is not a sufficient source of knowledge.* There are no self-evident first principles from which you can derive a complete knowledge of reality. Consider, as al-Ghazālī did,[8] the shape of the universe. The philosophers who followed Greek teaching first believed the universe was shaped like an onion, with the Earth at the center, the moon.Al-Ghazālī's critique was significant because he said it might be true, and if so, because Allāh willed it that way, not because he had no other choice. There is an infinite number of ways Allāh could have constructed the universe, and it was his choice to construct it this way. That is the heart of Islamic critique of what you might think is the natural law theory, and does not deny the existence of natural laws, for such laws are easily demonstrable. Rather, it is a criticism of the monistic epistemology that says reason is a sufficient source of knowledge.

If reason is not a sufficient source of knowledge, what else is needed? Besides reason, which has a role in science under the rubric of "theory," there is also experimentation and observation -- precisely what the Qur'an addresses when it commands us to look for Allāh 's signs in the heavens and on earth. However, beyond these two sources of knowledge, there is a third, which is authority. Authority as a source of knowledge may surprise those used to thinking science and authority are incompatible, but any scientist gets most of his knowledge not from his

own experiments or his own theories but from reading the professional literature. The literature is the authority and is known to be trustworthy because it has been peer-reviewed and because scientists may and do question and challenge it at any time. These three sources of knowledge -- reason, experience, and transmission from reliable sources -- are in fact the sources of all forms of knowledge.

Waḥi -- transmission from particularly reliable sources – is also important. If Allāh , the angels, and the prophets are not reliable, then who is? Even these entities are subject to the same sort of questioning. We are all born to different religions. We cannot simply believe whatever has been handed to us as a holy book or the teaching of a professed prophet or priest, or that whatever our mother tells us are all true beyond question. These three sources of knowledge have to check one another. When our reason, our experience, and the reliable sources all agree, then we can say that you have knowledge with as much certainly as human beings are capable. Only Allāh knows anything with absolute certainty. To the limits of human certainty, we can say that this is our key to knowledge; this is what we know.

Specific elements drove this development from the ancient Greek rationalistic method to the modern method of science just described. The first is *iqra',* the respect for knowledge. The Qur'an has commanded us to read, meaning to acquire knowledge from exogenous sources. There may be other creatures that are intelligent. Jacques Cousteau once claimed in a radio interview that the killer whale is more intelligent than human beings, yet the whale cannot go to the library or look things up on the Internet. Therefore, the whale's knowledge is forever limited to what he carries in his brain, whereas our knowledge is always open. One does not need to memorize hadith to be able to read them and the evaluations of their chains of transmission and soundness of their texts.

A second element is induction. This process is the heart of the scientific method, requiring the rigorous testing of theory by experiment and empirical observation. The role of observation is clearly encouraged in the Qur'an, which says to look for God's signs in the heavens and on earth.

A third element is universality. The Qur'an teaches, and we believe, that all truths come from Allāh . Therefore, because Allāh sent messengers to every people, all people have access to the truth, and we are not limited to the knowledge of our own history. When the Muslims encountered Greek knowledge, they did not call the Greeks pagans and ignore their books. They translated them all, not for uncritical acceptance, but for critical consideration, to decide what was true and what was false. When we accept the truth and reject what is false, we are better off for having gone through the process.

A fourth very important element is the abolition of the priesthood. Many past scientific civilizations preceded the Islamic one. The ancient Babylonians, for example, possessed fine astronomical sciences, but only among their elites. The idea that the masses should be trusted with this kind of knowledge was unknown. In Islam, the teaching of the prophet, peace be upon him, is that every Muslim, male or female, has a duty to seek knowledge from the cradle to the grave.[9] Therefore, knowledge is not to be the province of the elites. Indeed, we find that Muslim scholars who made advances in arithmetic, for example, did not just write papers for other scholars, but wrote books on arithmetic for secretaries and scribes,[10] so that people who were providing clerical services to others would be able to do their arithmetic properly.

Furthermore, Islam does not despise material success or advocate asceticism. A materially successful society is one that will conduct research in the hard sciences. For the poor, their main concern is subsistence, and developing low-level technology that will prevent one

from starving to death. A materially successful society has people who will dedicate their wealth to setting up *awqāf* to provide not only hospitals, but also to support institutions of learning and scientific research. The Muslim society in its heyday had unprecedented wealth that gave birth to the modern university and college.

In an academically free environment, science inevitably moves forward. Conversely, academic freedom is necessary for scientific progress. For Muslims, academic freedom is the corollary of our individual responsibility and duty to Allāh . Every Muslim is directly responsible to Allāh . Therefore, no one has the right to censor the academic work of another person. When confronted by falsehood one should not censor it, but expose its fallacy: "Nay We hurl the Truth against falsehood and it knocks out its brain, and behold falsehood doth perish!"[11] This approach is a core aspect of the scientific method.

The kind of interference that the Christian church saw with scientific affairs as exemplified by the Galileo affair was the exception, not the rule, in Islam, despite comparisons of Islam to medieval Christian civilization. One excellent scholar contradicted himself when he tried to represent the burning of Ibn Rushd's books as an example of intolerance of science by the orthodoxy of twelfth-century Spain, yet acknowledged that "some strictly scientific ones" were exempt.[12] He missed that Ibn Rushd was persecuted for his philosophical views, not for his scientific views. Abu Yusuf should not have burned any of Ibn Rushd's books, but to accuse Islam, or even Muslims, of having a problem with science is erroneous because to the degree that Ibn Rushd's work was purely scientific, it was not censored.

One element behind Islamic science does not derive directly from the Qur'an, and this is the issue of proper citation. Islam played a major role in the development of citation in hadith science. While authority plays a role in science, in modern science authority may be questioned. Therefore, when citing authority, it should be identified clearly and accurately. A scientific paper that cites Einstein as an authority must state where and when he said what was attributed to him, including the name of the book or journal in which he published it, the page number, and so on. If the transmission was claimed to be personal rather than public, the author would need to indicate how the information was obtained – directly, indirectly, and from where/whom. Anyone familiar with hadith science recognizes the *isnād* that is involved in that kind of personal communication. Therefore, hadith science set forth a model that was followed by the other sciences. This kind of care in citation was not part of Greek scholarship, so we should credit Islamic civilization for the contribution of this important part of the scientific method.

The second point involves the limitations of the literalist perspective. Some people try to use the Qur'an as a scientific text, resulting in Muslim pseudo-science. One writer has gone so far as to claim that the miraculous nature of the Qur'an is evident by the fact it has the speed of light to four decimal places.[13][14] The Qur'an makes these allusions, and no doubt the Author of the Qur'an knows more science than anybody ever has. There is also no doubt that He is trying to teach science there. However, one cannot acquire specific scientific knowledge by studying the Qur'an. Instead, one studies nature, acquires scientific knowledge, and looks at the Qur'an and says, "This book is consistent with what I have learned."

The third point is the most complex -- the emerging post-modernist paradigm. The West underwent a couple hundred years of materialism as the dominant philosophy. Although not accepted everywhere, it challenged everything that people believed and was constantly in contention. Its rise was ironic, because the scientists who developed the scientific paradigm behind materialist philosophy were by-and-large believers. Isaac Newton was the most important of them and in the *General Scholium* appended to Newton's magnum opus, the Principia

Mathematica, he testifies to his belief in God in a way that is reminiscent of the Muslim belief.[15] We know from Newton's religious writings that he rejected the trinity. We also know he believed in God not just as the spirit of the world or just as a Creator of the world who went away (an absent clockmaker as some have described it). Newton believed God is the Creator *and* Sustainer of the world *and* the Lord of the world, whom men worship as Lord, making him a theist, not a deist.[16]

Others looked at Newton's theories and concluded that Newton, Galileo, and others developed a system for understanding the motion of the planets, the mechanics of the universe, and of all physics in a way that did not require God's active intervention. Therefore, they argued, either God created the world and He went away, or maybe the world was always like this and we do not need to assume God's existence at all.

This was the dominant paradigm for centuries until three major discoveries of the twentieth century undermined that paradigm. Taken together, relativity theory, chaos theory, and quantum mechanics destroyed the view of the universe as a three-dimensional billiard table. The next section will analyze the legitimate and illegitimate associations between internal religion and new emerging science.

Internal Religion and Emerging Science

Emerging ideas that are somewhat established in the scientific world may not yet have totally seeped into the consciousness of the masses. Just as the idea that the earth circles the sun was quickly established for scientists, common people did not adopt the idea for a couple hundred more years. Those who may laugh today to think that people believed the sun went around the earth should ask, is it self-evident that the earth goes around the sun? We were raised with that belief so it seems self-evident, but it is not based on our personal experience. Rather, we have learned this from quantum mechanics and relativity.

The Qur'an mentions the *ghayb* and the *shahādah* -- the hidden and the manifest -- or the unseen and the seen. Problematically, Newton's classical mechanics seemed to make the entire universe a billiards table, with little billiards balls bouncing around. One knowing their positions, motions, and the laws of physics that govern them could predict what they do next. In this scenario, everything seems determined. If we are made up of matter, as we seem to be, then should not our actions also be determined? It seems as though everything has been determined. Even if these rules were determined by Allāh when he set up the universe, they allow no room for further divine intervention, which implies there can be no miracles. The billiard balls can only go a certain way. Allāh , even if He wrote the rule on Himself, would seem to have written a rule that prevents miracles.

Furthermore, and very important for religious belief, where is the room for free will? How can one be held responsible for his actions when they have been pre-determined at the time of Creation? Whether one commits adultery, murder, or any kind of sin, is it just the result of many material particles moving in a certain way? Where is the justice in holding me responsible for the choices that seem to be impossible? In other words, where is the room for human will and for God's will? They seem to be absent in this mechanical universe.

The answer to this question of course is that physics and mechanics are not the only components of reality, but in this paradigm, people could not see where the room was for a non-physical action. Physics appeared to occupy all the room for all possible explanations for

everything. However, with the discovery of quantum mechanics and chaos theory, everything changed. One item of chaos theory, the Butterfly Effect, is particularly illustrative.[17]

The Butterfly Effect points to the fact that physical systems are extremely sensitive to small changes in the initial conditions. Even if it were true -- which it is not -- that a given system's future is entirely determined by its present positions and motions, the tiniest conceivable change in that present motion totally changes the future and makes it utterly unrecognizable, no matter how tiny that change is. In other words, a butterfly's decision whether or not to flap its wings somewhere in Kansas right now could change the course of a storm in China six months from now. Miniscule changes like that can have such profound effects.

When combined with quantum mechanics, this hypersensitivity of physical systems to small changes relates to the discussion of religious issues such as human free will and divine intervention. Quantum mechanics seems to undermine the premise that everything is determined from its initial state. On the quantum level of the tiniest subatomic particles, things are not determined. It is helpful to picture an illustrative experiment. First, imagine that we have set up a machine gun randomly firing bullets in the general direction of a wall with two holes in it and behind that wall is another wall. Obviously, the bullets tend to collect directly behind the holes in the near wall.

Now, imagine that you are watching a sea and there are some breakers, or barriers. The outer barrier has two holes in it, and as the waves come in the barrier stops them except for the two holes, and the passing waves, as they come out of those two holes on the other side, interfere with one another. You will see the waves form an "interference pattern," so that as the waves crash against the inner, you would see that the highest waves are not the ones directly behind the two holes but in the middle between them, where the waves constructively interfere with one another. Then, they get smaller and smaller as they go out. If there had only been one hole, then the wave would have been highest after that hole and the other one would be highest after the other one.

Now, what happens when you shine a light in the two holes? You do the same experiment using a thin barrier with two slits in it and a piece of film like the wall on the other side, and you record the light coming through both holes. If both holes are open, the light pattern on the film will be like the wave pattern on the wall, an interference pattern with many peaks and troughs, as if the light is made of waves interacting with one another. However, we understand light comes in the form of little particles called photons. If you close one of the slits, of course the light is brightest behind the slit.

What happens if you take a piece of film and close one slit at one time and the other slit at the other time and let the light accumulate? What if you leave both slits open but shine one photon at a time over a long period of time so the total number of photons is very large? You do it one time, randomly closing one or another of the slits and another time with both slits open. In the first instance, you see the light collected behind the slits but in the second case you see an interference pattern. How does the light going through a slit "know" if the other side is open or closed? Why is it going to have one pattern if they are both open and a different pattern if one of them is closed? This is especially troubling in the light of relativity theory that says that you cannot have instant communication between distant things. How is this information transmitted? This is a serious question and the dominant interpretation of quantum mechanics that derives from this is that you cannot know both the position and the momentum of a partial at the same time. If you do the same experiment with electrons instead of photons, which you would normally think of as a particles rather than waves, you get the same result.

In other words, everything in the universe seems to interact with everything else, but how? Quantum mechanics has said that the wave involved here is a wave of probability of the particle's position and momentum, and that the position of a particle or the momentum of a particle do not actually exist until they are observed. There is only a probability that the particles are in a particular places or a probability the partial is at a particular momentum. The only way you can ever hope to know the position or momentum of a particle and when you observe it you affect the thing observed; you change it. Therefore, if you ask the question, what is it if I do not observe it? Is the moon there when nobody is looking? We do not know. This is very shocking and hard to believe, and it raises all kinds of questions.

Einstein believed that even if the position or momentum of a particle does not precisely exist at a particular moment, there must be some hidden variable that will determine what it will be at a future moment, and that some day our physics will advance enough to determine what those variables are. Well, some experiments have proven conclusively that Einstein was at least partially wrong. There may be hidden variables but they are not what Einstein would call "local variables." They are not local to the particle. They may be global variables or transcendent variables, but they are beyond the locality of the time and space, which has caused a crisis in the materialistic paradigm.

One scientist, a physicist named David Bohm, tried to resolve this problem.[18] Bohm's very interesting approach boils down to this: Let us accept what is called "the Copenhagen interpretation" of quantum mechanics, that observables do not exist until we observe them. If this is true, we have to assume that reality is divided into two parts, which he calls the explicate and the implicate. The explicate is that which we can observe. The explicate is determined by the implicate, which consists of that which we cannot observe, a whole realm of reality that is forever cut off from our senses. We cannot know it in any way; we only see its effects on the phenomenological world. He calls it explicate and the implicate; we can call it the *shahādah* and *ghayb*.

Notice that this means a couple of things. First, not everything is physics. The *shahādah* is the consequence of the *ghayb*. The *ghayb* may not be physical. Of course, a materialist might say that of course it is material; only physics is hidden from you. Consider the following. A friend walks into the room and another reaches out to embrace him. If it were not a friend, the reaction would be different. What determines whether a person stretches out his arms or not? In the classical mechanical school, many brain atoms that move in certain patterns determine the reaction. Introspectively, one's will drives the decision. The person is happy to see a friend and wants to make a gesture towards him. Where, in physics, is the room for this will? In the emerging paradigm, whether a synapse in one's head fires or not is at the quantum level and therefore is not determined by physics but by will. One can choose whether the synapse fires or not.

In chaos theory, a quantum difference such as whether a synapse fires or not can lead to different chains of events in the macroscopic world, such as whether to embrace someone or to turn away from him. These are questions of human will. There are implications for the divine will when we speak about the entire universe. If a butterfly flapping its wings determines whether a storm goes one way or another in China, this results from Allāh 's will rather than from a decision made by butterflies. Therefore, how one can believe in the laws of physics and pray for divine intervention at the same time is not problematic. If Allāh wants to answer your prayers, He can answer your prayers without contradicting the physical laws He has decreed,

because quantum mechanics only tells you how things are going to probably behave in the collective. It says certain things are improbable to a certain degree.

Something only has a fifty-fifty chance of happening; something else has maybe a one in a quintillion chance of happening or one in a googol chance. The odds that all the air in this room will rise to the top half and we will suffocate to death is not zero, but it is so infinitesimally small that we can ignore it, unless Allāh wills it to happen, in which case, we cannot ignore it. Therefore, miraculous things like all the air in the room going to one side is not a violation of the laws of physics, but is just something very unusual. Alternatively, as the classical era Muslim scientist might have said, it is not the Sunnah of Allāh . Allāh has a Sunnah; he has a usual way of doing things. Quantum mechanics tells you how Allāh usually does things, but then in any given instance, Allāh might do something else and it is not a violation of the laws of physics. It is very consistent with the laws of physics.

Conclusion

Revelatory and scientific epistemes are not mutually exclusive of alternatives but are instead complementary. The former, the revelatory episteme, gives us access to the hidden or implicate order. In other words, we cannot know it directly by our senses, but Allāh can choose to reveal it to us by the methods of revelation that Mahmoud Ayoub has discussed at some length.[19] Such revelations may even come in dreams, since the firing of a synapse in sleep is an obvious interface point between the explicit and implicate? Implicit?. Perhaps we need to be cautious about revelations in dreams, but there may be an infinite variety of means by which Allāh may give us knowledge of the hidden so while we do not see the angels helping us as we fight our battles, Allāh can tell us that they are there.

The latter approach, the scientific episteme, provides us with an understanding of the manifest of the *shahādah* that Allāh does reveal to us through the cognitive process. In the *tawhīdi* worldview, both are sacred. Rather than view the religious as sacred and the scientific as profane, the work of understanding the manifest, the explicate, the *shahādah*, is as sacred as the work of as sacred as understanding the word and meaning of the holy text. The book of nature is also a holy text, and understanding it is also an act of worship.

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[1] Thomas Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago: Univ. of Chicago Press, 1996).
[2] This version was originally published in 1915 in *Punch*. http://mathworld.wolfram.com/YoungGirl-OldWomanIllusion.html.
[3] Imād-ad-Dīn Ahmad, *Signs in the Heavens: A Muslim Astronomer’s Perspective on Religion and Science*, 2nd ed. (Beltsville: Amana, 2006).
[4] For a detailed analysis of Islam’s contributions to the development of the modern scientific methodology see *Signs in the Heavens* op cit.

[5] “And verily in cattle (too) will ye find an instructive Sign. From what is within their bodies between partially digested matter and blood We produce for your drink milk pure and agreeable to those who drink it.” (16:66).
[6] See, e.g., Ahmad, *Signs in the Heavens.*
[7] I want to emphasize the conclusion from my book, *Signs in the Heavens*.
[8] Al-Ghazālī, *The Incoherence of the Philosophers*, Michael E. Marmura, trans. (Provo, UT: Brigham Young University, 2000), pp.8--9.
[9] Narrated from Anas by al-Bayhaqī in Shu`ab al-Imān and al-Madkhal, Ibn `Abd al-Barr in Jāmi` Bayān al-`Ilm, and al-Khatīb through three chains at the opening of his *al-Riḥla fī Ṭalab al-Ḥadīth* (pp.71--76, nos.1--3) “Seek knowledge from the cradle to the grave.” “Seeking knowledge is a duty upon every Muslim (male and female).” Quoted by Khālid El-Dārymlī, “Values, Technology and Society: Islam and Science,” 2005, http://www.slideshare.net/kkkseld/microsoft-word-the-project-islam-and-science/, citing M.

Ḥusain Ṣadar, “Science and Islam: Is There a Conflict?” in Z. Ṣardar, *The Touch of Midas: Islam, Values, and Environment in Islam and the West* (Manchester Univ. Press, 1984), p.15.
[10] Abū’l-Wafā al-Buzjānī, *Book on the Stations on What Scribes and Secretaries Need in the Science of Calculation.* See “Abū’l Wafā Muḥammad b. Muḥammad Buzjānī” in *Encyclopedia Iranica*,
2008, http://www.iranica.com/newsite/index.isc?Article=http://www.iranica.com/newsite/articles/unicode/v1f4/v1f4a083.html.
[11] (21:18).
[12] Pervez Hoodbhoy, *Islam and Science: Religious Orthodoxy and the Battle for Rationality* (London: Zed, 1991), pp 114--115.
[13] Manṣūr Ḥassāb-Elnābī, "A New Astronomical Qur’anic Method for the Determination of the Greatest Speed C," May 10, 2001, http://www.55a.net/firas/english/?page=show_det&id=297. For a refutation of this argument attributed to by Prof. Arnold Neumaier see Dr. Manṣūr Ḥassāb-Elnābī, “Review of A New Astronomical Qur’anic Method for The Determination Of The Greatest Speed C,” http://www.mat.univie.ac.at/~neum/sciandf/eng/c_in_quran.txt.
[14] Ahmad, *Signs*, ch.8.
[15] See Ahmad, *Signs*, p.122.
[16] Ibid.
[17] For lucid and accessible summary of chaos theory see James Gleick, *Chaos*: *Making a New Science* (New York: Viking Penguin, 1987).
[18] See David Bohm, *Wholeness and the Implicate Order* (London: Routledge, 1981).
[19] Maḥmoud Ayoub, “Qur’an As Revelation,” IIIT Summer Institute Proceedings, accepted for publication, 2008.