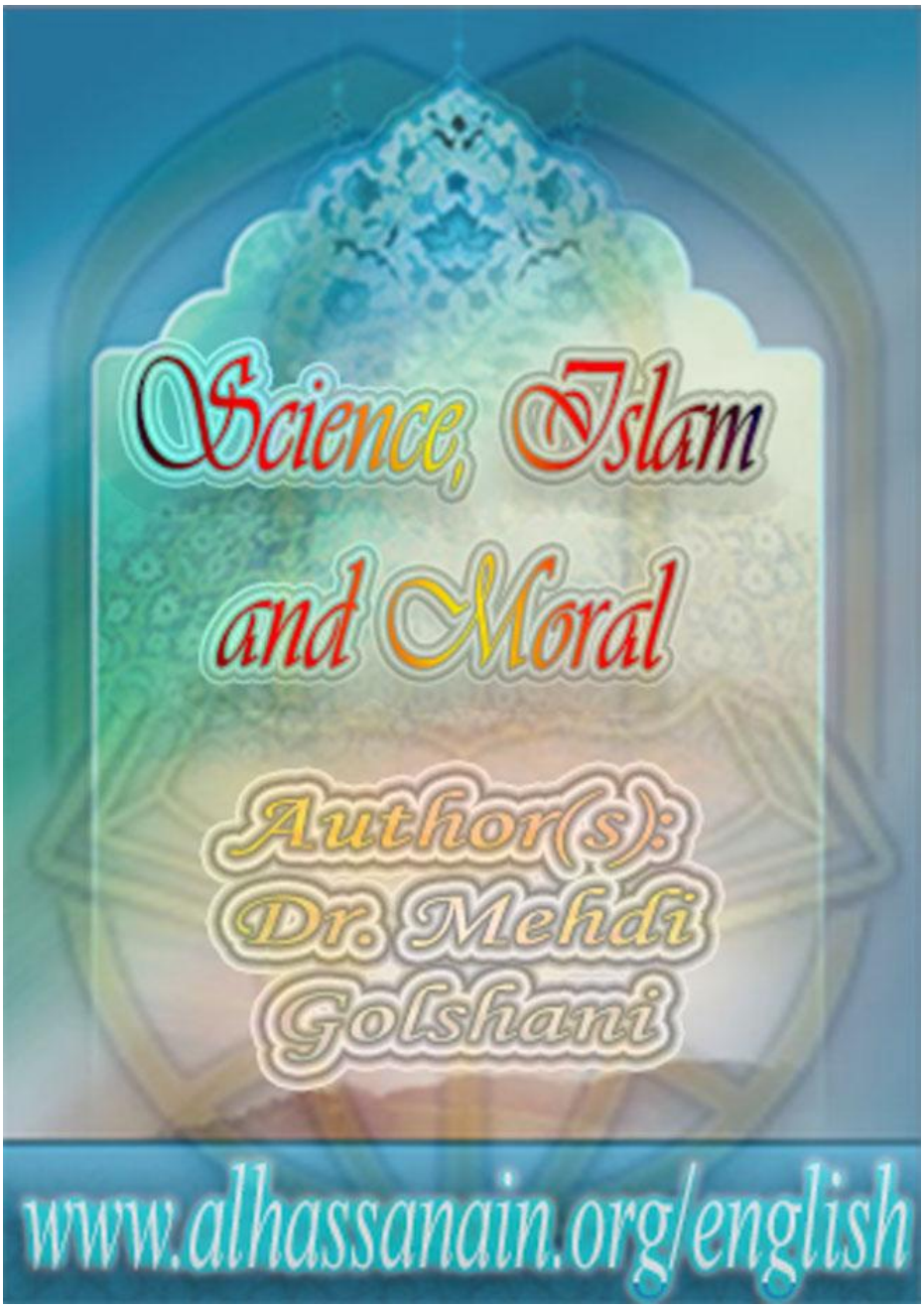

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Science, Islam and Moral Values

(Collection of Some Articles)

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Science for Humanity: an Islamic Perspective

This paper deals with the ethics of Science concluding that Science has to serve humanity and moral ethics in order to improve human condition and should not be used as a mean of domination and destruction.

Miscellaneous information:

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Abstract

Scientific work is a human activity for understanding how the natural world works and is structured. Science, by itself, cannot provide an answer to the question of why human beings seek scientific knowledge. The response comes from a more comprehensive framework that defines, among other things, one's goal for scientific activity. Traditionally there have been two major responses to this question: 'science for the sake of science' and 'science for the sake of understanding God's handiwork and for taking care of humanity's lawful physical and spiritual needs'.

A third view became dominant during the twentieth century: it advocated science for its practical and material benefits. According to the first and third views there should be no limit on the kind of scientific research being done, but according to the second view scientific activity cannot have a free run.

Due to the miseries brought about by the abuse of science and its application, especially during the twentieth century, many eminent scholars throughout the world have been crying out for a new attitude toward the goal of scientific enterprise - an attitude that seeks scientific knowledge for enriching the spiritual dimension of human beings and for securing human welfare, i.e. seeking knowledge for the sake of humanity, rather than ignoring humanity. Unless this is done there will be no hope for the future of human race on the globe. It is the duty of all scientific academies and institutions to have a crusade for realizing this change of attitude toward the goal of science.

Keywords: Science for humanity; goal of science; human welfare; values; ethical conduct; worldview.

Introduction

Science is a systematic human enterprise for understanding how the natural world works and is structured. Scientific activity is undertaken by human agents. Science thus makes no sense in human vacuum. Then the question arises as to why human beings seek scientific knowledge. Science by itself cannot provide an answer. To have a response, one needs a more comprehensive framework - a worldview - that shapes one's entire spectrum of activities, including the scientific. It is a scientist's worldview that defines the goal of his or her scientific activity.

One old popular view concerning the goal of scientific activity has been 'science for the sake of science'. It is often said that scientific activity is attractive because it is the source of intellectual enjoyment, or because it satisfies our sense of curiosity about nature and its mysteries and beauties. In this view, the most rewarding aspect of the pursuit of science lies in the aesthetics of its accomplishments, rather than in its practical results. In the words of Henry Poincaré:

Scientists do not study nature because it is useful; they study it because they delight in it, and they delight in it because it is beautiful. If nature were not beautiful, it would not be worth knowing; and if nature were not worth knowing, life would not be worth living.[1]

Here, one could ask why not science for the sake of power or wealth, as they are attractive as well. In fact, the followers of 'science for the sake of science' have often ignored the byproducts of science and its technological offspring, and the result of their work has often been abused by the powerful.

Some scientists make a distinction between pure and applied science. In their view, the applications of science can conceivably be harmful, but there is no harm in pure science. While this may have been true in older times, when scientific work had no direct contact with daily life and practical results of a scientific work took an appreciable amount of time to show up in practice, today the practical applications of a theoretical idea often emerge swiftly - today's science is the seed of tomorrow's technology.

Another traditional view about the goal of scientific enterprise is the outlook of the monotheistic religions towards nature. Here, scientific activity is for the sake of understanding God's handiwork in nature and to take care of essential needs of human individuals and human societies. Human beings are God's trustees on the earth, and they are supposed to keep the balance set by God in the cosmos and to avoid making corruption on earth.

During the twentieth century a third attitude toward science became prevalent: seeking science for its practical or material benefits. This view has become dominant among many of the contemporary governments of the world, and since a large proportion of scientific activities is currently financed by governments and corporate industries, its effect is very visible.

The second view contains most of the important elements of the first view but goes beyond it. It does not allow scientific activity to have a completely free run. According to the first and third views there should be no limit on the kind of scientific research being done. The important point,

however, is that although science can provide possibilities, it cannot by itself make choices nor can it provide limits. Those come from a meta-scientific arena.

The question of whether science by itself can guide us to good individual or societal life was brought up at an interesting debate between Bertrand Russell and Mortimer J. Adler[2], both noted philosophers. Russell believed that scientific knowledge is the only kind of valid knowledge, but he doubted that there could be universal and objective criteria for choosing between right and wrong or good and bad. He left the decision on this matter to feelings and gave moral values a utilitarian role. In 1941, people in Chicago asked Adler to have a debate with Bertrand Russell. Adler accepted to participate in the debate if Bertrand Russell were ready to take an affirmative position on some issue. Russell came up with the proposition that science is enough for the good life and the good society.

Around that time Russell had sent a letter to the New York Times in which he had reiterated his approval of the war with the Nazis. At the outset of the aforementioned debate, Bertrand Russell made the following three assertions:

(i) Science is the only objectively valid knowledge available to us.

(ii) Our knowledge of the world and of man is by itself incapable of answering any questions of value, as these are not matters of fact.

(iii) Our decisions or questions of value, as opposed to questions of fact, are determined by our feelings.

Adler mentioned that the Nazis and the Allies had opposite feelings about which party in that war had right on its side. On what grounds did Lord Russell think that his feelings were right, and Hitler's were wrong? If he could not provide objective grounds for asserting that rightness was attached to one set of feelings and wrongness to the opposite, then either force would be the arbiter or there should be objective criteria, which Russell was dismissing, in the determination of right and wrong. If force is not allowed to decide who is right or wrong, there has to be valid knowledge other than empirical science.

This anecdote indicates that the popular view that all of reality is accessible through science is simply an assumption which needs to be justified. Furthermore, there are some questions concerning scientific activity that science cannot answer. For example, we have to explain why science is successful. Why is mathematics, which appears to be a product of the human mind, so successful in describing the physical universe? Science cannot answer these questions, as well as some of humanity's "ultimate questions" such as What are we doing here?, What is the purpose of life?, What is the basis for ethical values?, What is beauty?, etc. To answer these meta-scientific questions, we need a larger framework that can deal with the whole spectrum of human experience. Thus, science has to be embedded into a worldview - an underlying metaphysics.

The difference of opinion about the goals of scientific activity is rooted in the difference in the worldviews of the scientists involved. Alfred North Whitehead has put the matter elegantly:

The mentality of an epoch springs from the view of the world which is, in fact, dominant in the educated sections of the communities in question. There may be more than one such scheme, corresponding to cultural divisions. The various human interests which suggest cosmologies, and are influenced by them, are science, aesthetics, ethics, religion. In every age each of these topics suggests a view of the world[3].

Science, Humanity, and the Contemporary World

There is no doubt that modern science has brought enormous benefits to human beings. It has given us insights about the structure of the universe and it has affected almost all areas of our lives. But, unfortunately, such science has also been used to the detriment of humanity and its environment. It has, for example, been used for the development of weapons of mass destruction and the pollution of our environment, and many scientists and engineers have been heavily involved in these destructive works.

The most important consequences of the improper use of science and technology have been:

- extravagant exploitation of natural resources
- widening the gap between the rich and the poor
- pollution of the environment
- undermining the spiritual dimension of humankind
- development of weapons of mass destruction
- extinction of many species.

In my humble view, all the unpleasant consequences of current science are rooted in the dominance of a worldview among contemporary scientists that has the following characteristics:

(i) neglect of humanity due to excessive specialization
(ii) neglect of moral issues in the scientific enterprise
(iii) thirst for power and wealth
(iv) neglect of higher orders of reality
(v) neglect of humanity's ultimate concerns.

In short, empiricist epistemology, naturalist ontology, and relativist ethics have yielded knowledge without wisdom, power without virtue, and comfort without peace of mind - all detrimental to humanity's felicity and welfare.

There are several major causes for the neglect of concern for humanity's long-range interests in the contemporary scientific enterprise.

1. Neglect of Humanity Due to Excessive Specialization

Before the development of modern science, all fields of knowledge were considered branches of the same tree, and scientists tried to have a unitary view of nature. Today, due to excessive specialization, there is fragmentation of knowledge both across disciplines and within disciplines. This has resulted in a lack of integral vision in individual scientists, leading to a society of individuals pursuing their personal interests. This, in turn, has led to three important consequences:

(i) It has deprived scientists a holistic view of nature.

(ii) It has deprived scientists the opportunities to pay attention to those elements which relate their discipline to a larger whole.

(iii) It has resulted in physical and natural sciences that are more or less divorced from what is going on in the humanities and what is actually needed by human societies.

2. Neglect of Moral Issues in the Scientific Enterprise

It is a commonly held view in the scientific circles that science and ethics are two independent spheres of human concern. Thus, 'normative statements' cannot be derived from 'factual statements'. This had led to the idea of the value-neutrality of science, which has been effective in marginalizing ethical considerations and has led to the spread of moral relativism in modern societies and has weakened ethical concerns in the scientific enterprise.

The idea of value-free science is a myth:

• Ethical codes like honesty, impartiality, and integrity function as a quality control mechanism in the scientific enterprise.

• Value-judgments can affect a scientist's line of research or his/her choice of theories. For example, Einstein and Heisenberg had a special emphasis on the simplicity of physical theories. On the other hand, Dirac emphasized on the beauty of physical theories. Pragmatic considerations are some other people's criterion for the choice of theories.

• Value-judgments affect decision making in the applications of science and technology. The outcome of certain applications of science and its technological offspring could affect a scientist's decision about his/her line of research.

3. Thirst of Power and Wealth

Whereas traditional science was seeking to read the book of nature as God's handiwork, the dominant tendency in the modern era has been to advance knowledge for the enhancement of political and economic power and to look upon nature as a commodity to be exploited. Schumacher has put the matter elegantly:

The old science - 'Wisdom', or 'science for understanding' - was primarily directed 'towards the sovereign good', i.e. the True, the Good and the Beautiful, the knowledge of which would bring both happiness and salvation. The new science was directed mainly towards material power, a tendency that has meanwhile developed to such lengths that the enhancement of political and economic power is now generally taken as the first purpose of, and main justification for, expenditure on scientific work. The old science looked upon nature as God's handiwork and man's mother; the new science tends to look upon it as an adversary to be conquered or a quarry to be exploited[4].

The misuse of science and its technological offspring during the twentieth century led to both human and environmental catastrophes. This created serious discontent among some of the noted scientists of our era. In his letter to Einstein in 1954, Max Born complained about the evils of modern science:

I read in the paper recently that you are supposed to have said: 'If I were born a second time, I would become not a physicist, but an artisan'. These words were a great comfort to me, for similar thoughts are growing around in my mind, in view of the evil which our once so beautiful science has brought upon the world[5].

This was said at a time when the scale of the misuse of science was negligible relative to what we are witnessing today.

In our era there are two main considerations for the promotion of science and technology: 'seeking science for the sake of science' and 'seeking science for material goals and power'. The present industrial West has fallen into the trap of "technopoly" - to use Neil Postman's term - and it has become a paradigm in which whatever can be done must be done. Furthermore, with the emergence of big science, the goals of scientific and technological research are increasingly set by industry or governments whose objective is not truth but knowledge and power. It is forgotten that science and technology are supposed to secure humanity's welfare and so their goal must be the good of humanity. This may require some constraints on certain areas of knowledge.

4. Neglect of Higher Orders of Reality

Modern science confines itself to the material real and confers reality only to those things that can be rooted in sense data. Empirical verification is the court of ultimate appeal. In the words of Bertrand Russell:

Whatever knowledge is attainable, must be attained by scientific methods; and what science cannot discover, mankind cannot know[6].

Therefore, spiritual realities are considered either as unreal or reducible to physics. This has led to the neglect of God and the spiritual dimension of humankind and the separate development of science and culture, and it has led to the confinement of human beings to the material realm, with no higher aspiration than fulfilling their material needs. But, this would put human societies into unhealthy competition for material causes, with no end in sight. The unrest and nihilism we witness in our time is the result of neglecting God and the spiritual dimension of human beings.

5. Neglect of Humanity's Ultimate Concerns

A dominant outlook among contemporary scientists is that science can adequately account for everything. But, due to the limitations of its scope, science cannot present a comprehensive picture of the world. As we mentioned earlier, it cannot handle moral queries, and it leaves many of the so-called 'ultimate questions' of humanity unanswered. Reflection about these questions can have lasting effects on human behavior and on decision making - including decisions concerning the scientific enterprise. As Richard Feynman put it:

But if a thing is not scientific, if it cannot be subjected to the test of observation, this does not mean that it is dead, or wrong, or stupid. We are not trying to argue that science is somehow good and other things are somehow not good. Scientists take all those things that can be analyzed by observation, and thus the things called science are found out. But there are some things left out, for which the method does not work. This does not mean that those things are unimportant. They are, in fact, in many ways the most important[7].

Islam, Science, and Humanity

The Noble Quran refers to natural phenomena as the signs of God and recommends the study of various phenomena of nature as a path towards knowing and serving God. To quote the Quran:

"Say, behold what is it that is in the heavens and the earth…" (10:101)

and

"Say, travel in the earth and see how He originated the creation." (29:20)

In the Quranic view, the study of nature is not for its own sake; rather, it is supposed to serve as a means of bringing one closer to God. The Muslim scientists of the past believed that God's wisdom is reflected in His creation. Similarly, the founders of modern science did not pursue the study of natural phenomena to understand nature per se or for the sake of their own gratification, but as a means of proximity to God.

In the Islamic outlook, science is framed within a theistic worldview that considers God the Creator and Sustainer of the universe. This view does not confine existence to the material realm, it has a telos for the created world, and admits a moral order. The received view of science, however, is indifferent with respect to all these points.

The Islamic view and the received view of science share the same methodology, i.e. they both involve experimentation, observation, and theoretical work. Their difference is in the underlying worldview which affects their outlook towards God, the cosmos, and humanity, and affects their decisions concerning the practical consequences of their scientific work. Contrary to what some scholars think, I do not think that the commitment of Muslim scientists to the Islamic worldview would dissuade them from being equal partners in the world scientific community. The history of the glorious Islamic civilization is a good witness to this claim.

The Islamic conception of knowledge does not confine knowledge of reality to that obtained through experimentation and theoretical reasoning alone, and does not consider the scientific study of the world exhaustive. Rather, by accommodating revelation and intuition, it encompasses spiritual as well as physical aspects of humanity and the cosmos, and it claims that there is more to reality than meets human eyes.

The contemporary view of science promotes the value-neutrality of science, but the Islamic view of science integrates knowledge with values. This is done in such a way that leads to accountability and responsibility of a scientist at all stages of his or her life, and it takes place at the metaphysical level of science. In the secularist vision, ethics plays at most a utilitarian role. In the Islamic worldview, however, the concept of moral values is linked to the concept of the world's telos. Thus, in a world free of a telos, moral law has no intrinsic value. It has only a regulatory role in society. The neglect of moral values in the contemporary scientific arena is partly due to the neglect of teleology in the modern secular science.

In the contemporary world, science is sought for the control and manipulation of the natural world and human societies. In a theistic context, however, science is sought for understanding the natural world and for solving individual and societal problems - goals which lead to God's

pleasure. Here, nature is viewed as a trust from God which should be handled properly. Thus, all plans for scientific progress and technological innovations should be harmonious with the cosmic order.

Because of the limitations of its scope, science can only respond to certain questions of human concern. It cannot present a comprehensive picture of the world. It simply leaves unanswered many questions that arise in science itself. Furthermore, it is silent about the meaning and purpose of human life and about morality. But, science framed in a more comprehensive framework, does not confine reality to the empirical realm and works within a more inclusive metaphysical framework in which higher levels of reality are recognized. Such a framework can shine light on our meta-scientific questions. In the words of George Ellis:

We should use broad criteria that take into account the whole range of human experience, and not just that part which can be scientifically described[8].

Conclusion

We mentioned that scientific knowledge and its technological offspring have brought humanity both blessings and curses, and that the weight of the curses threatens the future of the globe. We also reiterated our view that all of this is due to the divorce of knowledge from wisdom, and that this, in turn, is rooted in the dominance of a secularistic worldview in academic circles.

The scientists following this worldview are content with the results of their work, forgetting that science should serve humanity, rather than damaging human beings. In a theistic context, however, science is accompanied by wisdom. It is used for solving individual and societal problems - goals which lead to God's pleasure and humanity's welfare. Here, nature is viewed as a trust from God which should be handled properly. Thus, the training of committed believers and the formation of healthy societies is one of its primary objectives. This means that knowledge in general, and the sciences of nature and their practical byproducts (technology) in particular, should be developed in such a way that

(i) they satisfy the spiritual needs of individuals and societies;

(ii) they provide the basic physical needs of individuals and societies;

(iii) they safeguard the society against evil forces;

(iv) they give priority to the broad interests of humanity over the narrow interests of scientific fields;

(v) they not admit potentially dangerous undertaking without enough precautions and assurances.

To change the prevalent situation there is an urgent need for a change in the general outlook to science and technology and their role in human societies. If the orientation of science is changed from a mere tool for the exploitation of nature and increase of power to an understanding of nature and the provision of proper human needs, then science and technology can be helpful in establishing virtuous and prosperous societies. Under this more inclusive worldview, scientists would combine science with wisdom and creativeness with compassion to produce fruitful and lasting results. As Victor Weisskopf put it:

Science cannot develop unless it is pursued for the sake of pure knowledge and insight. It will not survive unless it is used intensely and wisely for the betterment of humanity and not as an instrument of domination. Human existence depends upon compassion and curiosity. Curiosity without compassion is inhuman; compassion without curiosity is ineffectual[9].

Under the dominance of this worldview, scientists would adopt a self-imposed code of ethical conduct, would not venture into the unknown simply in the name of scientific advancement, would feel responsibility for their work, and would work to lessen the miseries of life. Similarly, academic circles would adopt measures to implement ethical codes of conduct.

In short, science for humanity has human felicity and welfare as its boundary condition, to use mathematical terminology. But, science without

concern for humanity has no such boundary condition. Its goal is simply scientific advancement or material power or wealth. The evils brought about by the abuse of science during the last century show that humanity cannot afford the luxury of unrestrained research in science and technology.

The long-term interests of humanity necessitate a radical change in the received worldview of scientists toward a broader worldview that seeks science to serve humanity and not the other way around. It is the duty of all scientific academies and institutions to advocate this attitude regarding the goal of science.

Notes

1. R. N. Newton, The Truth of Science: Physical Theories and Reality (Cambridge: Harvard University Press, 1997), 223.
2. M. J. Adler, Philosopher at Large: An Intellectual Autobiography (London: Weidenfeld & Nicolson, 1977), 218-19.
3. A. N. Whitehead, Science and the Modern World (New York: The Free Press, 1967), vii.
4. E. F. Schumacher, A Guide for the Perplexed (London: Jonathan Cape, 1977), 14.
5. A. P. French, Einstein: A Centenary Volume (London: Heinman Educational Books, 1974), 277.
6. Bertrand Russell, Religion and Science (New York: Oxford University Press, 1970), 243.
7. R. Feynman, The Meaning of It All: Thoughts of a Citizen Scientist (London: Penguin Books, 1998), 16-17.
8. George F. R. Ellis, Before the Beginning (London: Boyars/Bowerdean, 1993), 86.
9. Victor Weisskopf, Physics in the Twentieth Century: Selected Essays (Cambridge: MIT Press, 1972), 364.

Does Science Offer Evidence of a Transcendent Reality and Purpose?

In this paper, the author elaborates on several crucial theological problems which have to do with the role of science in providing some evidence for the existence of God and purpose in nature.

Miscellaneous information:

This paper was originally presented to Science and the Spiritual Quest Conference (Berkeley, June 1998). The author is grateful to the Center for Theology and Natural Sciences (CTNS), in Berkeley, for their permission to publish the paper elsewhere.

Abstract

In this paper, we elaborate on several crucial theological problems which have to do with the role of science in providing some evidence for the existence of God and purpose in nature.

Teleology played an important role in medieval science. For the scientists of that era, every created thing had its especial place in the hierarchy of the created world, because it was created by a God who had a designed telos to the universe. The founders of modern science, however, believed that teleological considerations should not play a role in scientific descriptions.

At present, it is fashion to eliminate the notion of goal to the universe. Thus, even many of the believing scientists ignore teleological considerations in their scientific work. In the Qur'anic view, however, God is the Creator and the Sustainer of the universe. He has created everything in measure and has decreed for it a telos.

If we don't see a telos to the created universe in the findings of modern science, it is because the philosophical framework in which contemporary scientists express their work does not accommodate questions of teleological nature.

Nevertheless, we think that there are some clues to the teleological aspects of our universe in modern science. For example, the notions of purpose and design of the created universe has recently attracted much attention to the so-called anthropic principle, according to which the physical constants of nature are so finely tuned that if they were slightly different, carbon-based life could not have developed and we should not be here.

The argument from the presence of order and harmony in the creation to the existence of God, the so-called argument from design, is present in both the Qur'an and the Bible, and has been used frequently by the scholars of all monotheistic religions for this purpose. We believe, however, that empirical science can give us only a cognition of the works of God, but the deduction of God from His works is a matter of intellection or intuition.

Some inferences from science have been used as a premise in philosophical arguments for the existence of God. Specifically, two theories have generated heated discussions about this matter: the theory of Big Bang and the Darwinian theory of evolution. Modern science, as it is fashioned now, does not need to hypothesize God. Its normal enterprise is to explain natural phenomena without any appeal to supra-natural causes.

However, science can lead one to God, if it is recognized that science acquaints us with the character of some dimensions of the universe and not its totality and that Science needs a metaphysical framework which can answer our ultimate questions and admits supra-sensible realities. Then science can become a ladder that can take us to the frontier of physical and metaphysical. The jump from physical to metaphysical requires an intellectual exercise.

Introduction

Modern science infiltrated the Islamic world in the beginning of the nineteenth century. What affected Muslim intellectuals mostly was not science itself, but rather it was the transfer of various philosophical currents entangled with science that had a profound effect on the mind of Muslim scientists and intellectuals. Schools like Positivism and Darwinism penetrated the Islamic world and dominated its academic circles and had a noticeable impact on some Islamic theological doctrines.

Response of Muslim Scholars to Modern Science

There were four kinds of reactions in the Islamic world to modern science:

(1) Some Muslim scholars rejected modern science as foreign (corrupt) thought, considering it incompatible with Islamic teachings. In their view, the only remedy for the stagnancy of Islamic societies is the strict following of Islamic teachings.

(2) Some thinkers in the Islamic world, advocated the complete adoption of modern science. In their view, the only remedy for the stagnant Muslim societies is the mastery of modern science and the replacement of religious world-view by scientific world-view. They saw science as the only source of real enlightenment.

(3) Some Muslim scholars tried to adapt Islam to the findings of modern science. This group formed the majority of faithful Muslim scientists, and one can categorize them in the following subgroups:

Some Muslim thinkers attempted to justify modern science on religious grounds. Their motivation was to encourage Muslim societies to acquire modern knowledge and to safeguard their societies from the criticism of Orientalists and Muslim intellectuals.

Some people tried to show that all important scientific discoveries had been predicted in the Qur'an and Islamic tradition, and by appeal to modern science one can explain various aspects of his faith.

Some scholars advocated a re-interpretation of Islam. In their view, one must try to construct a new theology that can establish a viable relation between Islam and modern science. The Indian scholar, Sir Seyyed Ahmad Khan, was after a theology of nature through which one could re-interpret the basic principles of Islam in the light of modern science.

Some Muslim scholars believed that empirical science had reached the same conclusions that prophets were advocating several thousands years ago. The revelation had only the privilege of prophecy.

(4) Finally, some Muslim philosophers separated the findings of modern science from its philosophical attachments. Thus, while they praised the attempts of Western scientists for the discovery of the secrets of nature, they warned against various empiricistic and materialistic interpretations of scientific findings. Scientific knowledge can reveal certain aspects of the physical world, but, it should not be identified with the alpha and omega of knowledge.

Rather, it has to be integrated into a metaphysical framework - consistent with the Islamic world-view - in which higher levels of knowledge are recognized and the role of science in bringing us closer to God is fulfilled.

The Impact of Modern Science on Islamic Theology

When we compare medieval science with modern science, we notice that they are different in several important aspects. This is especially noticeable in the case of some theological perspectives. When modern science penetrated the Islamic world, some Muslim scientists adopted western philosophical theological perspectives intact. But, Muslim philosophers and theologians resisted against the adoption of some doctrines which were considered to be harmful to the basic Islamic teachings. Here, we elaborate on several crucial theological problems which have to do with the role of science in proving the existence of God and purpose in nature.

1. Teleological Explanation of the World

Teleology played an important role in medieval science. For the scientists of that era, every created thing had its especial place in the hierarchy of the created world, because it was created by a God who had a designed telos to the universe. The founders of modern science, however, ignored the notion of the telos to the universe. Those believing scientists did not deny the relevance of purpose to the created universe. But, they believed that teleological considerations should not play a role in scientific descriptions.

Today, many of the disbelieving scientists deny the notion of purpose of the universe. Weinberg's well-known statement is typical of their view:

The present universe had evolved from an unspeakably unfamiliar early condition, and faces a future extinction of endless cold or intolerable heat. The more the universe seems comprehensible, the more it also seems pointless.[1]

At present, it is fashionable to eliminate the notion of goal to the universe. Thus, even many of the believing scientists ignore teleological considerations in their scientific work. In the Qur'anic view, God is the Creator and the Sustainer of the universe. He has created everything in measure and has decreed for it a telos. The creation is in truth, not for sport or vanity, and everything has a definite term:

We did not created them save in truth. (44:38)

We have not created the heavens and the earth and whatsoever is between them, save in truth and for a definite term. (46:3)

We did not create the heaven and the earth, and whatsoever between them, as playing …(21:16)

We have not created the heavens and the earth, and whatsoever is between them, for vanity … (38:27)

The Qur'an has made a distinction between the Creator, the design and the internal order of the created things on the one hand and their guidance on the other hand. The direction that everything follows is not a result of its internal order. Rather, it is something beyond its orderly structure. Thus, the Qur'an talks of a universal notion of purpose and direction to the created universe:

[Moses] said: 'our Lord is He Who gave everything its creation. Then guided it.' (20:50)

Glorify the Name of your Lord, the Most Higher, Who created and shaped, Who determined and guided … (87:2-3)

Imam Fakhr al-Din Razi, in his celebrated commentary on the Holy Qur'an, has elaborated on the distinction between the creation of a thing and its sense of direction.[2] This sense of direction is a mysterious dimension present in everything, directing it toward its proper God-assigned role. One sees reference to it in the Qur'an for the cases of human beings, animals, plants and inanimate objects:

for human beings:

… the Lord of all Being Who created me, and Himself guides me … (26:78)

By the soul and that which shaped it and inspired it to lewdness and god-fearing. (91:6)

for animals:

And your Lord revealed unto the bees, saying 'take into yourselves, of the mountains, houses and of the trees … then eat of all manner of fruit, and follow the ways of your Lord …'(16:68)

for plants:

And the stars and trees bow themselves. (55:6)

for inanimate objects:

… and revealed its commandments in every heaven. (41:12)

Thus, every creature receives a mysterious kind of guidance after its creation. It is like an automobile which has a material design, but it needs a guidance to accomplish its assigned role. This sense of direction is rather evident in humans, and to a certain extent one can identify it with instincts in animals. But at this stage of the development of science it is not noticeable in the inanimate world. However, it is very naive to deny it on the basis of our present knowledge of the physical world.

The Qur'an mentions that everything in the world glorifies God, and that we do not understand their act of glorification:

The seven heavens, the earth, and all who dwell in them glorify Him. All creations, without exeption, glorify Him. Yet you cannot understand their glorification … (17:44)

All that is in the heavens and the earth glorifies God, the Sovereign Lord, the Holy One, the Almighty, the All-knowing. (62:1)

Rumi, the Persian poet and mystic of the thirteenth century, has eloquently expressed this point in spiritual couplets:

All particles of the world; say to you each day and night:

We have hearing and sight and are conscious; though with you strangers we are mute'.

Go from the world of inanimate into the world of spirit; then you hear the loud noise of the particles of the world.

The glorification of God by inanimate objects will become evident to you; the doubts suggested by [false] interpretation will not carry you away.

According to the Qur'an, we originate from God and we shall return to God, and everything is created to worship God in its proper way:

I have not created jinn and mankind except to worship Me. (51:56)

All that is in the heavens and the earth glorifies God … (62:1)

If we assume a purpose for the creation, then the evolution of created things is not without a telos. In the Qur'anic outlook, the end of this motion

is in the Hereafter, where everything meets its proper destination and the pious feel the presence of God. If there were no Hereafter, the creation would be in vain:

Did you think that We created you only for sport and that you would not be returned to Us? (23:115)

One might argue that Hereafter is meaningful only for humans and possibly animals. Thus, the universality of the sense of direction is disputable. In response, One could say the following

It is naive to deny non-humans of a telos only on the basics of our present knowledge of the physical world.

The discovery of anthropic coincidences in the modern cosmology is an indication of the special status of humans. It is as if all creation is a ground for the development of human beings. Paul Davies has put the matter nicely:

The success of human science and mathematics and the anthropic fine-tuning that is apparently a prerequisite for the very existence of human like beings, strongly suggests that our existence is linked into the laws of the universe at the most basic level. Far from being a trivial and incidental byproduct of random and meaningless physical processes, it seems that conscious organisms are a fundamental feature of the cosmos … Clearly, the universe could have been otherwise. The fact that it is, as it is, and that its form is linked so intimately with our own existence, is powerful evidence that the universe exists for a purpose, and that in our small yet significant way, we are part of that purpose.[3]

In short, the Holy Qur'an is very explicit in attributing a telos to the created universe, Thus, Muslim theologians have never ignored teleological considerations, and the silence of modern science about this point has not affected their view, though it has had a silencing effect on Muslim scientists.

The negligence of teleological considerations by the scientists of the last few centuries is partly due to their heavy involvement with mathematical manipulations and the predictive aspects of science and partly due to the false assumption that questions of teleological nature hinder the development of science. We don't believe that there is any inconsistency between holding a belief in a purposeful world and being a creative scientist.

If we don't see a telos to the created universe in the findings of modern science, it is because the philosophical framework in which contemporary scientists express their scientific work does not accommodate questions of teleological nature. In the words of Walter R. Hearn:

The self-limitation of science to examining only secondary or mechanical causes should signal immediately that science has no capacity to deal with the existence or non-existence of a purpose behind the universe …

In my opinion, to say anything at all about ultimate purpose requires stepping outside the normal boundaries of science, even though individuals who deny divine purpose may claim that their argument rests on "what science tells us". The irrelevance of certain questions within science does tell us something, however, about the limited relevance of science to some of the deepest human concerns.[4]

Nevertheless, we think that there are some clues to the teleological aspects of our universe in modern science. One has to be perceptive to discover such clues. For example the notions of purpose and design of the created universe has recently attracted much attention to the so-called anthropic principle, according to which the physical constants of nature are so-finely tuned that if they were slightly different, carbon-based life could not develop and we should not be here.

Anthropic coincidences call for an explanation, and there have been several explanations. In the monotheistic religions one can take them as an indication that God planned the universe with human beings in mind. Other explanations carry heavy loads of metaphysical assumptions which, in my view, are much more involved than the explanation in terms of an a priori plan by an intelligent designer. For example, the most serious alternative to the design hypothesis, is the many-worlds hypothesis, in which one postulates infinite universes to explain the order of just one universe.

2. Science and the Existence of God

In the Holy Qur'an, natural phenomena are referred to as signs of God, and it is implied that by understanding these signs, one can attain the cognition of the Lord of the signs:

And of His signs are the creation of the heavens and the earth and the diversity of your tongues and colors. Surely there are signs in this for the learned. (30:22)

In the Qur'an, one finds frequent reference of the creation, the constituents of objects, the thoroughness and orderliness of the creation and the harmony between man's existence with the rest of the physical universe:

So, journey in the earth, then behold how He originated the creation. (29:20)

So, let man consider of what He has been created? (86:5)

And you shall see the mountains, that you supposed fixed, passing by like clouds - God's handiwork, Who has perfected all things … (27:88)

It is He Who created for you all that is in the earth. (2:29)

The Qur'an quotes the prophet Abraham arguing from some phenomena of nature to the existence of God:

Thus, We showed Abraham the kingdom of the heavens and the earth, so that he might become a firm believer. When the night drew its shadow over him, he saw star. 'that', he said 'is surely my God.' But when it set, he said: 'I don't like to worship the setting ones.' When he beheld the rising moon, he said: 'that is my God.' But when it set, he said: 'If Allah does not guide me, I shall surely go astray.' Then, when he beheld the sun shining, he said: 'that must be my God: it is larger.' But, when it set, he said to his people: 'I am done with what you associate with God. I will turn my face to Him Who has created the heavens and the earth, a man of pure faith; I am not of the polytheists.'(6: 75-79)

The Qur'an also argues from the harmony of the creation to the unity of God:

Had there been other gods in them [the heavens and the earth] besides God, they would have been both in a state of disorder … (21:22)

The Qur'an even asserts that the study of signs of God in nature (i.e. natural phenomena) can eventually bring us closer to God:

We will soon show them Our signs in the universe and in their own souls, so that it becomes clear into them that He is indeed the truth. (41:53)

The argument from the presence of order and harmony in the creation to the existence of God, the so-called argument from design, is present in both the Qur'an and the Bible, and has been used frequently by the scholars of all monotheistic religions for this purpose.

The eminent Muslim scientists of the past considered the study of nature as a way of seeing the signs of God in the universe. As al-Biruni, a distinguished Muslim scientist of the eleventh century, put it:

When a person decides to discriminate between truth and falsehood, he has to study the universe and find out whether it is eternal or created. If somebody thinks that he does not need this kind of knowledge, he is, however, in need of thinking about the laws that govern our world, in part or in its entirety. This leads him to know the truth about them, and paves the way for knowing the Being Who directs and controls the universe, and for knowing His attributes. This is, in fact, the kind of truth that God enjoyed His knowledgeable servants to search for, and God spoke the truth when He said:

"… And reflect upon the creation of the heavens and the earth [saying]: 'Our Lord You have not created this in vain.'"(3:191)

This verse contains what I explained in detail, and if man works according to it, he can have access to all branches of knowledge and cognition.[5]

The same point is made by the founders of modern science. In the words of Robert Boyle:

When with bold telescopes I survey the old and newly discovered stars and planets … when with excellent microscopes I discern nature's curious workmanship; when with the help of anatomical knives and the light of chemical furnaces I study the book of nature … I find myself exclaiming with the psalmist, How manifold are thy works, O God, in wisdom hast thou made them all;[6]

Thus, Muslim scholars thought that the study of natural phenomena can disclose the interrelation between various parts of the universe and the unity behind the world of multiplicity, and this may lead one to the unique Creator.

With the infiltration of empiricistic ideas into the Islamic world, some Muslim scholars asserted that even in theology one has to follow the methods of empirical science and that the only way to the cognition of God is the study of nature through the methods of regular science. The reference of the Qur'an to natural phenomena was taken as an argument for the sufficiency of the empirical science. Some even identified the Qur'anic wisdom with the positivistic philosophy.[7]

While we, too, agree that experiment and observation are indispensable tools for understanding nature, we don't believe that our understanding of nature is merely a matter of senses. Intellectual exercise over the findings of

science is needed before one can get a picture of the physical world or one can get a theistic interpretation of our universe. We believe, as did the late Persian philosopher Murtada Mutahhari, that empirical science can give us only a cognition of the works of God, but the deduction of God from His works is a matter of intellection or intuition.[8]

To substantiate this claim, we argue on the following grounds:

Science can at most inform us of some attributes of God, such as knowledge, power, etc. But it cannot lead us to an Omniscient, Omnipotent God, which the Holy Qur'an is talking about. How can we get from the study of a limited part of the creation to an Eternal Transcendent God? The jump from finite to infinite requires an intellectual exercise. Even in science, we encounter the same situation. The laws of physics and chemistry are not direct results of experimental facts. Rather, they are deduced from the latter through an intellectual effort. Thus, e.g., matter itself is recognized through intellection, because experiments in physics or chemistry inform us only about the properties of matter.

The argument from design is neither a purely philosophical argument nor it is a merely empirical one. It has an empirical component and a philosophical one. It is the neglect of this fact that has caused confusion about this argument or has resulted in its refutation. Thus, Hume disputed the universality of this argument. In his view, this argument has an empirical character, and so it can't possibly prove an Omniscient and Omnipotent Transcendent God.

What Hume missed was the fact that an empirical argument works when we observe an effect and try to find its causes by experimentation. It can't possibly work when are dealing with both natural and supra-natural. The real value of the argument from design is that it takes us to the frontier of science and metaphysics. It gives a hint that there is a supra-natural reality. But, whether that reality is one or more, is finite or infinite or has finite power or infinite power is beyond this argument. These aspects need separate arguments.

The opposition between theistic and atheistic interpretations of physical processes, especially those related to the origin and formation of the universe, is due to their different metaphysical presuppositions. Metaphysical assumptions are often deeply embedded in our interpretation of physical processes, and inattention to them could result in conflict.

It is because of metaphysical presuppositions of this argument that many scientists don't deduce God's existence from their study of natural phenomena, and insist on their atheistic positions, no matter what they observe from the wonders of nature. The Qur'an, too, reminds us that the knowledge of natural phenomena - i. e. science in our modern terminology, can bring one closer to God, if one has already some faith in God. Then, the study of nature and its secrets and beauties fortifies one's faith:

Say: Behold what is in the heavens and the earth; but neither sings nor warnings avail a people who do not believe. (10:101)

It is interesting that the Qur'anic verses that invite people to ponder over the mysteries of creation, end up with phrases like the following.

Surely, in this there is a sign for men of understanding. (6:67)

Surely, in this there is a sign for thoughtful people. (16:13)

In short, the study of nature through the methods of empirical science can lead to God, if science is interpreted within a proper metaphysical framework in which the limits of science and the existence of higher levels of knowledge are recognized.

3. God and Creation

The problem of the creation of the universe has always been related to the problem of the existence of God, in one way or another. In the Medieval ages, it was used in various ways as a premise in philosophical arguments for the existence of God. But in the last two centuries, it has been the subject of a scientific proof of the existence of God. Two theories have generated heated discussions about this matter: the theory of Big Bang and the Darwinian theory of evolution. Here, we give a brief description of the problems involved.

(a) Big Bang

Einstein's equations of general relativity have various solutions. Among them are those that imply that everything in the universe is both expanding and decelerating. If this is the case, then the present universe is the aftermath of an explosion. Thus, it has had a beginning, and so there must be a Prime Cause. The observations of Edwin Hubble in 1930's indicated that the galaxies indeed expanded in the way predicted by general relativity.

Some astrophysicists, including H. Bondi, T. Gold and F. Hoyle, in their steady state theory, attempted to avoid the beginning by suggesting continual creation. Some other physicists, including de Sitter, Tolman and Dicke proposed an oscillating universe, which goes through infinite cycles of explosion and implosion. Neither the steady state theory nor the models of oscillating universe have overcome the problems confronting them.

Thus, they are not popular anymore. The works of S. Hawking, G. Ellis and R. Penrose in the late 1960's showed that if Einstein's equations of general relativity are valid and certain reasonable conditions are met, then space and time must have an origin coincident with that of matter and energy. This is taken by some believing physicists to be a strong argument for the creation by God.

In the last thirty years, some cosmologists have attempted to circumvent the notion of beginning (i. e. the initial singularity) by proposing that the universe is a quantum fluctuation arising from a state of vacuum containing quantum fields. But their quantum vacuum is far from an absolute vacuum. One has to assume certain laws and fields as background.

On the other hand, J. Hartle and S. Hawking, by applying quantum mechanical principles to the Big Bang and making use of the concept of imaginary time, attempted to show that space - time is finite but has no boundary. Thus, by negating creation in time they attempt to make God's existence superfluous. In Hawking's words:

So long as the universe had a beginning, we could suppose it had a Creator. But, if the universe is really completely self - contained, having no boundary or edge, it would have neither beginning nor end; it would simply be. What place then for a creator?[9]

These attempts leave the following questions unanswered:

• Where do the laws of physics come from?

• Why are these laws comprehensible to us?

• Why is there a universe in which such laws apply?

Furthermore, the assumption of no beginning in time, does not make the universe self-explanatory and independent of God. As Paul Davies says:

The fact that the universe might have no origin in time does no explain its existence, or why it has the form it has. Certainly it does not explain why nature possesses the relevant fields (such as the creation field) and physical principles that establish the steady - state condition.[10]

A mistake often made is to think that for the universe to have a creator, there must be an initial time for the creation of the universe. Muslim theologians believed that only God is eternal. Everything else is created in time. Muslim philosophers, however, believed that creation in time is a property of the material world, where as supra-natural realities, as well as principles and universals, are eternal. In theologians' view, uncreatedness in time meant not needing a Creator. Thus, the whole universe is created in time.

In rebutting theologian's view, Muslim philosophers pointed out that a thing's need or lack of need for a cause depends on whether it is a contingent being or a necessary being respectively, and it has nothing to do with its creation in time or its eternity. Muslim philosophers' argument was based on God's absolute effulgency and beneficency: it is not acceptable to think of God's emanation and beneficence as terminiating at a definite instant. Thus, God has caused an eternally created universe. According to these philosophers, creation simply means complete dependence of everything upon God i.e. the dependence of the created on what is necessary by itself.

Thus, the concept of origin in the case of creation refers to causal, not temporal. In Mulla-Sadra's theory of trans-substantial motion, every being has a graded reality which retains its identity despite its gradation. So, the whole universe is continually in creation, everything is getting a new existence from God at every moment. Thus, the dependence of the world on God is not limited to any specific instant. In Mulla-Sadra's words:

In general every material object, whether it is the material of the stars or the elements, whether soul or body, constantly acquires new identity and personality and its existence is never fixed …the proof of the principle indicated above is derived from the idea that nature is in a state of ever-renewing itself … and when the Creator created it, He created its self-renewing essence. Its self-renewal, however, is neither the creation of a creator nor the act of an agent … the maker, in virtue of His durability and endurance, created this creature which is self-renewal in terms of its essence and identity.[11]

(b) Darwinian theory of evolution

Another confusion concerning God and the creation of the universe relates to Darwinian theory of evolution. This theory challenged the fixity of species and claimed to explain the evolution of species in terms of natural selection and the survival of the fittest. According to Darwinism, life

developed out of random processes and there was no plan for the creation of species. The order that has emerged in nature is the result of a wedding of chance and necessity. In the words of G.G. Simpson:

Man is the result of a purposeless and materialistic process that did not have him in mind. He was not planned.[12]

What this theory achieved was only the suggestion of a fully naturalistic mechanism by which the evolution of species can occur. But some evolutionists claimed that by challenging the immutability of species and the replacement of sudden acts of creation of species by a slow evolutionary process, they had eliminated the need for a creator. What they missed was the fact that by finding the mechanism of something one does not eliminate its having an inventor.

Thus, the belief in an evolutionary mechanism for the emergence of species does not negate the idea of divine creation. One has to explain the emergence of species, whether they are brought into being gradually or through a sudden creation. As Abu al-Majd Muhammad Rida al-Najafi al-Isfahani, an eminent Muslim scholar of the early twentieth century, pointed out, the theory of evolution is not against theism. It is only the materialistic interpretation of this theory that negates God.

In his view, there is nothing in the Qur'an or the Islamic tradition to conclude whether all species were created separately or appeared through evolutionary random processes. In either case, we are dealing with God's activity. In al-Isfahani's words:

What difference would it make if the fathers of camels were camels or frogs sing in the water, or the Grandfather of an elephant was elephant, or a bird flies in the air, since the evidence in all cases is obvious God's work.[13]

Nevertheless, Al-Isfahani believed that what distinguishes humans from animals is their soul, and there is a clear difference between human mind and animal instincts.

Conclusion

All monotheistic religions view the study of nature as an attempt to see the works of God. This outlook was prevalent during the medieval period. The metaphysical framework accommodating the science of that era could provide a theistic interpretation of the universe. The founders of modern science shared this view.

But, with the rise of the mechanistic interpretation of the universe and the prevalence of the empiricistic philosophy, science divorced itself from metaphysics and played the role of a dominant ideology. The first half of this century witnessed the peak of the eclipse of metaphysics in the West.

Modern science, as it is fashioned now, does not need to hypothesize God. Its normal enterprise is to explain natural phenomena without any appeal to supra-natural causes. Even many believing scientists ignore supra-sensible realities in their study of nature. It is assumed that normal science is sufficient for the explanation of all natural phenomena. Science, however, can lead one to God, if it is recognized that:

Science acquaints us with the character of some dimensions of the universe and not its totality.

Science cannot answer our ultimate questions: Where did the universe come from? What do we do here, etc.

Science needs a metaphysical framework which can justify its success and can give meaning to the world, and which admits supra-sensible realities.

Empirical science, by its very nature, cannot directly lead one to God, and whatever can be described by science cannot be God.

If these considerations are taken into account, then, science can fortify one's belief in God and in a purposeful universe created by an Omniscient, Omnipotent God.

In the words of Pope John Paul:

To desire a scientific proof of God would be equivalent to lowering God to the level of the beings of our world, and we would therefore be mistaken methodologically in regard to what God is. Science must recognize its limits and its inability to reach the existence of God: it can neither affirm nor deny his existence.

From this, however, we must not draw the conclusion that scientists in their scientific studies are unable to find valid reasons for admitting the existence of God. If science as such cannot reach God, the scientist who has an intelligence the object of which is not limited to things of sense perception, can discover in the world reasons for affirming a Being which surpasses it. Many scientists have made and are making this discovery.

He who reflects with an open mind on what is implied in the existence of the universe, cannot help but pose the question of the problem of the origin.

Instinctively, when we witness certain happenings, we ask ourselves what caused them. How can we not but ask the same question in regard to the sum total of beings and phenomena which we discover in the world[14]

If the empirical science is augmented by an underlying metaphysical framework that can accommodate all levels of knowledge and all domains of human experience, then, we can expect the science to become a ladder

that can elevate one to the frontier of physical and metaphysical, where one can reach the state described by the Holy Qur'an:

In the creation of the heaven and the earth, and in the alternation of night and day, there are signs for the people of sense; those that remember Allah when standing, setting, and lying down, and reflect on the creation of the heavens and the earth [saying]: 'Lord, You have not created these in vain. Glory be to You; … (3:190-191)

Notes

1. S. Weinberg, The First Three Minutes (New York: Basic Books, Inc., Pub., 1977), P. 154.

2. Fakh al-Din Razi, al-Tafsīr al-Kabīr (Beirut: Dar'Ihya' al-Turath al-Arabi), Vol. 31, PP. 138-140.

3. P. Davies, "The Unreasonable Effectiveness of Science", in Evidence of Purpose, John Marks Templeton, ed. (New York: Continuum, 1994), P. 56.

4. Ibid., PP. 63-4

5. Abu Rayhan al-Biruni, Kitāb Tahdīd Nihāyāt al-Amakin le-Tashīn Masāfāt al-Masākin, Persian trans. By A. Aram (Tehran: Tehran University Press, 1352 H.S.) PP. 3-4

6. Robert Boyle, The Advancement of Learning (1605, A. Johnston, ed. (Oxford: Clarendon Press, 1974), P. 42.

7. A. Tabbarah, Rūh al-Dīn al-Islamī (Beirut: Dar al-'Ilm lil-Malayeen, 1982), P. 270.

8. M. Mutahhari, Collected Works (Tehran: Sadra Publications, 1373 S. H.), P. 893.

9. S. Hawking, A Brief History of Time (London: Bantam, 1988), P. 141.

10. Paul Davies, The Mind of God (London: Simon & Schnster, 1992), P. 56.

11. The Metaphysics of Mulla-Sadra, trans. By P. Morewedge (New York: The Society for the Study of Islamic Philosophy and Science, 1992), PP. 80-81.

12. George G. Simpson, The Meaning of Evolution (New Haven, CT: Yale University Press, 1949), P. 344.

13. Adel A. Ziadat, Western Science in the Arab World (London: The Macmillan Press Ltd., 1986), P. 97.

14. L'Osservatore Romano, July 15, 1985.

Values and Ethical Issues in Science and Technology: A Muslim Perspective

Introduction

There have been phenomenal advancements in science and technology in the last two centuries. Modern medicine has eliminated many diseases; modern transportation has led to the possibility of saving the victims of earthquakes and famine on a large scale, and modern communication has enabled establishing contacts with the remotest regions of the world.

On the other hand, in their long history from dim antiquity, it is during the last hundred years that human beings have perpetrated the worst forms of destruction. Let us mention just a few of these.

Many species have disappeared; the ozone layer has been almost depleted; and the number of human beings killed in the inter-regional and world wars makes one shudder. In short, the forces that had been tapped minimally have been harnessed to foist the dominance of some over others, and if needed, to decimate one's foes all together.

Furthermore, investment in science is becoming increasingly geared to serve economic and political purposes of the rich and the powerful, rather than to promote the higher causes cherished by all humanity. This raises the question: why did advancement of science and technology not lead to the overall well-being of humanity? Why are the deadly weapons and the pollution of the environment increasingly threatening human existence and impairing the quality of human life?

We share the view of many sages in the East and the West that the whole problem has arisen from a change in the attitude toward science that took place after the Renaissance. To paraphrase E. F. Schumacher, the change that took place in regard to science was that rather than continue to be 'science for understanding' it has tended to become science for manipulation'. The earlier outlook was based on wisdom and was guided by a moral code.

The latter view was directed towards material power through the exploitation and manipulation of nature. The old science bad aimed at discovering the secrets of God's handiwork in nature, whereas the new science sees nature as a quarry to be exploited.

In Schumacher's words: The 'science for understanding saw man as made in the image of God, the crowning glory of creation, and hence 'in charge' of the world, because noblesse oblige. The 'science for manipulation', inevitably, sees man as nothing but an accidental product of evolution, a higher animal, a social animal, and an object for study by the same methods by which other phenomena of this world were to be studied ‘objectively’.[1]

The weakening of moral values and ethical considerations in the scientific enterprise during the last three centuries, especially during the twentieth century, has been due to a number of causes. Here we would like to succinctly mention the most important of them:

1. The view of nature in the 17th and I8th centuries according to which nature was conceived as a machine with no inherent rights or interests, led to the development of an exploitative attitude towards nature.

2. Before the development of modern science, most of the scientists had subscribed to objective moral laws. The progress of science has been

effective in marginalizing ethical considerations and regarding moral values as subjective. This, in turn, has led to moral relativism.

3. Some popular scientific theories, such as Darwin's theory of evolution, have undermined belief in an objective moral order.

4. Before the Renaissance, science, religion and philosophy were intimately related to each other. The growth of specialization led to the isolation of science from other areas of human knowledge and concern. As Toulmin put it: "It was the development of specialization and professionalization that was responsible for excluding ethical issues from the foundations of science". [2]

5. The widespread belief among scientists about the absolute separation of facts and values has undermined the role of ethics in the scientific enterprise. Since Hume's time, it is usually argued that science is an objective, value-fee enterprise dealing with facts, whereas values are subjective and depend primarily on personal opinion. In Popper's words:

To sum up, it is impossible to derive a sentence stating a norm or a decision or say, a proposal for a policy from a sentence stating a fact; this is only another way of saying that it is impossible to derive norms or decisions or proposals from facts.[3]

This view ignores that the separation of facts and values is itself a value based decision. In most of the world's major religions the concept of moral law is related to the goal toward which the world is heading, and the rightness of any human activity is determined on the basis of its conformity with that goal.

In a world free of purpose, values are left with no reliable frame of reference and are only temporary means for handling human affairs. The real ground for moral conduct is belief in a universe which has an underlying purpose and moral order. The neglect of teleology in modern science has been effective in dispensing with moral values in the scientific enterprise.

6. The prevalence of moral relativism in our time has hollowed out the foundations of man's commitment to moral values. Moral relativists claim that all moral values are of equal worth. This is because they are no more than conventions developed by a community in order to regulate its affairs. According to this view, the standards of rationality and moral codes are culture-dependent.

Moral relativism is also not compatible with a truly religious perspective of the cosmos. Furthermore, the absence of a common moral basis in discussion or decisions-making leaves all such matters without any conclusion and only force can be the arbiter. As Polkinghorne bas elegantly put it: "If there is no common ground on which the disputants can meet, then the only strategy left is to try to shout louder than the rest".[4]

7. All religions of the world advocate some standards of conduct. All of them, despite their differences on theological issues, prescribe a set of common moral principles. Furthermore, all religions of the world play a key role in the ethical education of the public. The weakening of the religious authority in the course of the last two centuries has weakened the role of

moral values in all spheres of human concern, including the scientific enterprise.

Science and Ethics

Science attempts at a systematic study of nature by recourse to observation, experiment and reasoning. Ethics, in the sense used here, concerns rules of conduct, the so-called moral values. The fundamental question that confronts us is whether these two spheres of human concern are independent of each other or are interrelated; and in the latter case, what is the nature of their relationship?

At the first glance, they seem to be independent. But one deals with “facts”, while the other is deals with “oughts". This is in fact, what Hume expounded and since then this notion bas been increasingly accepted by western philosophers and intellectuals. We agree that on the basis of logic alone one cannot derive normative statements from factual statements.

Nevertheless, we also believe that scientists cannot ignore ethical issues, and science and ethics are related both at the metaphysical and practical levels, as will be argued in the following section. Thus, the claim for moral neutrality in scientific research and its applications is simply an illusion.

The Relation of Science and Ethics

Science deals with a very important aspect of human life, but it cannot deal with the whole spectrum of human experience. To deal with this wider spectrum, one needs an enlarged view of science, a metaphysics, which includes both science and ethics, among other things, and which can handle all aspects of human experience in a unified manner. Usually the values that shape people' s interaction with nature are derived from religious world views. In the words of Lynn White: “What people do about their ecology depends on 'What they think about themselves in relation to things around them. Human ecology is deeply conditioned by beliefs about our nature and destiny, that is, by religion.[5]

At the practical level, science and ethics are interrelated for the following reasons:

1. Science is a goal-directed enterprise. Thus, it must include some of those values that give direction to both its goals and the means of achieving them. For example, commitment to truth is a value which is essential to the enterprise of science. In the words of Karl Popper. "The fact that science cannot make any pronouncement about ethical principles has been misinterpreted as indicating that there are no such principles, while in fact the search for truth presupposes ethics".[6]

Furthermore, science is an important means for obtaining socially-valued goals like knowledge and power.

2. The scientific enterprise involves value-judgements. Here are a few important instances:

a. Codes of conduct are involved in the practice of science which, inter alia, function as a quality control mechanism and ensure trust in science. These consist of honesty, openness, impartiality and integrity, etc. There is consensus in the scientific community about the necessity of following these codes.

b. Value-judgements also permeate scientific practice at the level of discovery, and may change a scientist's line of research.

c. Value-judgements play a very important role in the assessment and choice of theories. Since scientific theories arc appraised on the basis of certain criteria which are value-laden, Thomas Kuhn counts the following as characteristics of a good scientific theory: predictive accuracy, internal and external consistency, broadness of scope, simplicity (that is, unifying power) and fruitfulness.[7]

One could also add other criteria such as social utility and beauty. These criteria, as Kuhn and McMullin[8] have emphasized, operates as values, “epistemic values” in McMullin's terminology.

As Kuhn put it: The criteria of choice function not as rules, which determine choice, but as values which influence it. Two men deeply committed to the same values, may nevertheless, in particular situations, make different choices, as in fact they do.[9]

Thus, for example, the disagreement between Einstein and Bohr about quantum theory was rooted in the fact that they had different views about what a "good" theory is expected to accomplish.

d. Value-judgement enter into decision-making concerning the applications of science and technology. Scientific discoveries and technological innovations often lead to important social, moral and political consequences. Thus, as a member of a society, a scientist should not ignore the consequences of his or her research or teaching.

The destructive consequences of science and technology during the last century was the result of the separation of facts from values and the indifference of some scientists to the consequences of their scientific finding or technological innovations. The manufacturing of chemical/biological and nuclear weapons could be cited as an example.

The progress of science during the last century has raised serious ethical issues about experiments involving human or animal subjects or public safety. To humanize applied science and technology, one needs to take into account ethical considerations, especially when one is dealing with the kind of research that affects humankind or the environment.

This is because scientific and technological progress cannot, by itself, hold the societies intact; its accomplishment requires paying due attention to the moral dimension of the scientific activity.

3. Science has become increasingly interlocked with business, industry and political goals. This can lead to moral conflicts between proper scientific goals and business values or government priorities, which are oriented to political and economic interests.

4. Those who preach value-neutrality of science confuse the findings of science with its applications. Science is a double-edged sword, where it could be used to secure human welfare, or it could be used for destructive purposes. Something outside of science is needed to lead scientists to use their science for good causes.

5. To secure human welfare in all human activities, including scientific, a strong sense of responsibility on the part of the persons concerned is essential. Science cannot provide this. Moral responsibility comes from elsewhere, chiefly from religious belief.

Urgent Need for Ethical Concern

In our era, there are two main approaches to the pursuit of science: "science for the sake of science" and "science for material goals and power". The dominant materialistic outlook which underlies each of these approaches, reduces everything to the level of matter and labels anything beyond science as unscientific and fosters an attitude whereby the universe is viewed as a cosmic accident lacking meaning and purpose.

But the development of the notion that science and technology should be pursued for their own sake and free from their impact on society and environment has given rise to a serious crisis for die human race.

Indeed, the recent advances in molecular biology and genetic engineering have led to an unprecedented increase in human power over living things, with probable harmful consequences. This has caused a lot of concern among some scientists and philosophers. The root of this apprehension lies in the prevalent secular interpretation of man's position in the cosmos, in the assumed relationship of humankind with the rest of the creation, and in the separation of facts from values; that is, separation of knowledge from codes of conduct.

Thus, it is very important that science be put within a broader framework, an underlying metaphysics, that takes all aspects of human concern into account. This includes the relation of humankind to God and to the cosmos, and, in tum, brings up the issue of wisdom and moral values, and implies that there has to be an ethical orientation to the scientific activity.

It is only when that happens that science and technology will be at the service of humankind's integral development. The ethical issues raised by the recent advances in technology are of various kinds. Here, for the sake of brevity, we consider only two important categories.

1. Genetic Manipulations

Experiments in genetic engineering, studies on the genetic origin of intelligence, and the cloning of human embryos and animals have brought up the question of redesigning human beings. These new developments have the following characteristics:

1. They are double-edged, i.e. they could be used to treat some diseases, or they could be used to produce biological weapons or to change human characteristics, or they could be used to disrupt the delicate balance underlying our planet's whole eco-system.

2. There is not enough information about the possible consequences of the new discoveries.

While biotechnology could prove exceptionally beneficial to medicine and agriculture, serious questions are being raised regarding the new reproductive technologies. Thus, all experiments should be done with extreme caution, and one has to refrain from conducting experiments that raise serious ethical issues.

For example, as far as the problem of human cloning is concerned, some serious questions have been raised in both religious and secular circles. We just sample a few of the objections raised against human cloning among both Christians and Muslims.

a. Cloning destroys the dignity, uniqueness and sacredness of human life. In other words, it leads to dehumanization.

b. Cloning reduces human body to the level of a merchandise.

c. Cloning affects family life and would lead to legal and ethical dilemmas.

d. Cloning leads to the loss of kinship.

e. Cloning could lead to some unpredictable, incurable problems.

Some religious people have rejected human cloning on grounds of its artificiality. In our view, however, it is the dignity of the human person which is the main issue involved in cloning.

2. Environmental Crisis

The industrialization of the west in the nineteenth and twentieth centuries has resulted in the degradation of our environment, causing over exploitation of the earth's resources, extinction of many species, pollution of air and water, military proliferation and toxic surplus, among other things. The environmental crisis thus created is the result of a drive for unlimited economic growth.

This drive has been fueled by the materialism and secularism of the industrialized societies which view nature as a commodity that is to be exploited to the maximum. This environmental crisis threatens the existence of all life forms on our planet, including humankind. If the processes of technological development continue unchecked, there is no hope for humanity in the future.

To reverse the present trend, there has to be a concerted effort on the part of governments worldwide, the scientific establishment and religious authorities. But this is not going to succeed unless the moral dimension is added to the present relationship between human beings and their environment.

As Anthony Giddens put it: Not just the external impact, but also the logic of unfettered scientific and technological development will have to be confronted if serious and irreversible harm is to be avoided. The humanizing of technology is likely to involve the increasing introduction of moral issues into the now largely "instrumental" relation between human beings and the created environment.[10]

This calls for recognizing that what is technically possible is not necessarily morally admissible.

Importance of Moral Dimension in the Islamic Outlook

In the Islamic outlook, science and ethics are synthesized within the underlying Islamic world-view which considers the phenomena of nature as signs of God and attributes a purpose to the universe and assumes a moral character for the cosmos. According to the Qur'an, God gave humankind the ability to grasp nature:

And He taught Adam all the names... 2: 31

God also invested human beings with His vicegerency on the earth:

It is He Who has appointed you vicegerents in the earth, and has raised some of you in ranks above others, that He may try you in what He has given you. Swift is your Lord in retribution... 6: 165

Moreover, He honored them:

And surely We have honored the children of Adam... 17: 70

This means that they are God's dignified trustees on the earth. This was accompanied by three things that are discussed below.

1. Humankind's Ability to Use Natural Resources

By granting human beings the ability to gain knowledge of the secrets of nature, God gave them the power to take advantage of nature's resources:

Do you not see that Allah beside what is in the heavens and what is in the earth subservient to you, and made complete to you His favors outwardly and inwardly… 31:20

2. Humankind's Responsibility

As a trustee of God, each person must act responsibly:

So, by your Lord, we would certainly question them all as to what they did 15: 92-93

Thus, mankind is supposed to take care of the earth, in accordance with the purposes prescribed by God, discharging his duties with sincerity and justice and avoiding any kind of mischief in the earth:

And do not make any mischief in the earth after its reformation, and call on Him, fearing and hoping 7:56

This includes destruction of individuals, annihilation of species, abuse of the natural resources, pollution of the environment, etc. Thus, for instance, the killing of even one person is counted in the Qur'an as the killing of all human beings:

That was why We laid down for the children of Israel that whoever killed a human being, except as a punishment for murder or for sedition in the earth, should be looked upon as though he had killed all human beings... 5:32

This Stresses the sanctity of human life as it is a gift from God. The responsibility implied by trusteeship has the following dimensions:

1. Responsibility for one's actions:

This is the day for sorting things out which you have been denying... Stop them! They must be questioned. 37: 21-24

2. Responsibility towards other member of the society:

They believe in God and the last day; they command decency and forbid dishonor, and compete in doing good deeds. Those are honorable people 3:114

In the Prophet's words: Verily, each one of you is a guardian (shepherd) and each of you is responsible for his flock (subjects). [11]

3. Responsibility towards animals and other creatures:

There is no animal crawling on the earth, nor a bird flying with its wings, but they are communities like you 6: 38

The Prophet Muhammad (s.a.w.w.)said: All creatures are God's family; and God loves the most those who are the most beneficent to his family. [12] In the words of Imam Ali (a.s.): Fear God about His servants and His cities, because you will be questioned even about lands and beasts. [13]

3. Humankind's Knowledge of Good and Evil

According to the Qur'an, God created human beings in good proportion and with suitable potentialities and inspired to them the consciousness of right and wrong:

Have We not given him two eyes; a tongue and two lips; and shown him the two highways (of the good and the evil)? 90:8-10

And by the soul and Him who shaped it and inspired it with (the knowledge) of the right and wrong. 91:7-8

Moral Orientation of Science and Technology in Islam

As far as the ethical dimension of science is concerned, there are four concepts in the Qur'an (and the Islamic tradition as such) which are specifically relevant to the moral orientation of science and technology. These are the concepts of “useful knowledge", “balance", "purification of soul" and "avoiding unfounded judgements".

Useful Knowledge

Whereas the acquisition of knowledge, in its generic sense, is strongly recommended in Islam, it is emphasized that one must seek useful knowledge. In the Prophet's words: "My Lord, save me from any knowledge which is useless.” [14]

Any knowledge which helps humankind in performing its God-assigned role in the world is considered useful. All else is categorized as useless. Thus, any branch of knowledge whose harm is greater than its benefit is to be avoided.

Imam Ja'far Al-Sadiq (a.s.) has elaborated on this point: Any son of science and technology which eliminates man's needs or is useful to God's servants and helps them to continue their lives and meet their needs, is permitted by religion to teach or to learn… Anything causing disturbance or harm, or ending in corruption and having no use for man, is forbidden to teach, to learn or to impart it to others... [15]

Balance in the Cosmos and in all Human Actions

According to the Qur'an, everything in the created universe is orderly and balanced (measured and in proportion), and humankind is not supposed to disrupt this balance. We must act in concordance with the order of the balanced cosmos:

The sun and the moon pursue their ordered course... He raised the heaven and set the balance that you might not transgress the balance 55: 5-8

Thus, it is concluded from that the cosmos is orderly and balanced, and that man should not transgress the balance in his relation with himself and with the rest of the creation. In other words, the laws governing the cosmos should be harmonious with those ruling over human affairs as they all refer to the same God and God wants to keep everything balanced in the cosmos.

Another idea mentioned in the Qur'an in connection with the concept of ‘balance’ is that of ‘moderation’. It is recommended that in satisfying one's legitimate needs, one is not supposed to consume or acquire beyond one's real needs:

And those (are servants of God) who, when they spend, are neither wasteful nor niggardly, and there is a just mean between those (extremes) 25:67

Thus, the excessive use of natural resources is to be avoided.

Purification of Soul

In the Qur'anic outlook, the message of God's Prophets and Messengers has been two-fold, to teach the true faith and to purify the lives of people:

Our Lord, rise up from among them an Apostle who shall recite to them Your communications and teach them the Book and the wisdom, and purify them... 2: 129

Thus, pursuit of knowledge has to be accompanied by the teaching of moral values. The assumption of the character traits of God gives a correct orientation to one's scientific activity.

Avoidance of Unfounded judgements

One of the important points emphasized in the Qur'an is the avoidance of unfounded confirmations and rejections:

And follow not that of which you do not have knowledge; surely the hearing and the sight and the heart, all of this shall be questioned about that 17: 36

This is especially important for our era, where many experiments are being carried out for which possible risks are not known yet. Some scholar[16] have attacked the monotheistic religions on the grounds that they have been responsible for the present environmental crisis.

In their view, the monotheistic religions see no reason for the existence of nature save to serve humankind and their otherworldly inclinations encourage the neglect of the environment. But the fact is that neither Judeo-Christian tradition nor Islam sanctions the spoliation of the earth or its resources for that represents an utterly utilitarian attitude and the negligence of humankind' s role in making the present world flourish.

To summarize: in Islam, as well as other Abrahamic religions, human beings are God's vicegerents on the earth, and are responsible for the well-being of all human beings and also that they are responsible toward each other. Instead of being exploited, nature should be treated as sacred as it is the handiwork of God, the Sacred.

The principle of balance and moderation is central to the Islamic outlook. Furthermore, Islam extends the sphere of ethical concern to all creation. For Muslim scientists and technologists, the Islamic worldview should be the guiding light in the applications of science and technology, and scientific activity must fulfil the requirements of human societies and it should prevent the scientists from contributing to anything that is harmful to the safety of human beings and their environment.

As regards the genetic manipulation of human beings, Islamic prohibition covers the following:

• Producing children through channels other than marriage.

• Disrupting the family system.

• Manipulating human genes before knowing the ethical, social and biological consequences of that research.

• Violating human dignity.

As far as environmental ethics is concerned, the Islamic view is based on harmony between mankind as God's trustee in the earth and nature as manifestations of God's handiwork. This necessitates that the abuse of natural environment be prevented and God's creatures be saved both from destruction and harm.

Conclusion

In the past, ethical considerations were a concern of all believing scientists, both in the Islamic and the Western world. This perspective has dramatically changed in our age. The development of science and technology under a secularist-materialist worldview has led to grave consequences for humankind.

In this worldview, the ethical, philosophical and religious dimensions of science and technology are neglected and humankind's physical comfort is confused with true happiness. The industrial world with all its technological superiority is crying out for meaning and purpose, things that scientific and technological advancements have failed to provide.

There is no doubt that the environmental crisis and the possibility of improper genetic manipulation of some natural processes is a threat to the very existence of human life and human societies. To ensure normal human life it is urgent that effective steps be taken to save the human race from the impending catastrophe. We have the following to recommend in this regard:

1. The source of all problems that threatens the very existence of humankind and its ecosystems lies in the short-sighted worldview and epistemology that underlie the present science and technology and in the interpretation of humanity's position and responsibility in the cosmos.

The present trend of restricting knowledge to the scientific investigation of nature has to be replaced by one that embeds science within a richer framework and which includes other dimensions of human experience, including the spiritual and moral ones, a worldview that relates man's life to the rest of the universe.

2. Scientist’s training should be combined with ethical education in order to stimulate moral concern. This could most effectively be done in a religious context. An ethics without religious basis could exist., but a religiously-based ethics has the advantage that religion can provide justification, interpretation and definition of moral values. Furthermore, religious value systems are more effective in mobilizing people for preserving the environment.

3. Scientists should refrain from conducting any kind of research which could be harmful to human life, to other creatures and to our environment. Thus, experiments like germ line gene manipulation, which have raised the prospect of altering human genetic machinery and could disrupt the metabolic balance of the individual, require extraordinary caution and should not proceed irresponsibly.

4. The nation-states have shown their incompetence in combating environmental crisis and in preventing harmful applications of science and technology. The moral authority of religion is one of the best ways of securing moral concern in the individuals and in societies.

5. In all three monotheistic religions, humankind is part of a wider cosmic order. This means that plans for scientific progress and technological innovations are supposed to be harmonious with this cosmic order. Thus, the scientists committed to these religions, as well as other people of goodwill, should address the moral dilemmas created by the abuses of science and

technology and by the present environmental crisis and should devise a joint strategy based on some core religious values.

John Polkinghorne has put the matter nicely: “It is essential that Christians and other religious people should seek what common ground they find with all other people of good will in trying to articulate an ethical basis for caring for our world. Perhaps that common ground can be found in the acknowledgement of a respect for all humanity and for life and for the world that gave us birth. We need a sharp concept of the common good, wide enough to embrace the natural world and future generations.” [17]

I think this is feasible and it is the only hope for the survival of human race on this planet.

Notes

1. E. F. Schumacher, A Guide for the Perplexed (London: Janathan Cape, 1977), 65.
2. Quoted in M. Artigas, The Mind of the Universe (Philadelphia: Templeton Foundation Press, 2000), 258.
3. K. R. Popper, The Open Society and its Enemies (Princeton: Princeton University Press, 1971), 1: 64.
4. J. Polkinghorne, Beyond Science (Cambridge: Cambridge University Press, 1996), 124.
5. Lynn White, "The Historical Roots of Ecologic Crisis" in Science, 155 (1967), 1205.
6. K. R. Popper, “Natural Selection and the Emergence of Mind” in Gerard Radnitzky and William W. Bartley III, eds., Evolutionary Epistemology, Rationality and the Sociology of Knowledge (La Salle, IL: Open Court, 1987), 141.
7. Thomas S. Kuhn, "Objectivity, Value-judgement and Theory Choice’ in his, The Essential Tension: Selected Studies in Scientific Tradition and Change (Chicago: University of Chicago Press, 1977), 321-2.
8. E. McMullin, “Values in Science Association (East Lansing, MI: Philosophy of Science Association, 1983), 14-20.
9. T. Kuhn, “Objectivity, Value-judgement and Theory Choice”, 331.
10. A. Giddens, The Consequences of Modernity (Stanford: Stanford University Press, 1990), 170.
11. Muhammad Ibn Ismail Al-Bukhari, Sahih Bukhari, Kitab Al-Nikah, Bab Al-Maratu Raiyah Fi Bayt Zawjiha.
12. Jalal Al-Din Abd Al-Rahman Abi Bakr Al-Suyuti, Al-Jami’ Al-Saghir Min Hadith Al-Bashir Al-Nadhir (Damascus: Maktabat Al-Halbuni, n.d.), 1:558, The statement that all creatures are God’s family means that all are His dependent.
13. Imam Ali, Nahjul Balaghah, ed., Subhi Al- Sahih (Beirut: Dar Al-Kitab Al-Lubnani, 1980), 242.
14. Jalal Al-Din Al-Suyuti, Al-Jami Al-Saghir, 1: 185. The same tradition has been narrated by Muhammad Baqir Majlisi, though with a slightly different wording. See Majlisi, Bihar Al-Anwar (Beirut: Dar Ihya Al-Turath Al-Arabi, 1983), 2:32.
15. Hassan Ibn Ali Al-Harrani, Tuhaf Al-Uqul An-Al Al-Rasul (Qum: Daftari Intisharati Islami, 1363 Solar), 335-336.
16. See A. Toynbee, “The Religious Background of the Present Environmental Crisis” in D. and E. Spring, eds., Ecology and Religion in History (New York: Harper and Row, 1974); and Lynn White, “The Historical Roots and Ecologic Crisis”.
17. J. Polkingghorne, Beyond Science, 124-125.

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