

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



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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. The only hope for a better future for humankind is to keep Ethics as a central concern in order to avoid misuse of discoveries that can create destruction and not improvement for humankind and its condition.

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## 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 had 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'.<sup>1</sup>

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 18th 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-free 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.<sup>3</sup>

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 has 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".<sup>4</sup>

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 has 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."<sup>5</sup>

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."<sup>6</sup>

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 are 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.<sup>7</sup>

One could also add other criteria such as social utility and beauty. These criteria, as Kuhn and McMullin<sup>8</sup> 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.<sup>9</sup>

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 the 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 turn, 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.<sup>10</sup>

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).<sup>11</sup>

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.<sup>12</sup> 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.<sup>13</sup>

### **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...

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#### **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<sup>16</sup> 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 wellbeing 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.

1. E. F. Schumacher, *A Guide for the Perplexed* (London: Jonathan 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.

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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. Polkinghorne, *Beyond Science*, 124-125.

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