

What do you understand to be Islam's position regarding science – is there anything inherently anti-science in it? Does it encourage scientific research? Is the idea of "Islamic science" at all useful?

I don't think Islam is any more anti-science than Christianity or Judaism. But all religions are fundamentally different from science both in goal and method; their survival and propagation are based upon faith and obedience whereas science would come to a stop if it ceased to challenge and question whatever scientific beliefs exist at a given point in time. That the state of science in today's world is different in different religions is simply because some religions are practiced with greater seriousness than others. A literalist understanding of any holy text inevitably puts it on collision course with science. The conflict is very deep: according to Islam, as well Christianity and Judaism, the world is governed by a God who responds to prayers and intervenes in physical processes.

If science is understood as a search for the causes underlying natural phenomena then, for the faithful of any religion, although some knowledge of the physical world can be gleaned from using the tools of science, the ultimate reason for why something has happened can be found only in the mind of God. Predictions are possible but only in a limited sense because He is not obligated to abide by the laws of physics. When angry, He may choose to send floods or drought, set mountains quaking, or rain pestilence from the skies – even if any of this involves physical principles being overruled. Although science considers geological phenomena to lie within its domain, Islamic authorities across the world held the 2004 tsunami and 2005 Pakistani earthquake as expressions of divine wrath.

What have been the most important contributions to science made by scholars in the Muslim world in recent years?

Two scientists, who won Nobel Prizes in physics, stand out in this regard. Abdus Salam, together with Steven Weinberg and Sheldon Glashow, is responsible for creating the Standard Theory of particle physics. This is a theory of monumental importance and has withstood every single test carried out to date in huge particle accelerators. Salam's sect, however, is considered heretical by mainstream Muslims. Ahmed Zewail, an Egyptian-American, developed a very important technique in femtosecond chemistry that allows one to take snapshots of certain chemical reactions in real time. At the second tier, there are Muslim scientists who have done well and obtained professorial positions in good universities in the West. However, they are few in number compared against scientists from China and India.

Why is there comparatively little scientific research done in Muslim countries today? What is holding it back?

Science can prosper among Muslims only if there is a willingness to accept certain basic philosophical and attitudinal changes – a *weltenschaung* that shrugs off the dead hand of tradition, rejects fatalism and absolute belief in authority, accepts the legitimacy of temporal laws, values intellectual rigor and scientific honesty, and respects cultural and personal freedom. The struggle to usher in science will have to go side-by-side with a wider campaign to elbow out rigid orthodoxy and bring in modern thought, the arts, philosophy, democracy, and pluralism.

The quality of science is totally dependent upon the quality of teaching. Most universities in Islamic countries have a starkly inferior quality of teaching and learning, a tenuous connection to job skills, and research that is low in both quality and quantity. Poor teaching owes more to inappropriate attitudes than to material resources. Generally, obedience and rote learning are stressed, and the authority of the teacher is rarely challenged. Debate, analysis, and class discussions are infrequent. Academic and cultural freedoms on campuses are highly restricted in most Muslim countries. At Quaid-i-Azam University in Islamabad, where I have taught for nearly 40 years now, the constraints are similar to those existing in most other Pakistani public-sector institutions. This university serves the typical middle-class Pakistani student and, according to the survey referred to earlier, ranks number two among OIC universities. Here, as in other Pakistani public universities, films, drama, and music are frowned on, and sometimes even physical attacks by student vigilantes who believe that such pursuits violate Islamic norms take place. The campus has three mosques with a fourth one planned, but no bookstore. No Pakistani university, including QAU, allowed Abdus Salam to set foot on its campus.

Is there any rise in the number of scientific papers being produced by scholars in Muslim countries? Is that changing - are we seeing a renaissance in science in Islamic countries today? Where?

Publications have hugely increased in the last 10-15 years across the world. This holds in practically every country, non-Muslim and Muslim. But I think the number of papers has almost ceased to be a measure of progress. Assessing the scientific worth of publications—never an easy task—is complicated by the rapid appearance of new international scientific journals that publish low-quality work. Many have poor editorial policies and refereeing procedures. Scientists in many developing countries, who are under pressure to publish, or who are attracted by strong government incentives, choose to follow the path of least resistance paved for them by the increasingly commercialized policies of so-called international journals.

How much collaboration is there between scientists in Muslim countries?

Effectively there is not any. The center of gravity of science lies far from any Muslim country. This why COMSTECH and ISESCO, which are organizations aimed at creating scientific linkages between Muslim countries, have flopped. The few projects funded by these organizations are in fairly pedestrian areas that are far from the cutting edge of scientific research: water, sanitation, pollution, camel-breeding, etc. At a recent COMSTECH meeting in Islamabad, there were discussions of how to scientifically differentiate between *halal* and *haram* foods.

Do you think there is any difference between Arab and non-Arab Muslim countries in terms of the contributions to science? Which countries are leading the way in scientific research in the Muslim world?

Iran and Turkey offer some relief in an otherwise bleak situation. Their universities and schools appear to be qualitatively better, and scientific research more fruitful and advanced. Iran, the most intellectually advanced country of the Muslim world, is a country that boasts an educational

system that actually works. Ayatollah Khomeini was quite content to keep science and Islam separate—unlike Pakistan’s leaders who have made numerous absurd attempts to marry the two. Khomeini once remarked that there is no such thing as Islamic mathematics. Nor did he take a position against Darwinism. In fact, Iran is one of the rare Muslim countries where the theory of evolution is taught. Moreover, it is a front-runner in stem-cell research – something which President George W. Bush and his neo-conservative administration had sought to ban from the United States.

Are scientists from Muslim countries leaving to go and work elsewhere? If they are, why? Is it because of money? Freedom? Do you see great work being done by Muslim scholars living outside majority Muslim countries? Does that then suggest that at least on an individual level, there is nothing to prevent a practicing Muslim also producing great scientific work?

Scientists from Muslim countries often seek to stay in developed countries. The reasons are mixed: better working conditions and pay, greater freedom, and more professional satisfaction. Of course, getting a research or academic job is often highly competitive and only a fraction actually succeeds.

What are the challenges of working in a Muslim country? How do they differ to those elsewhere? Have you felt constrained in your research in Pakistan? If so, in what way?

The main difference is attitudinal. Leaders and administrators are not interested in ideas; they want conformity. The level of knowledge and professional interest in faculty and students is lower than one would find in universities in the West, or even in India. Getting a degree is a drudgery for most students. Only rarely does one find the student who is excited about learning something new, and keen to take new learning initiatives. University graduates who can find no other job become college or university teachers, and this perpetuates the cycle of poor teaching and learning.

Is there a focus on science with practical benefits rather than a push for pure scientific research for its own sake in research institutes in the Islamic world?

Utilitarianism is the strongest reason for pursuing science everywhere, but it is particularly strong in Muslim countries. One actually sees a denigration of theoretical knowledge that is more intense than elsewhere. Just last week I met a young researcher who had returned from Germany after doing his Ph.D. on cosmic black holes. His vice-chancellor told him to do something useful rather than chase wild ideas.

Is there any evidence that Islamic concerns have acted as a spur to any kinds of scientific innovation, eg in astronomy or other sciences?

Scientific innovation was initially spurred by certain religious needs such as the desire to make accurate clocks for prayer timings, finding directions towards the Holy Kaaba, and working out various Islamic inheritance problems. These are no longer relevant in the age of atomic clocks,

GPS, and computers.

To what extent is there a debate about evolution in Muslim countries today or does that remain taboo?

In the contemporary Muslim world, attitudes towards Darwinism are mixed. Teaching of the theory of evolution is allowed in Turkey, Egypt, Iraq, Iran, Indonesia, and perhaps some other countries. However, it was removed from the syllabus in Pakistan in the regime of General Zia-ul-Haq, and is expressly forbidden in Saudi Arabia and Sudan.

Is there any evidence that the Arab spring is having any effect on science in the Middle East? If not yet, do you think it might in the future?

The Arab Spring was in response to autocratic stability and despotism, which are largely responsible for keeping the Arab world in darkness. It was not for a cultural or scientific renaissance. So one should not expect a scientific revival to be around the corner. An Arab renaissance will happen only if appropriate cultural and attitudinal changes follow the political changes. How fast, or slow, these countries move into the 21st century will depend on how Arabs choose to reinvent their way of life.

Muslim Arabs will have to cast off the false, but widely held belief, that science is somehow contained within their religion. They must reject the notion that supplications to the powers "up above" can actually change material outcomes. The existing "inshallah" culture - which denies causality and puts the onus on God for everything – is unsupportive of science and, in fact, antithetical to it. Existing attitudes have meant that Arab science, at best, has been limited to adapting some available technologies to meet immediate ends.

Arab work habits are poor, and there are frequent interruptions for the purpose of fulfilling religious rituals. To become competitive with the modern world, punctuality and adherence to man-made rules will need to improve dramatically. Also, the strictly utilitarian view of science as a mere handmaiden of technology must give way to a realization that humans are inventors, not mere discoverers.

One must welcome the Arab Spring in so far as it is a hope that inspires change in a part of the world which, so far, has learned to consume but not produce. The realization that there is something deeply wrong may yet spur the deep introspection needed for changing cultural mores and the way of life.

I believe you are leaving LUMS after December. You have said that you recently faced a lot of criticism when you introduced a course titled Science and the Contemporary World Order which discusses science, religion and politics. Was it religiously-based? What do you plan to do next?

The course was one that would have been welcomed in universities outside Pakistan but is judged to deal with sensitive content here. My goal was to give students a wide exposure to the world of idea. The response in this course, as well as in my physics courses, has been

overwhelmingly positive but LUMS has consistently refused to explain why they did not renew my contract. While I do not know what pressures were put on the administration, internal or external, the fact is that I am out of a job. What happens next I cannot tell.

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