Keynote Address to the conference on

ISLAMIC CONTRIBUTIONS TO CIVILIZATION

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As-salamu alaikum, wa rahmatullah wa barakatuhu..

Bism Allah-ir-rahman-ir-rahim.

I am honored and pleased to have been invited to strike the keynote at a conference on such an important subject, and one that is so dear to my heart. I am saddened that visa problems have prevented me from being with you in person to deliver this address. I am especially saddened that I am not able to meet you and make a direct contact with the officials and representatives of the organizing institutions, and of course, that I will not be able to make interventions throughout the conference. Those who know me will confirm that I am well known for asking difficult questions, and I will confide to you that I enjoy doing so. I had looked forward to what would be my first trip to India, but I shall just have to wait for another opportunity.

In the classical Islamic civilization, things were different. A Muslim could travel form one end of the Muslim world to another with no passport or visa, and a non-Muslim required only carry a letter of introduction to travel as easily. That brings us to our subject, *Islamic* contributions to civilization. While the mass of mankind has remained completely ignorant of these contributions, the academic world has had two main perspectives. The one that dominates in the West has been that the Islamic civilization was a caretaker civilization that "preserved Greek learning" while the West went through the Dark Ages. This is, of course, a Eurocentric view and is completely inadequate. Islam did not merely preserve Western thought; it discovered and absorbed knowledge taken from Greece and Africa and Byzantium and Persia and India and, later on, even from China. It synthesized and developed that knowledge and added to it. And it advanced beyond that knowledge, creating whole new sciences in the process. Islamic civilization did not invent trigonometry, but the trigonometry of ancient Greece was geometric rather than algebraic. It centered on the chord rather than the sine function, which was invented by the Hindus, and integrated into trigonometry by the Muslims, who added it to it the cosine and the tangent. The ancients did not have spherical trigonometry, which was a product of Islamic civilization.

Of the mathematical sciences the development of zero as a placeholder is an incomparable achievement. There is no doubt that the Arabs received what we now call Arabic numerals from the Hindus, but Islamic civilization developed a digital system well beyond that of pre-Islamic India. Certainly no one would contest that the modern world would be impossible if it had to be designed with Roman numerals.

It is my hope that the contributions of this conference will illuminate and expand the scope and depth of understanding of the amazing variety of these contributions in many different fields of arts and sciences. It is true that the Muslims carried forward Galen's work in medicine to Europe, but to that work was added new technologies such as local anesthetics, and new theories such as the circulation of the blood, and an integrated approach to the study of psyche and soma, and in the practice of medicine doctors considered the mental and spiritual health of the patient at the same time as they examined the bodily functions.

Of the physical sciences my own specialty is astronomy, and the influence of the Islamic civilization in that field has been enormous in ways both manifest and subtle. Among the most manifest examples of that influence is the large number of star names of Arabic origin. Among the least appreciated is the influence of Ibn ash-Shatir on Copernicus. One finds in Muslim apologetics a lot of nonsense about the Muslims having developed a heliocentric theory before Copernicus. This is not true. The truth is more subtle, and more profound. Copernicus's theory for the orbit of the moon around the earth is essentially the same as Ibn ash-Shatir's. The question of whether the earth moves or not is of no significance to this problem. Both Ibn ash-Shatir's and Copernicus' models are based not on Ptolemy's model, but on the simpler and more powerful model of Ibn ash-Shatir's teacher, at-Tusi. The most important element that Ibn ash-Shatir introduced, and that Copernicus retained, is the modification of at-Tusi's parameters so that the model would explain not only the position of the moon in the sky but the change in its apparent size as it moves closer or further from the earth in its orbit. This emphasis on revising the theory in order to comply with ever more precise empirical observations was an innovation of Islam in science beyond its Greek predecessor. It is a step in the transition from the ancient methods of doing science to what we call the modern scientific method.

There is no more import figure transition than Ibn al-Haytham. His seminal work on optics totally overturned the ancient Greek notion that vision is a sense akin to touch in which the eyes send out a probe that senses the visual environment. Instead he demonstrated by experiment that sight consists of the reflection of ambient light from objects into the eye upon the retina, with a psychological element as well that takes place in the brain.

Islamic contributions ranged beyond the sciences and into technology. We find for example the development of passive solar cooling technology. Long tunnels built underground, where the ambient air temperature is only 55°, lead to vents in the floors where the air rises to cool the rooms and the heated air escapes by rising through tall towers. This technology impacts Islamic architecture, which brings us to one of the many contributions of Islamic civilization to the arts. Of architecture, need one do more than mention the Taj Mahal, here in India, which stands as the *sine qua non* of beauty in that field. In architecture and in the spatial arts in general we find Islamic civilization discovering, absorbing, developing, and eventually transcending predecessors and leaving a legacy that influences succeeding civilizations. Among the innovations of the Islamic spatial arts that remain today is the arabesque, whose name attests to its historical origins. The great Western artist Esher spent a year studying the art of the al-Hambra

before inventing his unique adaptation of the techniques he discovered there into his own remarkable artistic expressions. The carpet designs of the Muslim world are still in high demand to this day, and the use of calligraphy in decorative art certainly reaches its high point in Islam. And while conservative Muslims seem as eager as Westerners to suppress Islam's role in the development of representational art, both Persian miniatures and the magnificent achievements of Mughals such as the Shahnama and Hamzanama testify to the reality of those contributions.

Perhaps, as despised among some Muslims as representational art is music, but music is without doubt part of the broader artistry called the *handasah as-sawt*, or the art of sound, that includes such specifically Islamic arts such as the recitation of the Qur'an and, somewhat more controversially, Sufi dance and song. The courtly European troubadours who sang love songs to the lute were the artistic offspring of the Arab troubadours who sang Sufi poetry, filled with metaphors of their love of God to the tune of *al-ûd.*

Above all, I hope that this conference will provide an opportunity to further shore up the views that I myself have advocated in my publications and my teaching that it is the core teachings of Islam that have driven the contributions of which we speak. In particular, I find seven elements of Islamic teachings that contribute to the development of modern science. I believe that the following factors, some of which did not play a significant role in earlier major world civilizations, were conducive to progress in the Islamic civilization:

(1) The Qur'anic mandate to observe nature. The ancient Greeks were rationalists who believed that all knowledge could be derived from first principles. Muslims are taught that everything is by God's will, and that therefore the principles that govern the universe cannot be known without looking at God's signs in the heavens and the earth (and in ourselves).

(2) The universality of Islam, which provides a hospitable environment for the universality favorable to scientific progress. Muslims absorbed the knowledge of earlier cultures, even polytheistic ones like that of Greece and India, because they understood that all truth comes from Allah.

(3) The prohibition of a priesthood. A critical impediment to the spread of knowledge in earlier civilizations was the belief that it must be confined to a elite class. Pythagorus, famous for his eponymous theorem, was the head of a secret society that sought to keep such knowledge from the masses. In Islamic civilization, great thinkers like al-Khwarithmi (from whose name we get the term the word "algorithm") directed his famous book on algebra to a mass audience, and as early as the tenth century Anu'l-Wafa al-Buzjani wrote an opus entitled *Book on the Settling What is Necessary from the Science of Arithmetic for Secretaries and Businessmen*.

(4) The acceptability of material prosperity. A prosperous society can pursue the arts and sciences in a way that a sustenance society cannot. The suspicion, if not downright antipathy, for material prosperity found in certain religions, impedes advancement. In Islam, a religion founded by a merchant, material success is not *harâm* as long as wealth is earned honestly and put to *halâl* use once acquired.

(5) The requirement of freedom of thought. Because every human being is directly responsible to Allah (there being no intermediaries between the Creator and His creature) the freedom of thought that is indispensable to progress is mandatory in Islam. It is popular to quote such verses of the Qur'an as "Let there be no compulsion in religion" in support of this position, but I believe that the shahada itself, "There is god but God," requires it.

(6) The development of careful citation in hadith science. The necessity of subordinating the claims of authority to a scientifically rigorous methodology of determining the authenticity of such claims laid the groundwork for modern requirements of citation. Science consists not only of theory and experiment, but of a careful citing of sources. Before the invention of hadith science we see no such care in ancient literature.

(7) The Qur'anic emphasis on learning and study. The importance of education cannot be overstated. From the very first word of revelation to the Prophet Muhammad (pbuh), "Read!" we see this element emphasized in Islam. It is important, however, to always remember that education is not the memorization of a body of facts, but more fundamentally the acquisition of the faculty of critical thinking that allows one to meaningfully assess, review, and integrate facts.

Finally, I hope that this conference will avoid the pseudoscientific trends into which the exploration of the relationship between Islam and science has too often degenerated. I mean that the Qur'an is not a scientific textbook and that no particular scientific theory, or fact for that matter, should be put forth as a dogma of Islamic belief. The truths stated in the Qur`an are eternal. Scientific truths are always undergoing revision and refinement and are sometimes overturned completely. Equating any eternal truth of the Qur'an with an ephemeral truth of science is to set oneself up for a religious crisis whenever a new scientific discovery puts an old scientific conclusion into doubt.

Islamic contributions to civilization go far beyond the arts and sciences. It is, after all, human behavior that religion seeks to guide. Islamic contributions in the field of ethics lie closest to the heart of what religion is about. So also are developments in psychology, understanding the connections between deep-seated, even unconscious, human motivations and surface desires. It was the Muslim historian Ibn Khaldun who transformed economics from the simple study of the economy of the household or from a set of normative concepts into an actual empirical science touching all of society, and invented the science of sociology at the same time.

In the area of political theory one can review how the Muslim philosophers adapted and revised the works of the ancient Greeks. Or one can consider how the mirror for princes school of writing developed handbooks of pragmatic political advice based on actual Muslim historical analysis, and how this led to Machiavelli's influential version of the genre called *The Prince*. Or, one can go straight to the heart of things and point out how Islamic civilization firmly established the concept that the king was not above the law. It is this principle that underlies the phrase "rule of law" that has acquired such importance in modern discourse about politics. We must remind ourselves that the Magna Carta, which is viewed as being so instrumental in the establishment of rule of law in Western

thought, was imposed on King John by noblemen who had just returned from the Crusades. There they had witnessed how Salahuddin al Ayyubi had governed with a keen understanding that he was as subject to the sharia as anyone else. That the British nobility wanted King John to subject himself to the English common law (rather than to Islamic law) neither undermines nor negates this important contribution to civilization.

In conclusion, I pray the program here will be a feast for the mind, so that when, *in sha Allah*, I see the final published proceedings of this conference, I will be saddened once again, not only to have missed the opportunity to enjoy authentic Indian food (which is among my favorite ethnic cuisines), but to have been absent in person from an intellectual buffet that will cover the wide variety of Islamic contributions to civilization, the ways in which religio-spiritual attitudes and practices abetted those contributions, how the legacy of earlier civilizations was accepted and internalized by the Islamic civilization, and how that civilization in turn has left a legacy for its successors. I pray for all this in the hopes that it may lead to a revival and renaissance of that civilization.

Again, I apologize for the bureaucracy that prevents me from being with you in body. I assure you however that my spirit is with you, and that Allah *subhanna wa ta`alla* is with us all at all times. *Jazâkum Allah al-khair*!

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