How an Obsolete concept of Science impedes the Development of Islamic countries: The Example of Iran

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1. Introduction

The Islamic revolution of Iran, the attacks on the US on 9/11, and the result of recent parliamentary elections in Palestine are symptoms of a much broader movement in the Moslem world – one that the west has failed to understand. . The West is politically far behind the developments underway in the Moslem world. As a Moslem who has been involved in various Islamic groups and as a scientist who has lived long enough in the West to understand its culture and attitudes, I have a unique perspective that helps me to understand how the Moslem world and the West have failed to communicate. I hope to become a part of the solution by offering my unique perspective and experience.

It is still much too early to expect a constructive dialogue between the Moslem world and the West. Half a century may pass before the Moslem world is ready to move decisively to embrace modernity and technological development [1]. But increased collaboration on specific science and technology projects can provide a solid basis for beginning a discussion. While scientific and technological cooperation can easily pave the way for more amicable relations, it can also result in serious and dangerous misunderstandings. This essay is an attempt to reveal where these misunderstandings could occur. In spite of the difficulties, it is important to embrace any action that can pave the way toward a broader dialogue an minimize the risk of conflict between Moslem and Western cultures.

2. Science and 'Elm'

The biggest potential danger in starting to build links between the Moslem and Western scientific communities is potential misunderstanding over basic vocabulary and the underlying concepts and world-views they represent. Poorly constructed translations have led to misunderstandings of the most basic nature. Western concepts of research, science, and scientists do not map directly or easily into terms familiar in Moslem countries.

The word „Elm", for example, is often translated as “science” but in fact this classical term does not represent processes that the West would recognize as science. In Persian a person possessing or being engaged in Elm is called “*ahl-e-elm*”, or „*aalem*". Aalem is a widely used term in Moslem culture. It is a common understanding in Iran that one who is “*ahl e Elm*” is a mullah, a religious scholar. A modern scientist would never be called ahl-e-Elm. The Persian word *daneshmand* is sometimes taken as equivalent to the scientist, but it isn't..

The English term scientist, was coined mid-19.century in England, but the term *daneshmand* is at least a thousand years old. It is a general term for scholar, or philosopher. I have recently coined the term “Daneshgar” to be used as exact translation of the term scientist: a person who has the profession of science. But this new term, being built out of the term *Danesh* not Elm, is not yet widely accepted.

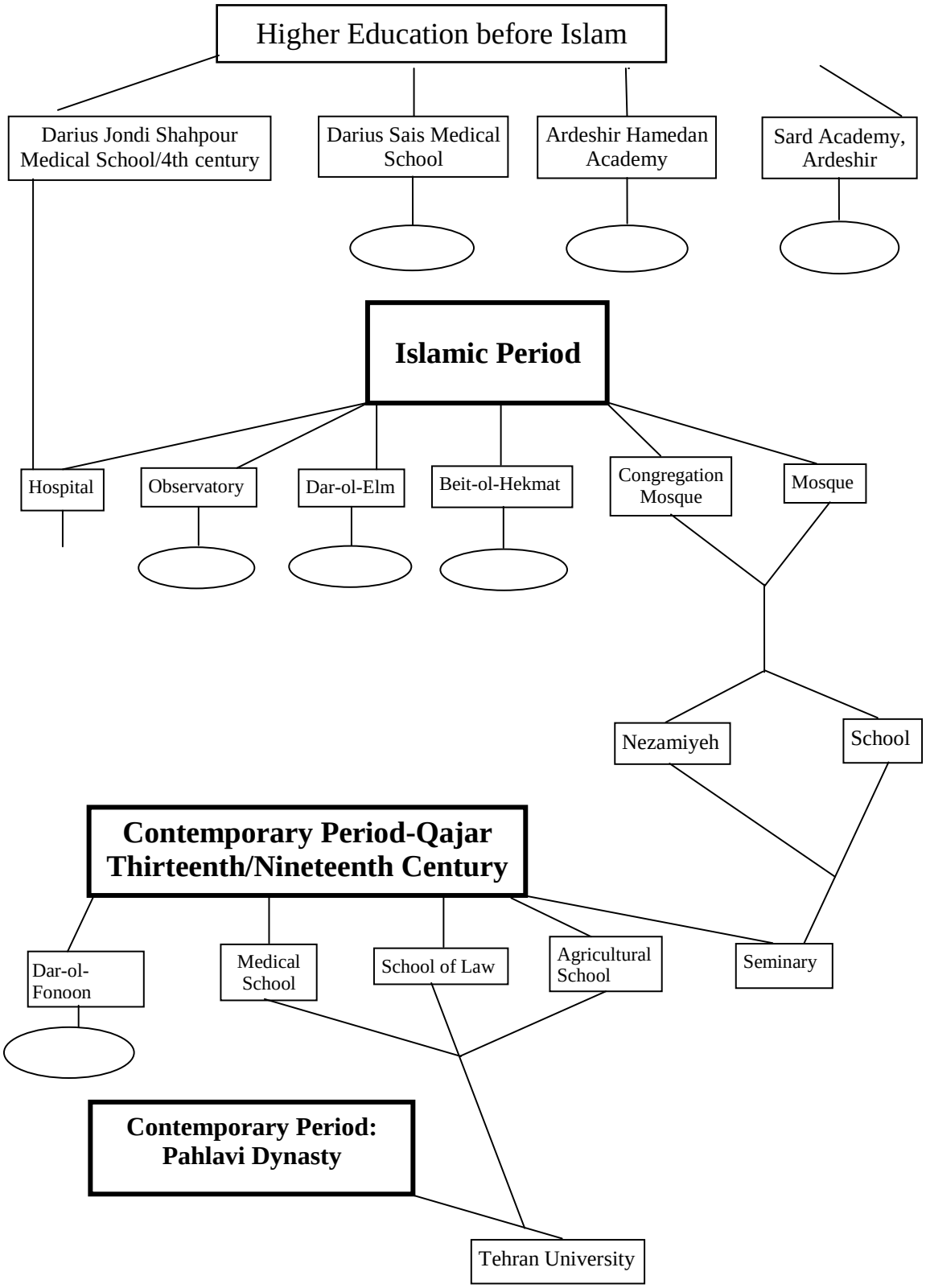
The terms science, elm, and danesh refer to different concepts. These differences, are not only a linguistic problem; they, have a very deep impact on the development policy of Iran, and in all Persian and Arabic speaking countries. There is still no common understanding of what modern science means. We still have difficulty conveying the difference between modern science and Elm – the difference between a modern scientist and a religious scholar. This is one of the major challenges faced in the Moslem world and a very obvious obstacle on the course of modernization and development in Islamic countries. It has had far reaching effect on different S&T policies of the past decades and it seems that there is no end to this misunderstanding in sight.

3. A short history of the higher education in Moslem countries: example Iran

The Persian term „daneshgah", equivalent to university, is about 70 years old, but the history of„ "higher education" in Iran dates back to pre-Islamic times. There is, however, almost no continuity in the educational institutions in Iran and the Moslem world. The following diagram shows how the system has evolved over time. As can be seen from this diagram, the only educational institution still operating, albeit in a form that has changed significantly from their original „liberal" traditions as universality, are the seminaries.

3.1 Educational institutions before Islam

No educational institution in the Moslem world has a tradition dating to the pre-Islamic era, with the exception of the Persian Jondi-Shahpour medical school. Jondi-Shahpour must have been established before the fourth century A.D. It was particularly significant during the reign of Anushirvan, the Sassanid king. There is evidence that Shapur-ibn-e-Sahl, who died in 255 A.H./nineth century A.D., was the last physician and dean of Jondi- Shahpour medical school. The tradition of this school/ hospital was transferred to medical schools during the Islamic era. With more than 500 years of history, Jondi Shahpour has been the most stable educational institution in the Moslem world, except for the seminaries.



Development of educational institutions in Iran: Jondi Shahpour Medical School was the only pre-Islamic institution transformed into Islamic educational institution. Theological seminaries are the only educational institutions still active today that are rooted in early Islamic period.

3.2 Educational Institutions in the Islamic period

While information about the early history of educational institutions during the Islamic period is quite meager, we know much more about them than their pre-Islamic predecessors. [2]. Institutes such as Dar-ol-Elms (science schools), Dar-ol-Kotob (libraries), Darl-ol-Hekma (schools of Natural Philosophy), Dar-ol-Hadis (Hadis schools), Dar-ol-Qurans (Quran schools), congregation mosques, mosques, and Madrasehs have functioned as education centers since the 2nd century AH/ 8.th century AD. Hospitals and observatories are operated as educational centers. Throughout the Islamic world, institutions of higher education were called Nezamieh. Their curriculum included Islamic theology, sciences, and philosophy. After the fifteenth century, however, there was a gradual decay of natural philosophy in these institutions following a shift in the concept of science in Islamic countries. While in principle science was still taught at the Nezamiyehs, and seminaries, in fact natural sciences as it was formerly practiced, was almost completely dismissed from these educational centers. Education was reduced to religious education and the concept of science was reduced to religious sciences or at most what religious scholars defined to be sciences. In fact science was divided into “useful” and “harmful” science. This distinction allowed conservative Moslem scholars to narrow instruction in science to the minimum immediately needed for daily life -- such as some arithmetic and lunar astrometry. This approach, which is still alive in the Islamic world, left a distorted concept of sciences, not only in the seminaries but also in the mind of all Moslems, irrespective of their social rank and level. Even the so-called secular Moslem intelligentsia are affected by this distorted concept of science. The importance of route memorization throughout the educational system of Moslem countries is a sign of the dominance of this concept of science.

It is a sad irony that the great 10th century Persian scientist Farabi developed a detailed classification system and definition of sciences but almost nothing of his work was implemented in the Islamic schools.

The decline in the dar-ol-Olooms (schools of sciences), the growth of religious schools, the reduction of science concept and its appropriation to religious thoughts in Islamic civilization coincides with the arrival of early Turkish rulers, such as the Sljuks.. The changes began a process of distorting the concept of science in the Moslem world that continues to make it difficult for Moslems to understand the modern world and its achievements.

For a Moslem, Islam is superior to any ideology or religion. For religious scholars - who are also perceived as scientists or „aalem" - it is hard to accept the superiority of modern societies. Moslems do not recognize the extent of the scientific revolution that has taken place in the West. The scientific breakthroughs that were set in motion by Newton or Einstein, also marked the beginning of an ever-growing gap between Western and Moslem understanding of science. Modern scientists of Islamic countries have failed to educate leaders and citizens about the advancements in science at every level, ranging from failing to introduce new terms and concepts so fundamental to understanding science, to accurately portraying the evolution

of the human thought in the last three centuries. Contrary to what Western politicians believe, those in the Moslem world most susceptible to modern thoughts are not the so-called secular scholars who fail to grasp the essence of modernity, but those who have absorbed the indigenous culture and the Islamic way of thought, and are willing to incorporate positive changes that they deem essential to their cultural evolution.

Even today, the term aalém refers not to academic experts but to mollah"s and teachers of religious seminaries. An aalém prompts much respect in the society, and there are many historical examples of the high esteem paid both by the community and rulers to an aalém. Even now, there are numerous religious schools around the Islamic world, some which with a long tradition, like Al-azhar in Egypt, Najaf seminary in Iraq, and Qum"s Feyzieh in Iran.

4. The philosophy behind establishing modern higher education institutions in Iran.

The most important establishments of higher education in modern Iran are Dar-ol-fonoon and the Tehran University. I will briefly elaborate on the motivation behind establishing these institutions.

4.1. Dar-ol-Fonoon.

The first polytechnic of Tehran, called Dar-ol-Fonoon, was established about 150 years ago. Newspapers of the period reported[3]:

> "Last year the Trustees of his Excellency decided to establish a Ta"limkhaneh (instruction house) at Tehran"s Soltani Arg Square to teach and advise sciences and technology…"
>
> "a large and right building has been constructed in Tehran"s Arg Square for the education of all techniques and is named Dar-ol-Fonoon and it is the intention of his imperial majesty that the children of his government learn some sciences not prevalent in our government"

The main motivation was to solve certain administrative issues and to "learn some sciences not prevalent in our government". The need to establish Dar-ol-Fonoon was determined not by scholars or intellectuals, but by rulers and politicians. Lack of enthusiasm and appreciation regarding the new scientific institution caused the Nasseredin Shah of Persia, who had ordered the establishment of Dar-ol-fonoon, to second-guess his decision and to agonize over its potential "evil consequences". Consequently, hasty decisions were made regarding the selection of teachers and instructors of Dar-ol-Fonoon. For example, the lecturer in physics was an Austrian army artillery instructor named August Kruiser., whose recently published

lecture notes by the Physics Society of Iran reveal how unsophisticated his physics knowledge was.

4.2 Tehran University

Although Dar-ol-Fonoon preceded the establishment of Tehran University by seven decades, the lack of motivation and enthusiasm that prevailed at the time of Dar-ol-Fonoon was also observed at the commencement of the Tehran University. In a letter to Issa Sadiq at the University of Columbia dated March 30, 1932, Teimurtash, Reza shah"s minister of the court, wrote [3]:

> “you are requested to study the number of teachers and the kind of facilities needed for the establishment of a Dar-ol-Fonoon offering medical pedagogy and road building engineering (paved roads and railways) in Tehran and also to find out about the approximate costs. We look forward to hearing the result of your investigation.”

Explanations provided by Issa Sadiq [4] and the statements of Mahmood Hesabi, who, as the founder of the modern physics in Iran, had a crucial role in the design of the college of sciences and engineering, show that the prevailing motivation for the establishment of Tehran University was to train teachers.

It is interesting to know Issa Sadiq"s opinion about research:

> During the establishment of the colleges of literature and sciences I recognized that the objective was not merely to train a number of students in a subject, but research should also be one of the aims of a university. To achieve this goal, first of all, lectures taught by professors were limited to their special fields. Therefore, a professor of geography was not assigned to instruct history as far as possible...and they were asked to translate important resources they had used for their lectures, for publication.

Considering translation and preparing lecture notes as a research activity in 1932, i.e. 25 years after the scientific revolution of the theory of relativity and 7 years after the second scientific revolution of the last century on quantum mechanics, is a sign of distorted concept of science and research still dominating the scientific life in the Moslem world. One should bring in mind that during the same period Raman and Bose, two Indian physicists, were engaged in researches leading to their Nobel Prize in another third world country.

5. Is there any science in the Moslem countries?

This challenging question refers to the slow development of science and technology in Islamic countries. Between the 9th and the 15th centuries, science seemed to flourish throughout the Islamic world by the way of many educational institutions created.

In the modern era, despite the proliferation of institutions, lack of a scientific community did not allow science in the Islamic world to go beyond an imitation of what had already been done. To my knowledge, there are no independent studies to prove the existence of a "scientific community" within the Moslem world, except for a claim put forth by certain authors that Iran is on the verge of forming such a community[5] Below, you will find a list of factors that are representative of how the absence of a scientific community paves the way for pseudo-science, hence, hindering willing individuals from excelling in Moslem countries.

1. In the modern world, science is just an influential entity as religion, state, or government. **(?)** In the Moslem world, however, science represents two conflicting views; one rooted in the social psychology of Moslems as "elm," and the other as modern science that provokes ambiguity and is therefore, resisted by the society. The latter can be likened to a jigsaw puzzle that is missing many pieces but also has other parts that are put together the wrong way. Individual scientists, mostly educated abroad, are representative of the mismatched section of the science puzzle, as their scientific experiences are pertinent to that industrialized country alone. Different individuals trained according to different principles tend to cause a clash of ideas that rids the society off its collective scientific experience.
2. No university in the Moslem world ranks in the top 200 universities in the world.

To put this in perspective, it is important to note that Moslems account for 20 percent of the world population: A sign of negligence regarding science in the Moslem world.

3. In addition to national academies, there is the academy of sciences of Moslem countries. None of these plays an essential role in fostering the development of sciences or science policy in the Moslem world. These are mostly nominal institutions designed to deceive the world community and to provide representation in international scientific community. Although members of these institutions are mostly chosen by political motives, they claim to be merit-based, where the term „merit-based" is controversial as it is defined by the very same leaders. Anyone opposing these terms can be identified as a traitor, as it is a common practice even among the most secular of Moslem countries to defend political and religious institutions by labeling individuals who dare to speak against them. There is no scientific community and not a critical mass of scientists to oppose such institutions which

fulfill political motives. It is interesting to note that within the traditional „aalems", the religious scholars, the term “merit–based” is highly estimable, as a legacy of old traditions.

4. Unless Moslem countries are ignorant of the Science and Technology indices, they are trying to cope with the gap through inefficient means such as by „data fabrication" or by establishing various committees with no emphasis on scientific advancement. One example is the creation of numerous committees to pinpoint the impediments to development in S&T., where working groups and committees headed by incapable scientists do not solve but impose more restrictions on S&T policy discussions. While the lack of a critical mass of professional scientists underwrites the absence of R&D, the Iranian government continues to solve this problem through creating yet more committees: In the last 20 years, such committees have been established in Iran: with the same agenda, same people, and same results,

5. Pitfalls of scientometric studies: The standard terminology of scientometrics should be applied with respect to the Moslem world. Terms like R&D expenditures, government budget appropriation for R&D (GBAORD), higher education expenditures on research and development (HERD), basic - and applied - research, experimental development, research projects, technology, technological product and process, number of students, scientific publications, number of scientific journals, R&D personnel, and number of patents have different connotations and do not necessarily transcend to the Moslem world. Even simple concepts like "university" can have a different meaning: A small building with just an enrollment office and some class-rooms, without a library, labs, workshops, computer room and faculty is hardly representative of the western concept of „university." It is not difficult to draw more examples of similar words that have widely different associations in the western and Moslem world. It is sufficient to compare the different scientometrics or technological terms used in Iran with their definitions in the Oslo– or Frascati–Manual to see how they differ. Due to complexities inherent to social and political events of the past two decades, Iranians developed a system in which imitation of S&T and R&D advancements is encouraged.

A RAND study lists countries in the following categories: scientifically advanced; scientifically proficient; scientifically developing, and scientifically lagging. While most of the Moslem countries are categorized as „scientifically lagging," only Egypt, Indonesia, Iran, Pakistan, Turkey, and Uzbekistan perceived as scientifically developing countries among the Moslem world.

Given these facts, it would be an overstatement to claim that modern science is present in the Moslem world. There is an urgent need to encourage a scientific community among Moslems and help it to reach a critical mass.

6. Excellence in Science and Technological Innovation: making Dialogue possible

Science and Technology are often perceived as engines of economic growth,, infrastructural social development, and as a democratizing agent. This frame of thought is responsible for the growing interest in the West to increase scientific and technological cooperation with the Islamic world since 9/11[6].

The Moslem world has lagged behind at all aspects of S & T; from primary education to industrial and academic research, although the degree of disproportion is varied

It is too naïve to assume that without correcting the perception of science and technology amongst the Moslem intelligentsia and technocrats, there will be a real acceptance of modernity and a constructive dialogue. The Moslem challenge will be enduring as long as the dichotomy of „elm" and „science" exists. Unless this disparity is resolved, any attempted development will be superficial and will benefit only those who idealize the superiority of the Moslem culture and promote the decay of the Western civilization; hence tainting what could otherwise be an encouraging dialogue. Moslems should try to foster dialogue that develops the notion of science and attempts to fill the gap between science and „elm". Previous attempts by western states to initiate dialogue by focusing on Moslem countries human rights records have been in vain. The subject of human rights has not only to be proved to be ineffective, but has led to and will continue cause more misunderstandings; mostly due to the international political behavior of the West in the last two hundred years. We have also been witnessing an influx of science that consists mostly of poor translations and imitations to the Moslem world strengthening the distorted notion of science, thus further emphasizing memorization as the main learning tool. Science education at universities is reduced to reading some books or memorizing some scripts prepared by the lecturer based on the decade-old books they read during their educations. Memorization is accepted as the main tool of education due to the experience of the seminaries and their respected rankings in the society.

Given these presumptions, I would like to stress some facts pertaining to the importance of international science and technology collaboration of Moslem world as a conclusion:

1. The current lack of capabilities in the Moslem world may be common to the rest of the developing world. But the unique historical strength of S&T at the forefront of human knowledge, the challenge of peace in the Middle East, and the Islam-phobia fueled in the US after 9/11 are indicative of the need to distinguish and categorize “Islamic World” from the rest of the developing world. as far as S&T cooperation is concerned,

2. Common people, scientists, and scholars in the Islamic world are living in a conceptual schizophrenic psychological situation: The glory of the past, the unique historical contribution to S&T, an existing elaborate system of terms for science and technology, like “Elm” and “San' at” referring not to the modern concepts of S&T but to anachronistic concepts of the post- glorious era, being in a miserable

developmental and political status, together explain why Islamic countries are trapped in nostalgia that blurs the reality and results in their lagging behind.

3. Science and Technology can function as democratizing agents.. A key to changing the way people think is by promoting "critical thinking", which embodies the ability to draw logical conclusions, and to detect broken conceptual links. The scientific way of thinking enables us to assess whether facts fit theories and models, to differentiate between assumption, prescription, deduction, proof, hope, faith, possibility, probability, and certitude.
4. There are plenty of scientific and technological institutions in the Moslem world, none of which based on a sound epistemological basis regarding the modern concept of science and technology. The term used for the concept of modern science in almost all of the Moslem countries, i.e. “Elm”, is predominantly synonymous to theology and its methodology, even when applied to modern areas like physics, chemistry, or sociology. One of the consequences of this fact is memorization at all level of the education and science education.

Looking at these conclusions and taking into account the facts mentioned before, we may reach some conclusions towards accelerating the process of evolution of the Moslem world with respect to modernity, S&T development, and fighting chronic poverty:

1. Allowing for scientists in small communities to be integrated into the international scientific community.
2. Providing occasions for advanced scientists in the Moslem world to cooperate with the scientific communities of the developed world based on true merit.
3. Independent of the level of S&T attained, excellence in education, research and development should have the absolute priority.
4. Helping to establish world-class research centers, at least one top-ranking university in the Moslem world.
5. Terrorism is not always related to poverty. Actual or perceived terrorism attributed to the Moslems is rooted not in material poverty, but in the absence of modern concepts. Terrorism that spurs from backwardness is rooted neither in the poorest Moslem countries, nor in those with dynamic science and technology programs; but in the richest one. Fighting its roots is only possible through filling the conceptual gap we are witnessing. This can only be achieved by promoting excellence in science and technology.

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