

SCIENCE EDUCATION: THE ISLAMIC PERSPECTIVE

Seyyed Hossein Nasr

وَفِي كُلِّ شَيْءٍ لَّهُ آيَةٌ
تَدُلُّ عَلَى أَنَّهُ وَاحِدٌ

In everything there exists a sign from Him
Bearing proof that He is One.

The first question to pose concerning science education from the Islamic perspective is whether science education is necessary, and only if the answer is in the affirmative, should it then be asked what kind of science education would be in accordance with that perspective. Few Muslims would debate the necessity of education not only for practical ends but as an integral part of Islam as a religion. Education or *al-ta'lim wa'l-tarbiyah* can be interpreted in fact as the heart of the religious life, leading man through *ta'lim* or the transmission of knowledge as well as *tarbiyah* or the training of the soul to an ever greater degree of perfection until the arrival of the moment of his meeting with the Lord. In the Islamic context, education can in a sense be interpreted as life itself as it should be led and pursued.

As for science as currently understood, it exists as an undeniable component of modern civilization and is in fact in a sense its heart. And to the extent that the Muslim world has been influenced and dominated by the forces of modernism, it too has come to be influenced to an ever greater degree by Western science. Moreover, before modern times, Islam had cultivated its own scientific tradition for a thousand years, a tradition which remained over the centuries as one of the glories of Islamic civilization. In order for Islamic civilization to survive as well as to face the realities of the modern world, it is necessary, therefore, to have some kind of science education in the Muslim world.

Whether Muslims wish to reject modern science, accept it wholeheartedly or appraise it critically and integrate into their life and thought whatever in it is in conformity with the Islamic world view, they must know this science in depth. There must exist, therefore, a science education in the curriculum of schools within the Islamic world. The question that remains is what kind of science education? How is science to be taught without destroying the Islamic world view? How is it to be taught without alienating Muslim youth from their own culture? How is it to be taught in the light both of the clear doctrines contained in the Qur'an and *Hadith* about the world of nature and of the long tradition of Islamic science created by devout Muslims on the basis of these doctrines over the centuries? To answer such questions is one of the basic challenges facing the Muslim intelligentsia today and it is to some of these questions which we wish to turn in this discourse.

At the very beginning, it must be asserted clearly that there is such a reality as the Islamic perspective concerning the sciences of nature and the way or ways of teaching such sciences. Islam possesses of course a Sacred Law (*al-Shari'ah*) to guide the actions of men and doctrines (*al-aqā'id*) concerning the nature of God,

His Names and Qualities. But Islam also possesses distinct teachings concerning the nature of the world, its origin and end and the relation of the world to its Creator.¹ The Qur'an refers ceaselessly to the natural order and the Qur'anic revelation addresses the cosmic order in such a fashion that the world of nature may be said to participate along with man in the reception of the Divine Revelation.²

Likewise, modern science, far from being value-free, is based on a specific world view derived from certain philosophical, religious and also anti-religious theses drawn from European thought.³ Whatever the neutral character of facts described by modern science might appear to be, this science makes certain definite assumptions concerning the nature of reality, causality and such categories as time, space, matter, energy, form and number. These assumptions are based upon the philosophical background from which modern science grew, while the growth of this science is also related to certain specific social factors of European society. This science cannot be taught in the Muslim world as if the world view upon which it is based were not there, or as if Islam did not possess its own perspective concerning the sciences of nature and could accept blindly and uncritically any science as being the 'ilm mentioned in the Qur'an and the *Hadith* simply because the root of the word science comes from the Latin *scientia* which can be translated as *al-'ilm*. A century of uncritical thinking along these lines in the Muslim world has produced such a catastrophic result in the educational system and within Muslim society, that it is no longer possible to turn a blind eye to the question of science education from the Islamic perspective. It has now become imperative to ask what is the Islamic perspective upon science education and how to create a science education program which would enable Muslims to preserve their own religion and culture, confront the modern world and be able to avoid the calamities which the modern world is facing as a result of the application of a science based upon the forgetting of God and the working of God's Will in the world of nature and of man.

The root of the Islamic attitude towards nature and the sciences of nature is to be found in the Noble Qur'an and its most important and authoritative commentary which is the *Hadith*. These twin sources of the Islamic tradition contain a definite doctrine of the origin, nature and end of the cosmos, a doctrine which was elaborated later by generations of Muslim thinkers. Although it is not possible here to elucidate fully the Qur'anic doctrine concerning nature,⁴ one can at least point out its most salient features. First of all, it is necessary to point to the remarkable frequency with which the Noble Qur'an refers to nature and natural phenomena. The cosmos participates in the Qur'anic revelation and the phenomena of nature possess an "Islamic" meaning and convey a message to those who have eyes to see and ears to hear. Their message, moreover, is related to the truth revealed in the Qur'an for they are the signs (*āyāt*) of God as are the verses of the Sacred Text and as is man who is himself the observer of these signs.⁵ The cosmos is also a book, the *Qur'an al-takwīn* of certain later commentators, upon whose "pages" are inscribed the primordial revelation of God, but a book which can only be read by one whose mind and soul has been transformed by the message of the revealed or written Qur'an (the *Qur'an al-tadwīn*). The message of

this cosmic book is moreover, not simply the external features of nature or the quantitative aspects of phenomena although even these aspects and features possess a significance beyond themselves.

The Qur'ān and *Ḥadīth* teach us about a cosmos which has a Creator and Sustainer, a beginning and an end. They speak of the cosmic order as being created through the truth and not in vain, of possessing a goal and purpose, of being based on design and not having come into being through chance, or reflecting a wisdom whose significance lies beyond the domain of phenomena. The Islamic universe does not begin with an accidental big bang, nor evolve by chance through aeons, nor change without a purpose and goal. Its laws are not independent of the Will and Wisdom of its Creator, and its existence depends at every moment upon the Divine Command BE (*kun*) which generated the cosmos at the beginning. Its end is not the cold death of a star or galaxy but integration into higher realms of being described so majestically in the eschatological verses of the Qur'ān and in certain *Ḥadīths*.

Science education according to the Islamic perspective must begin and have as its background throughout all the stages of education this Qur'ānic view of the cosmos, which can itself be taught and elaborated on various levels from the stage of a beginner to that of the most advanced student. This view must provide the criteria and framework within which the modern sciences must be judged and evaluated. The Qur'ān is not a book of science in the modern sense as some modern apologists have tried to make it, seeking to harmonize this current scientific hypothesis with one verse of the Sacred Text and that supposedly scientific fact with another. But the Qur'ān and *Ḥadīth* do contain the principles of the cosmology and philosophy of nature which must serve as the framework and governing philosophy of all science education in the Islamic world.

These sources contain also the roots of a complete epistemology which does not limit the knowing faculty of man to simply the senses and reason but includes also revelation as the supreme source of knowledge complemented by intellection (*ta'āqul*) which must not be confused with ratiocination as understood in post-medieval Western thought. On the basis of these teachings, there developed over the ages an elaborate Islamic methodology of science which must also be always kept in mind and taught in an appropriate manner in any program of science education which seeks to be Islamic.⁶

In addition to turning to the Qur'ān and *Ḥadīth*, it is essential to focus attention upon the Islamic sciences which grew and developed over the centuries in Islamic civilization. These sciences, which also played a major role in the development of Western science, did not simply happen to be cultivated by people who were Muslims and who lived in the Islamic world. They are profoundly Islamic in the sense of being integrally related to the Qur'ānic conception of the cosmos and of applying the principles found in the sources of the Islamic revelation to the sciences which Muslims created by integrating the sciences of antiquity, whether they were Greek, Persian or Indian, into the Islamic world view. It is not possible to have an Islamic science education by quoting a few verses of the Qur'ān which are usually interpreted on the basis of a sense of intellectual inferiority *vis-à-vis* Western science and circumventing a millennium

of Islamic science and philosophy which is inseparable from it. The neglect of the philosophy and history of Islamic science in science education in the Islamic world has had very unfortunate consequences during the past century and cannot be continued if an truly Islamic educational system is to be created.

The modern discipline of the history of science itself was created in the late 19th and early 20th century in first Europe and later in America mostly on the basis of a positivist philosophy. Its two most important founders, G. Sartton who was an eminent scholar of Islamic science and E. Mach, espoused the cause of a positivism which is a far cry from the Islamic philosophy of science. Muslim scholars of this century have not dealt as much as it is necessary with their own scientific tradition and when they have, it has been usually on the basis of the methodologies and philosophies established by Western historians of science.

What is needed before anything else is a thorough Islamic history of science which would incorporate what Western scholars have discovered⁷ into an Islamic framework and continued research into the vast number of Arabic, Persian and some Turkish and Urdu manuscripts dealing with the various sciences and medicine. The whole notion of what is "exact" science and what is not "exact" and in fact the whole concept of what constitutes "science" must be moved out of the constraints placed upon this notion by 19th century positivism and seen in the light of the Islamic scientific tradition itself.

Moreover, the relation of Islamic science to Islamic revelation must be reinterpreted in the light of Islam and the whole idea of decadence as it was conceived by earlier Western orientalism in the case of Islamic civilization must be reexamined. Later developments of science in Ottoman Turkey, Safavid Persia, Mamluk Egypt and Mogul India must be added as chapters to the better known earlier periods of Islamic science. On the basis of this integral view concerning the whole tradition of Islamic science, the history of Islamic science must be studied and taught not as a chapter in the history of Western science but as an integral part of Islamic civilization. It must be seen as a thousand year long scientific tradition on whose basis alone can Muslims take the next step in the development of a science which would be related to their own world view rather than being simply a chapter in the history of Western science written on Muslim soil.⁸

As far as science education itself is concerned, in the earlier stages all approaches to the teaching of the sciences should be based on the Islamic scientific tradition itself. The student should be taught that the Muslims had carried out extensive scientific activity for nearly a millennium in one part of the Islamic world or another and that this activity was carried out almost always by men who were devout Muslims. The students should be also taught that these sciences were an integral part of the Islamic intellectual tradition and that if they were opposed here and there by this or that theologian or jurist, it does not mean that they were anti-Islamic, for the Islamic intellectual tradition possesses many schools and dimensions.

The students should be made aware that the fact that the Islamic sciences did not continue to expand and develop during all the periods of Islamic history and especially since the 11th/17th century is not a condemnation of Islamic

civilization. No civilization in history has kept a sustained interest in the development of the sciences of nature at all times as the ancient Egyptian and Chinese traditions bear witness. To identify science with civilization is a modern Western invention; and even in the case of the West, who can predict with certitude that the best Western minds will be attracted to physics and the other sciences a century from now as they have been since the 11th/17th century, even presuming that modern science and its applications do not prevent man from continuing his existence on earth until then?

Finally, Muslim students must be taught that although the earlier phases of the Islamic scientific tradition influenced medieval and Renaissance Western science greatly, Western science underwent a revolutionary change of perspective in the 11th/17th century and developed under a new paradigm very different from that of Islamic or for the matter Latin science. Modern science owes much to Islamic science but is not simply a further development of Islamic science which in contrast to modern science was cultivated in a universe governed and sustained by God, where the sacred dominated over everything and where the secular or profane was not even accepted as a legitimate category, where reason was still wed to the intellect and subservient to revelation, where men saw the signs of God in all things and studied nature to discover God's wisdom and purpose, where the sciences of nature were integrated into a hierarchy of knowledge, the highest form of knowledge being that which concerns the Divine Reality, namely, *Lā ilāha illa'Allāh*. Islamic civilization was not great because it contributed to modern science but because it was able to create an elaborate science of nature without bringing about that modern alienation of man from nature and also from God which has already withered away the soul of modern man and is now threatening his very physical survival.⁹

On the level of the particular sciences, the Islamic sciences should be taught as much as possible with their Islamic identity before proceeding to the teaching of the modern science in question. This can be done especially in elementary and secondary education. For example, in mathematics practically every branch of the subject before differential and integral calculus was developed by Muslim mathematicians on the basis of earlier Greek and Indian works. In this case, arithmetic and algebra should be taught as subjects developed by Muslim scientists and in certain cases as algebra even the book of Khayyām could be adopted as a text. Number theory should be taught on the basis of the works of Ghiyāth al-Dīn Jamshīd Kāshānī and others and the names of modern Western mathematicians brought in only later in advanced mathematics when necessary. How many Muslim students even know that the science of trigonometry was formulated as a separate branch of mathematics by al-Bīrūnī and Naṣīr al-Dīn al-Ṭūsī? In many parts of the Islamic world where the trigonometric functions such as sine and cosine are used under their European names, hardly any student is even aware that *sinus* itself is the translation of the Arabic *jayb*.

In astronomy, the early introduction of the subject into the curriculum could be carried out almost completely in terms of Islamic astronomy. Students could be introduced to the configurations of the heavens through works of Muslim astronomers while the institution of the observatory and the development of

instruments which were in fact still in use when Tycho Brahe made his observations could be treated from the point of view of historical development of the observatories of Maraghah, Samarqand and Istanbul. Even mathematical astronomy and the astronomical revolution of the 11th/17th century could be treated with the Muslim critique of Ptolemaic astronomy especially that of Naṣīr al-Dīn al-Ṭūsī, Qutb al-Dīn al-Shīrāzī and Ibn al-Shāfir in view. It can also be shown that the heliocentric system was known as a possibility to Muslims and that if the Muslims did not bring about the Scientific Revolution as it occurred in Europe, it was because the Islamic tradition with its emphasis upon the sacred character of God's creation would not permit that secularisation of the cosmos which was a necessary condition for the rise of the mechanical view of the universe.

In chemistry, it is hardly ever taught that many of the instruments used in secondary school chemistry laboratories to this day came originally from the Islamic world as such words as alembic (*al-'anbāq*) testify or that the division of substances into mineral, vegetable and animal or the acid-base theory are grounded in ideas developed by Muslim alchemists and chemists such as Jābir ibn Ḥayyān and Muḥammad ibn Zakariyyā' al-Rāzī. Of course alchemy is not simply a rudimentary chemistry, nor simply a superstition except for those who do not understand its principles. It is at once a science of the cosmos and a science of the soul.¹⁰ But it is related to modern chemistry which grew out of its cadaver once the spirit of this discipline was lost. Even before modern times, however, the Muslims had developed chemistry in addition to alchemy although the rapport between the two was not antagonistic as it was to be in the West beginning in the 11th/17th century.¹¹ On the basis of this tradition, a great deal drawn from Islamic sources could be taught to students before they would be introduced to Boyle, Lavoisier and other founders of modern chemistry.

In physics, usually students are introduced directly to the classical physics of Galileo and Newton. Muslim students could, however, be first introduced to the ideas of Ibn Sīnā, Abū'l-Barakāt al-Baghdādī, Ibn Bājja and others who criticized in various ways the Aristotelian theories of projectile motion and discovered the fundamental concept of momentum. This would serve as not only the historical background for the *Pisan Dialogue* and Galilean physics, but would also turn the attention of the student to the concern of Muslim scientists with some of the issues which have remained central to modern physics.

In certain branches of physics such as the science of weights and measures and optics a great deal can be drawn directly from such figures as al-Bīrūnī and al-Khāzinī for the former and Ibn al-Haytham and Kamāl al-Dīn al-Fārsī for the latter. There is no reason why in fact both these disciplines cannot be taught at the secondary level and even to some extent at the level of elementary college physics on the basis of Islamic sources.¹²

As for medicine and pharmacology, it is illogical and even absurd to neglect the Islamic tradition at a time when Western medicine itself is facing such a crisis and when so many Westerners are seeking alternative forms of medicine including the Hippocratic and Islamic. In this field, the philosophy of Islamic medicine should be taught to all students while traditional Islamic medicine and

pharmacology should be taught parallel with the Western as is already the case in Pakistan and among Muslims of India.¹³ In this way, not only will the human relationship between the doctor and the patient and the religious nature of medicine and the vocation of the physician be preserved, but a very efficient and economically feasible form of medicine that is also closely related to the dietary habits and the whole culture of the Muslim peoples will become available once again. Furthermore, at least a step will be taken in preventing to some degree the excessive use of modern pharmaceutical products in Islamic countries which like much of the rest of Asia and Africa have become dumping grounds for drugs some of which possess unknown serious and negative side effects.

The few instances mentioned are merely examples which could be multiplied in many other fields such as geography, geology, botany and zoology. Science education from the Islamic perspective would demand that in each case the Islamic science in question be studied and presented in a manner that it would first of all give a sense of confidence to the student in his own religion and culture and secondly provide a bridge and sometimes an antidote to the modern Western sciences whose study creates so often a sense of alienation among students toward their own religious and cultural traditions. Only on the basis of the Qur'anic conception of nature and the Islamic sciences which developed within Islamic civilization for a millennium, should the modern sciences be taught to students.

These sciences must indeed be taught in depth and they must be mastered fully if Muslims are to write another chapter in the history of their own scientific tradition. But the Western sciences should not be taught in a vacuum nor *en bloc*. They should be taught once the mind of the student is trained in the manner outlined above; and they should also be taught critically and in such a manner as to separate fact from hypothesis and tested hypothesis from mere theory. Where certain theories such as that of evolution parade as scientific fact, they should be exposed for what they are and full use must be made of the studies of the shortcomings of modern science and its criticism being made in the West itself to an ever greater degree during the past decades.¹⁴

Modern science is itself undergoing a profound philosophical crisis especially as its frontiers in the field of physics. The boot strap theory, quantum mechanics and the anthropic principle in modern astrophysics and cosmology all require a philosophy of nature different from what has been prevalent since the 11th/17th century. Moreover, there are even more extensive philosophical, ethical and even scientific criticisms being made of many fields of modern science by eminent scientists and philosophers of science themselves, while a number of scientists have been searching in oriental sources for new paradigms.¹⁵ If such search has been directed mostly toward the Far East and India thus far, it is because Islamic doctrines and teachings are by and large less available to the Western intelligentsia than those of India and the Far East.

In such a situation, all modern science must be taught to Muslim students critically. To describe the stratigraphy of a geological formation is one thing and to speak of its genesis "millions and millions" of years ago quite another. The first is based on observation and the second on the philosophical theory of

uniformitarianism and the concept of a purely quantitative and uniform time, both of which are not themselves "scientific" but assumptions made by modern science concerning the nature of reality. There is no reason why one could not describe the rock formation without accepting the agnostic or deistic presumptions upon which theories of genesis in geology are usually based or by neglecting the possibility of other forces not now observable acting in the cosmos, or by refusing to believe in cosmic rhythms and the hierarchy of existence about which traditional Islamic sources have spoken so often.

In such fields as modern cosmology and evolution especially, there is need for great discernment for both are based on assumptions which are diametrically opposed to Qur'anic teachings. As far as cosmology is concerned, an Islamic educational system should point to the completely provisional nature of modern cosmology based on incredible extrapolations and therefore subject to constant change every few years. Islamic cosmology could always be taught as a symbolic science of the cosmos which can act as the background for every science of the cosmos which could legitimately be considered as Islamic and which can provide meaning even for the discoveries of vast stellar spaces and galaxies by modern astronomy.

As for evolution, there is no single hypothesis in modern science which is as opposed the dicta of the Qur'an and in fact the traditional teachings of all religions as evolution, which was in fact espoused to allow men to be able to study the wonders of nature without having to point to the necessity of a Creator. In contrast to the views of certain modernist Muslims influenced by 13th/19th century European thought, the Qur'an does not contain the roots of the theory of evolution nor did traditional Islamic thought ever divorce creative power from the "Hands" of the Creator.¹⁶ During the last few decades, a chorus of scientists has joined philosophers and theologians in their criticism of the Darwinian theory of evolution, basing themselves only on scientific facts and observations.¹⁷ Strangely enough, this is taking place exactly at a time when in the West certain theologians are beginning to turn against the traditional theology of the church and develop a kind of "evolutionary theology" of which the works of Teilhard de Chardin are a well-known example.¹⁸ No educational system in the Islamic world should teach the biological and geological sciences without full awareness of the literature which is critical of both evolution and such movements, and without distinguishing for the student the difference between facts and hypotheses based on a world view which excludes God as an active principle in the created order.

The ethical and sociological criticisms of modern science emanating now from the West must also be considered in the teaching of these sciences and Muslims have much to learn from this kind of scholarship. It must be remembered, however, that the problem of modern science from the Islamic point of view is not only its unethical applications. This fact must certainly be emphasized and science must always be taught in the light of the Islamic doctrine that knowledge should never be divorced from ethics as the traditional *madrasah* system always underlined. But it must also be remembered that in contrast to what many modern Muslim apologists write, the problem of modern science is not only the way its applications are divorced from ethical considerations. It is also in its

creating of a knowledge of the natural order from which God and even man have been abstracted, leading despite the outcry of certain individual scientists, to a view of the universe in which man himself is redundant and where all that is spiritual and sacred appears as unreal.

To avoid the pitfalls of a scientific world view which has spread in the West despite the protest of many scientists, science education in the Islamic world should emphasize at all stages the limitations of science as a way of knowing, the hierarchy of knowledge and the existence of a higher form of knowledge which is not invalidated by modern science, but which alone can provide the final meaning of whatever discoveries modern science makes, to the extent that these discoveries correspond to some aspect of reality. Science education should also emphasize to the students the dangers of reductionism and being out with clarity with Islamic teaching that the higher can never grow out of the lower nor be reduced to it.

Science education should enable Muslim students to learn modern science in depth but also as a step toward creating a veritably Islamic science, performing the same task that early Muslims did *vis-à-vis* the Graeco-Alexandrian, Persian and Indian sciences. They must have the necessary religious and intellectual background to be able to think as Muslims rather than be consumed by a science which, although claiming to be international, is really Western and related to a value system closely related to the history of the West. They must know the tradition of Islamic science and make it their own in such a way as to feel that they belong to it.¹⁹ Only then can they set about to master modern science and perhaps take a step in creating a new chapter in the history of Islamic science by making contributions which would be at once Islamic and scientific within an Islamic paradigm of the natural sciences and with methodologies in conformity with the Islamic intellectual tradition.²⁰ In such an effort, they would absorb modern Western science into their world view but not as an alien body of knowledge. Rather, they would absorb and consume it as an organic body consumes food which in being digested is also analyzed into components some of which are absorbed and others rejected.

In conclusion, it must be emphasized again that the Islamic world has no choice but to master modern science, but it can only do so without destroying its own world of faith if this science is critically appraised in the light of the Islamic intellectual tradition and studied only after students become well-versed in the Islamic scientific tradition and the ethos of Islam itself issuing from the Qur'an. At a moment when modern science is undergoing a crisis and when many are seeking to revive the ethos of Islam, it would be a tragedy to overlook the crucial task of reviving the Islamic intellectual and scientific tradition and of studying critically modern science in the light of the principles drawn from this tradition. The task is a difficult one, but despite this difficulty the question of science education remains central to all present day educational concerns. It is a question that must be addressed and which no one seriously involved with Islamic education can overlook. The Islamic world certainly has the intellectual means of confronting this challenge and with faith in Divine Succour will be able to achieve this difficult task, for with God all things are possible. As the Qur'an

asserts ease follows upon difficulty when there is reliance upon the Will of the One who created the universe and who is the ultimate reference of all knowledge of His creation.

Notes

1. On Islamic doctrines concerning nature see S. H. Nasr, "The Cosmos and the Natural Order", in *World Spirituality - A Historical Encyclopedia of the Spiritual Quest*, vol. 19 on Islam, (ed. S. H. Nasr), New York, and *idem*, *An Introduction to Islamic Cosmological Doctrines*, London 1978.
2. It should never be forgotten that the first revelation was received by the Blessed Prophet in the bosom of nature in the cave of al-Hirā' and that according to traditional sources the whole sky was transformed in this experience.
3. See E. Burt, *The Metaphysical Foundation of Modern Physical Science*, London, 1925; and S. H. Nasr, *Man and Nature*, Kuala Lumpur, 1986.
4. On Qur'anic verses referring to nature, see F. Rahman, *Major Themes of the Qur'an*, Chicago, 1980.
5. See Nasr, *An Introduction*.... p. 6.
6. See O. Bakar, "Ibn Sina's Methodological Approach towards the Study of Nature in His 'Oriental Philosophy'", *Hamdard Islamicus*, vol. VII, no. 2, Summer 1984, pp. 33-49; *idem*, "The Question of Methodology in Islamic Science", *Muslim Education Quarterly*, vol. 2, no. 1, 1984, pp. 16-30; and S. H. Nasr, "Reflection on Methodology in the Islamic Sciences", *Hamdard Islamicus*, vol. III, no. 3, Fall 1980, pp. 3-13.
7. A quarter of a century ago we began a seven-volume annotated bibliography of books, monographs and articles on Islamic science in all non-Islamic languages including not only European ones but also Chinese and Japanese. Our goal was to make this vast material available so that a group of Muslim scholars under the auspices of some university or institute could study all these works and on the basis of what has been done so far by non-Muslim scholars and of course the writings of Muslim scholars themselves to produce a new version of Sartori's *Introduction* written from the point of view of Islamic historiography and the Islamic conceptions of science. Two volumes of the project have been already published as *An Annotated Bibliography of Islamic Science*, Tehran, 1975 and 1978 and Lahore, 1985. The third volume on mathematics is now being published by the Suhail Academy of Lahore while the last four volumes, whose texts were completed and ready for publication, were lost in Tehran during the events of 1979.
8. In both our *Science and Civilization in Islam*, Cambridge (USA), 1968; and *Islamic Science - An Illustrated Study*, London, 1976, we have tried to present the tradition of Islamic science in this manner. The details, however, are far from complete even as far as present day knowledge of the various branches of the Islamic sciences are concerned. It is hoped that a joint effort by a number of scholars can produce a more extensive opus based on this concept but embracing the extensive research that has been carried out even since these works were written.
9. See T. Roszak, *Where the Wasteland Ends*, New York, 1973; *idem*, *Unfinished Animal*, New York, 1977; E. Schumacher, *Guide for the Perplexed*, New York, 1978; and S. H. Nasr, *Man and Nature*.
10. See T. Burckhardt, *Alchemy: Science of the Cosmos - Science of the Soul*, trans. W. Stoddart, London, 1967.
11. See S. H. Nasr, "From the Alchemy of Jābir to the Chemistry of Rāzī," in his *Islamic Life and Thought*, London, 1981, pp. 120-123.
12. Ibn al-Haytham's works can also be used in many other branches of physics and astronomy. By emphasizing his significance in optics, we do not in any way wish to detract from the significance of this remarkable scientist in other fields.

13. The Hamdard Institutes of Karachi and New Delhi established by Hakim Muhammad Said and Hakim Abd al-Hamid have rendered great service in the propagation of Islamic medicine which for historical reasons is often referred to as Unani or Bu 'Ali medicine in that area.
14. See for example, W. Smith, *Cosmos and Transcendence*, La Salle (Ill.), 1984; and W. Heitler, *Naturphilosophische Streifzüge*, Braunschweig, 1970.
15. Such works as the *Tao of Physics* of F. Capra have by now become quite popular. Although they do not deal with Oriental doctrines in depth, they do indicate an important trend in the Western Oriental doctrines in depth, they do indicate an important trend in the Western scientific community.
16. See Shaikh Abdul Mabud, "Theory of Evolution: An Assessment from the Islamic Point of View", *Muslim Educational Quarterly*, vol. 4, no. 1, 1986, pp. 9-56.
17. See for example, G. Sermoniti and R. Fondi, *Dopo Darwin*, Milan, 1980; D. Dewar, *The Transformist Illusion*, Mulfreesboro (Tenn.), 1955; E. L. Grant Waston, *Nature Abounding*, 1941; and L. Bounoure, *Déterminisme et finalité*, Paris, 1957.
18. On the traditional critique of evolutionism and such movements see S. H. Nasr, *Knowledge and the Sacred*, New York, 1981, chapter seven.
19. Recent debates throughout the Islamic world on Islamic science and its meaning, although still rudimentary in many quarters and suffering from certain dogmatic or ideological restraints in others, are nevertheless valuable in bringing about greater awareness of the significance of this tradition. For a critical appraisal of the recent debates concerning Islamic science see, M. Y. Ahsan, "Trash and Treasure", *Iqbal Review*, vol. 27, no. 1, April-September 1986, pp. 201-249.
20. During the past three years the Muslim Association for the Advancement of Science in Aligarh has been founded with this specific goal in view. See their journal MAAS which began publication in 1985.

EDUCATION IN THE UNITED ARAB EMIRATES AND THE ISLAMIC VALUE-SYSTEM

Samira Ali Bin Daair

The Gulf Arab countries have within the span of two or three decades undergone unprecedented socio-economic changes as a result of the oil wealth. Some economists, at a loss in describing these countries, which as a result no longer fitted into the third world category, coined a new term; namely "the fourth world". But despite this fashionable epithet, these countries are in reality still within the vicinity of the third world; afflicted by the same circular problems that are a common feature of developing countries in the post-independence phase. Many writers have pointed out the trap that the developing countries have fallen into, in adopting wholesale, Western development models, in the absence of the socio-economic conditions that prevail in the developed world. And because of what Dore¹ has called the "late-development effect", which has set a limit to the initial trends, these countries have got into a vicious circle. Another document on problems of development "An inquiry into the poverty of nations"², shows that this blind emulation of Western models has been a factor that has barred planners in third world countries, with their limited resources, from a critical consideration of the real issues involved in development. And many have turned towards evolving alternate models of development based on indigenous needs and occupational structures on the one hand, and within the parameters of their socio-economic realities on the other.

But despite these sporadic attempts to redefine development, it would seem that Western patterns predominate, since the trends have been set and people's expectations have already been oriented towards them.

I have placed the UAE in this category, because the wealth of a nation is not judged by its immediate spending power or even merely percapita income, but by its investment in an infrastructure that will yield permanent returns. And an important aspect of this development is the human resource, since the human factor is the independent variable upon which any development plan depends for its internal dynamism. Therefore the type of development that must be aimed at is based on two major components, as far as the UAE is concerned:

- (i) In the economic sphere there must evolve a self-supporting, self-reliant internal system for effecting and sustaining continuous development. For in the event of this local human factor remaining remote from the real forces of production, development, even in the economic sense, will refer only to the superficial structure of society, as represented by architectural expansion and physical manifestations of modernisation.
- (ii) The spiritual dimension in human progress which, in a sense, lies at the base of social development. And therefore this must either precede the former, or the two must be concurrent.