Science Education and Religious Belief: some philosophical perceptions and practical strategies

Dr Nasim Butt

The scientific enterprise is erected upon a certain philosophical and metaphysical base which is seldom questioned by practising scientists. If, therefore, one removes oneself from the universal domain of the practising scientist and enters the parochial den of the philosopher of science, one is subjected to a deluge of questions about the nature and validity of scientific knowledge, and how this knowledge is achieved: what are the methods of science? How does science differ from other disciplines? What are facts, laws and theories? What is 'truth' in science? How does science progress? Answers posited to such questions have challenged the belief that scientific knowledge is *certain* knowledge about how nature works, revealed by careful, *completely objective* observation and measurement. Instead, a dynamic view of science emerges, in which man's creative imagination plays an important part and in which complete objectivity, although patiently striven for, can never be achieved. Although a considerable consensus among scientists exists about the knowledge which results from their activities, scientific knowledge is nevertheless tentative and uncertain and influenced by numerous social and cultural factors.

It is crucial to appreciate that scientific knowledge is not an objective, literal description of reality (no such description being possible), it is an uncertain and tentative way of *imagining* or *representing certain aspects* of reality. This view immediately suggests explanations for failures in Western science, the modern science practised almost universally, including those Muslim states ruled by westernised elites only too happy to emulate the West in the name of progress and development. Take, for example, the thalidomide case, the unwanted side-effects of science (such as pollution) and the progressive destruction of the stratospheric ozone layer through the excessive use of aerosols and refrigerator fluids produced as a result of the capitalist entrepreneurial tendency. Western science is a very narrow epistemological path: we must, therefore, be prepared for the unexpected when such partial knowledge possessing elements of uncertainty is technologically applied.

It is my belief that science cannot be taught without its value-laden philosophy. Science is not value-free, objective and neutral. In fact, in a post-Kuhnian world[1] it is untenable to talk about such an intellectually transcendental type of science. Every factual statement that science produces has a number of underlying assumptions which are usually unquestioned. Consider the fact, for instance, that 'pure water boils at 100°C at 101.3223 kN/M^2'. Could any honest and diligent person 'find' that fact, where 'find' means determine in some way other than looking it up in a book of data? The answer must be 'no', because before anyone could make such a statement after observing water boiling, he or she would have to have concepts of 'boiling', 'temperature' and 'pressure', know how to use a thermometer and have access to both a barometer and a supply of pure water. The conclusions to be drawn from this are (1) that facts are not 'things' but statements which are made after observation, (2) that observation in science may require the experienced use of tools, and (3) that statements of fact incorporate concepts which must be understood before the statements can be made. Clearly, such facts are not simply 'found' in nature.

It is a matter of great regret that existing science education locates in the students' minds an impression that this narrow epistemological path is the 'only' approach. It is my view that students should gain some understanding of the historical development

and contemporary cultural significance of scientific principles and theories. They should also appreciate that past scientific explanations were valid in their own time and that early technologies are still valid in some cultural contexts. Unfortunately, however, much of school science as currently presented does not encourage the development of these aims.

I view with cautious optimism, therefore, statutory developments in the science curriculum. In the Programme of Study for Key Stage 4 (years 10 and 11 in accordance with the National Curriculum age grouping), under the heading History of Scientific Ideas[2], the statutory document states:

> Pupils should be given opportunities to develop their knowledge and understanding of the ways in which scientific ideas change through time and how the nature of these ideas and the use to which they are put are affected by the social, moral, spiritualand cultural contexts in which they are developed; in doing so they should begin to recognise that, while science is an important way of thinking about experience, it is not the only way. (1A)

These ideas have now been incorporated in Attainment Target 1 of the science curriculum, namely 'Experimental amd Investigative Science' (post-Dearing review developments. These are encouraging words from the Department for Education and Employment (DFEE), but how and in what way they will be implemented in schools remains to be seen. Suffice it to say here that Muslim science teachers and educationists have the opportunity to play an important and constructive role in the implementation of this key passage. Subsequent paragraphs will show why.

Current science texts retain some Greek names, notably that of Archimedes, but the emphasis is on 17th, 18th and 19th century science. The names in a secondary school physics book might include the following: Galileo (1564 – 1642 CE), Boyle (1627 – 1691 CE), Hooke (1635 – 1703 CE), Newton (1642 – 1727 CE), Coulomb (1736 – 1806 CE), Watt (1736 – 1819 CE), Volta (1745 – 1827 CE), Young (1773 – 1829 CE), Ohm (1789 – 1854 CE), Faraday (1791 – 1867 CE), Ampere (1800 – 1864 CE), Joule (1818 – 1889 CE), Kelvin (1824 – 1907 CE) and Maxwell (1831 – 1879 CE). Very little is ever made of the cultural contexts in which they worked and, more significantly, no reference at all is made to the seminal work in science and technology performed by Muslim scientists such as Ibn Sinā (d. 1036 CE), Ibn al-Haithām (d. 1040 CE), Al-Birūnī (d. 1051 CE), Ibn Rushd (d. 1198 CE) and Ibn Nafīs (d. 1288 CE).

School chemistry and biology are equally culpable. Chemistry, for example, dismisses the contribution of early chemists by labelling them 'alchemists'. Yet it is clearly nonsense to believe that all early scientists were only trying to make gold, or that they did not lay the sound foundations upon which Dalton (1766 – 1844 CE) and others could base the atomic theory. The work of the Muslim chemist Jabir Ibn Hayyān (d. c. 815 CE) is particularly relevant in this regard. Also, quite significantly, the fact that much of Newton's work could be termed 'alchemy' is conveniently ignored.

The danger inherent in the present situation, then, is that students can emerge from schools with negative images of the science of non-Western societies. More significant for us, however, is that Muslim students will emerge from schools with either a negative perception of Islāmic science or, perhaps equally disastrous, no perception of Islāmic science at all. It is crucial, therefore, for some history of science to be included in school science courses and, concomitantly, for European science to be placed in a world perspective instead of the present Eurocentric impression of a global enterprise universally applicable. In addition, posters displayed in the classroom or laboratory could help to create the necessary awareness which could also be reinforced with appropriate passages

and illustrations from textbooks and, for Muslim scientists, the *Qur'ān*.

Students should also, I believe, explore topics or themes which exemplify the limitations of scientific knowledge. The notion of science as an omnipotent enterprise able to solve all man's problems is now a decadent idea. With the growth of the environmental lobby in the West, people are much more sceptical about the ability of science to improve the quality of their lives. The implications of producing transgenic organisms, the social and environmental catastrophe that modern technologies can bring about and the much-debated research on human embryos are all examples of topics which produce interactions between moral and scientific perceptions. In Islām, however, the students should understand that the religious perspective is much clearer. Indeed, in order to provide guidance to their scientists, early Islāmic philosophers attempted to classify sciences as either 'praiseworthy' or 'blameworthy'.

Students must be made aware of the fact that different civilizations have different world-views; that science and technology is a product of this (the Western) world-view and would consequently be underpinned by different assumptions in different civilisational contexts. This has been to some extent admitted by the Secondary Science Curriculum Review (SSCR) working under the aegis of the Association for Science Education (ASE) and the School Curriculum Development Committee (SCDC)[3]:

> Science is, after all, an activity of human beings, acting and interacting. In fact it is a social activity. Scientific endeavour, including the development of technology, is determined by the cultural, religious, environmental, political and economic factors, and it is an activity in which the entire human race has been and is involved.

The Islāmic perspective, of which the students should be aware, is that the epistemological unilateralism of Western science is just one aspect within the overall conceptual framework of knowledge. One of the best articulators of Islāmic epistemology was Imām Abū Ḥamid Muḥammad Al-Ghazālī (1058 – 1111 CE), who was a professor at the Nizamīya Academy in Baghdād. Al-Ghazālī analysed knowledge in his *Book of Knowledge* on the basis of three criteria:

1. **The source**
   (a) Revealed knowledge, acquired from the Prophets and not arrived at either by reason, like arithmetic, or by experimentation, like medicine, or by hearing, like languages.
   (b) Non-revealed knowledge, the primary sources of which are reason, observation, experimentation and acculturation.
2. **The level of obligatoriness**
   (a) Individually requisite knowledge *(Farḍ 'ain)*, that is, knowledge which is essential for an individual to survive, e.g. social ethics, morality, civil law.
   (b) Socially requisite knowledge *(Farḍ kifāyah)*, or what is essential for the survival of the whole community, e.g. agriculture, medicine, architecture, engineering.
3. **The social function**
   (a) Praiseworthy sciences, that is, those which are useful and indispensable sciences the knowledge of which activities of this life depend.
   (b) Blameworthy sciences, which would include astrology, magic, certain types of war sciences, aversion therapy, the scientific study of torture, etc.

It is, I believe, of crucial importance for students to understand that Western science is based on part 1(b) of this epistemological taxonomy. Reason became the transcendental value of the age of European enlightenment in the eighteenth century. Observation and experiment as the prime methodological tools, underpinned by reason as the prime conceptual tool, were to launch science on the path of irreversible progress and

technological achievement. Francis Bacon's dictum that 'nature reveals its secrets under torture' is particular apposite in this connection.

Taking Al-Ghazālī's classification as a whole, it becomes clear why, in Islām, science and religious education are complementary. Islāmic epistemology is uncompromisingly and unreservedly holistic. The methodologies and conceptual tools of science cannot operate on their own, they need the framework of absolute truth – Divine Revelation – and they function within the ethical and moral injunctions and principles enunciated therein. This is the sort of science which is holistic, not reductionist; a science not envisaged as the universal panacea for humanity, having come the closest to truth that we can get, but as a conceptual tool very useful for solving some of humanity's problems, revelation being the transcendental truth to which the enterprise of Science is ultimately accountable. In short, this is the sort of science that is not in conflict with religion.

The rediscovery of the nature and style of Islāmic science in our time is one of the most exciting and intellectually requisite challenges facing Muslim societies. To this end, it is necessary to examine modern science and science policy within a framework of concepts that shape the goals of Muslim society. This exercise was attempted at a seminar on 'knowledge and values' held under the auspices of the International Federation of Institutes of Advanced Study (IFIAS) in Stockholm in September 1981.[4] The Seminar isolated ten Islāmic concepts which embrace and describe the nature of scientific enquiry: *tawhīd* (unity), *khilāfah* (man's trusteeship), '*ibādah* (worship), *'ilm* (knowledge), *ḥalāl* (legal), *ḥarām* (illegal), *'adl* (justice), *ẓulm* (tyranny), *istislah* (public interest) and *dhiya* (waste). In the words of Ziauddin Sardar:[5]

> The positive values act as guiding principles for scientific activity and science policy in Muslim cultures, while the negative values of *ḥarām*, *ẓulm* and *dhiya* act as indicators which point out that the legitimate boundaries of Islāmic science have been overstepped. The three central concepts of *tawhīd*, *khilāfah* and *'ibādah* shape the paradigm of Islāmic science. Within this paradigm, Islāmic science operates through the agency of *'ilm* to promote *'adl* and *istislah* and undermine *ẓulm* and *dhiya*.

Admittedly, this theoretical model of science is skeletal and needs to be fleshed-out and extensively elaborated before being operationalised as a science policy for Muslim countries. It should be noted that the concepts are not inflexible. Others could be added: for example, *taqwā* (God-consciousness), *Ākhirah* (the Hereafter) and *ijmā'* (consensus of the community) are obviously very important. This point, however, is marginal. The central objective should be to develop an Islāmic philosophy of science based on concepts such as these.

Within such an ethical and moral framework, faith and theory would not be compartmentalised. Students would be aware of the criteria of theory assessment and, therefore, may be in a position to evaluate the relative merits of competing theories. Prior to embarking on this intellectual endeavour, students should be aware that all that is destructive physically, materially and spiritually, is *ḥarām*, while all that promotes these human parameters is *ḥalāl*. Scientific activity should promote social justice and pay due regard to *istislah* (public interest), a chief supplementary source of Islāmic law. Conversely, scientific activity should not promote alienation and dehumanisation, concentration of wealth in fewer and fewer hands and environmental destruction. There is thus no need to avoid theories deemed to be anti-religious as their evaluation should prove to be intellectually stimulating and a productive exercise on the basis of the societal parameters outlined above.

This brings me to the religiously degrading and intellectually distorted attempt to legitimise modern science by equating it with the *Qur'ān*. This is done by pointing out

that the *Qur'ān* places great emphasis on the pursuit of knowledge and use of reason, and that it mentions several scientific facts and theories, all of which are supported by recent discoveries and advances. The standard reference work which propagates this type of approach to science and Islām is *The Bible, the Qur'ān and Science* by Maurice Bucaille, a French surgeon.[6] This type of pseudo-intellectual analysis amounts to the following: if the statements and theories mentioned in the *Qur'ān*, which was revealed 1400 years ago, are supported by modern science, the Divine nature of the *Qur'ān* is confirmed; and if modern scientific theories find a reflection in the *Qur'ān*, then modern science must have the same universal validity as the *Qur'ān*.

Both propositions are palpably preposterous. By equating the *Qur'ān* with science, the latter is elevated to the realm of the Divine and makes revelation subject to the verification of Western science. If this proposition is taken to its ludicrous conclusion, the *Qur'ān* would be proved false if a particular scientific fact does not tally with it or if a particular fact mentioned in the *Qur'ān* is refuted by modern science. Such an approach, therefore, is to be strongly condemned. It raises science to the level of sacred knowledge, effectively undermining any criticism of it.

Apart from this type of pestiferous philosophy of science, we must realise that there are many books for students based on theories such as that of evolution. Our long-term aim, of course, should be to develop educational criteria and curriculum materials designed and suitable for Muslim students of all ages and aptitudes. In the meantime, however, I am of the opinion that the theory of evolution, as enunciated by Charles Darwin (1809 – 1882 CE)and others, should be taught precisely because it has exercised such a profound influence upon Western thought. Our students should have a clear view of the intellectual antecedents of the present Western society and culture. The Islāmic perspective, of course, should also be given, concisely and eloquently, at the same time that the dehumanising ways in which the evolutionary theory was used in the early part of the present century are pointed out.

Apart from such dehumanising abuse, further difficulties can arise with Darwin's theory of evolution when it introduces the ideas of 'natural selection' and 'survival of the fittest'. These ideas, applied to human evolution, portray a sequence leading from man as an ape-like creature through to stone-age man, the hunter gatherer and finally to modern man. The process may be seen as one of progress and, all too easily, modern man may be identified with the economically successful white man surrounded by his technological 'goodies', while hunter-gatherer or stone-age man may be identified with those in nomadic tribal societies often described as 'primitive'. Using this model, a hierarchy of races can be inferred. It is important to stress that in actuality we are very ignorant about the origins of different racial groups, and to direct the students' attention to the following verse of the *Qur'ān*:

> *O mankind,*
> *We have created you male and female,*
> *and have formed you into nations and tribes*
> *in order that you may know one another.*
> *The most honoured of you in the sight of Allāh*
> *is he who is most righteous.*
> *Indeed, Allāh is Knower, Aware.*[7]

In any case, whatever its reality for modern man, race is not a fact of Islāmic cognition. Indeed, the very idea of Islām is the antithesis of the race principle. The Islāmic conception of man is that he is essentially a moral being and only incidentally a construct of biology. The fundamental precept here is that, according to Islāmic cognition, the ultimate determinant of man's humanity is his morality, not his biology. That is to say, the ultimate

worth of a person is determined by his or her righteousness (or *taqwā*). Human biological differences must be construed as the signs of *Allāh's* glory and bounty that add lustre and colour to mankind's cultural and ethnic diversity. Or, in the incomparable words of the *Qur'ān*:

> *Among His (Allāh's) signs*
> *are the creation of the Heaven and Earth,*
> *and the variety of your tongues and hues.*
> *Surely, in that are signs for those who know.*[8]

These concepts would not be imparted in an epistemologically parochial and reductionist education system. Hence the crucial need for Muslim teachers, scientists, scholars and educationists to understand the pedagogical underpinnings of the British education system, and to collectively produce materials which impart such a holistic awareness while at the same time fulfilling the requirements of the National Curriculum. As I mentioned earlier, it is my belief that an opportunity has now been provided which we should, as a community, take advantage of.

Faith cannot in any way be left at the door of the classroom. For a Muslim, Islām is a living reality within the framework of which all other systems and processes operate and find their meaning. It is not an imposition if the teacher's faith is manifested in classroom dialogue and curricular discussion. It is hypocrisy, however, as the fundamentally secular West has shown us, to compartmentalise faith, and practise a politically handicapped and claustrophobic religion reduced to ritual and theological disputations. In Islām, every act is carried out for the pleasure of *Allāh*; this is the essence of *Imān* (faith). The practice of science and the art of teaching are no exception to this universal ethical precept.

> *We (Allāh) will show them the signs in all regions of the Earth*
> *and in themselves,*
> *until they come to see that this is the truth.*[9]

1. See T.S. Kuhn, *The Structure of Scientific Revolutions*, The University of Chicago Press, 1962.
2. *Science for Ages 5 to 16 (1991),* Proposals of the Secretary of State for Education and Science and the Secretary of State for Wales, DES May 1991, p44. See also the recent slimmed-down version of the science curriculum, post-Dearing review, incorporating these ideas in the preamble to key stages 3 and 4.
3. *Science Education for a Multicultural Society*, Leicestershire Education Authority, 1986.
4. The discussion of the Stockholm seminar is reported in *The Touch of Midas: Science, Values and Environment in* Islām *and the West,* edited by Ziauddin Sardar, Manchester University Press, 1984.
5. Z. Sardar, Islāmi*c Futures: the Shape of Ideas to Come,* Mansell Publishing Limited, 1985, pp 175-176.
6. Maurice Bucaille, *The Bible, the Qur'ān and Science*, Seghers, Paris, 1980.
7. *Al-Qur'ān*, chapter 49, verse 13.
8. *Ibid*., chapter 30, verse 22.
9. *Ibid*., chapter 41, verse 53.

