

REFORMULATING A COMPREHENSIVE RELATIONSHIP
BETWEEN RELIGION AND SCIENCE:
AN ISLAMIC PERSPECTIVE

Osman Bakar

Formulation of the relationship between Islam and science has been confused because of misuse and misunderstanding of key terms and their precise context. Which Islam? Which science? If we are aiming at a science molded in the crucible of Islam, we need to approach science as a theoretical construct with four components: a body of knowledge, basic premises, methods of study and goals, all of which must be fully informed by the domain of *imān* and understood at the level of *iḥsān*. This paper establishes a philosophical framework for the harmonious relationship between epistemological dimensions of science and the Islamic worldview as well as between ethical and societal dimensions of science and *Shari'ah*.

Keywords: Islam; science; context; normative teachings; theoretical structure; hierarchy of values; conceptual goals; epistemological; ethical; practical application; holistic; *Shari'ah*.

Introduction

This paper has been written in response to a specific question which has two facets: What is the best way to formulate the relationship between Islam and science? How does this methodology constrain/explore the discourse from an Islamic perspective? In attempting to provide a clear and fairly comprehensive response to these questions, we have to first take note of the glaring fact that contemporary discourse on the subject of Islam and science is clouded with all kinds of confusion. This abundant confusion stems largely from the failure of many participants in the discourse to

Osman Bakar is Professor, Malaysia Chair of Islam in Southeast Asia, Center for Muslim-Christian Understanding, Edmund Walsh School of Foreign Service, Georgetown University, Washington DC 20057, USA; email: drosmankakar@yahoo.com.

provide proper definitions of key terms central to the discussion. Clearly, here both terms 'Islam' and 'science' are central to the whole discourse, and thus they need to be well-defined and explained.

Then there is the failure to clearly state the precise context in which the terms are being used in the discussion. Given the multiple senses in which the terms might be understood, these two failures can have undesirable consequences on the outcome of the discourse. We often find cases of gross misunderstanding because of misunderstanding the context in which these terms are used. These sources of misunderstanding need to be addressed, more so when we are confronted with a situation in which a significant portion of contemporary works on Islam and science are polemical in nature and tend to perpetuate misunderstanding.¹

Islam and Science: Which Islam?

Whatever kinds of relationships between Islam and science are to emerge prominently in our discussion will depend on the meanings given to the terms 'Islam' and 'science' or which of their respective dimensions are emphasized. Which Islam or which part of Islam is it that is being related to science? Indeed, the term Islam may be understood in several senses. It has been used by certain people to refer to the normative teachings of the religion as contained in the Qur'ān and prophetic tradition. There are Muslims who, when speaking about the relationship between Islam and science, do not even want to consider the ḥadīth literature as a source of their understanding of the former.² Arguing that the Qur'ān is divine

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1. A complete and objective account of contemporary discourse on Islam and science inclusive of the theme 'Islamic science' is yet to be written. Works produced so far that purport to give such an account, while being informative in certain respects, have failed to present an accurate picture of the intellectual position on science of each of the major discussants in the discourse. As examples of works in this category, see Sardar, Ziauddin (1989), *Explorations in Islamic Science*, Mansell, London; Stenberg, Leif (1996), *The Islamization of Science: Four Muslim Positions, Developing an Islamic Modernity*, Lund Studies in History of Religions, Ludwig; and Kirmani, Zaki (2000), "Islamic Science Debate: Entering the New Millennium" in *Hamdard Islamicus*, vol. XXIII, no. 4.
 2. Not all who reject ḥadīth are involved in intellectual discussions on Islam and science. But a good example of intellectual groups that reject ḥadīth literature in their discourse on Islam and science is the Malaysian *Jemaah Quran* led by Kassim Ahmad, the country's well-known and controversial

whereas aḥādīth are of purely human origin and thus possibly questionable in their authenticity, this group of Muslims depends solely on their own interpretations of the Qurʾān for their formulation of the relationship of Islam and science. They want to understand Islam, including its perspectives on science, by going directly to the first source, the Qurʾān, and not through the intermediary of the historical manifestations of the religion in the form of its spiritual traditions, intellectual culture, and civilization. Such an attitude toward Islam's intellectual past is also to be found among the believers in aḥādīth.

Then there are those who use the word Islam not only to refer to its normative teachings that allow for fresh interpretations, but also to its culture and civilization as these dimensions have been manifested throughout Muslim history. If Islam is understood in this sense, then it has to be inclusive of its past intellectual culture, of which science used to be an integral part. A discussion of Islam and science based on this broader meaning of Islam would necessarily differ in scope, content, and depth from the one that ignores the traditional theories and practices of science in Islamic civilization and their conceptual relationships with religion. It is a position that is informed by a solid knowledge of the history of Islam the religion and Islam the civilization. This civilizational approach to the Islam and science discourse which is sensitive to tradition is based on the conviction that past formulations of the relationship between religion and science have an intrinsic value that make them relevant to contemporary attempts to arrive at the same conceptual goal.³ Some have disputed the

literary figure, a former ideologue of scientific socialism and leader of an opposition political party. Interestingly, he sees complete compatibility between modern science and Islam on the argument that science in all ages is value-free.

3. The leading exponent of this civilizational approach to Islam and science discourse is Iranian-American Seyyed Hossein Nasr, currently University Professor of Islamic Studies at George Washington University. His ideas on the subject, to be found in numerous books and articles written over the last four decades, have found an attentive audience in the Muslim world but the more spiritual aspects of his views have been misunderstood in many Muslim intellectual circles. Among the most relevant of his works to the discourse, see *Introduction to Islamic Cosmological Doctrines* (1964), Harvard University Press, Cambridge; *Science and Civilization in Islam* (1968), Harvard University Press, Cambridge; *Islamic Science: An Illustrated Study* (1976), World of Islam

value of this approach to our contemporary needs. But whichever decision we make on the relevance of tradition to contemporary discourse should only be based on a careful and objective study of past formulations, at least those associated with important scholars of Islamic intellectual history.

In our view, the most significant formulations would be those of practicing scientists. Pertinent to our whole discussion, we are rather fortunate to have a long list of Muslim scientists in the past who were very knowledgeable in religion and other fields of study like history and philosophy. Their works on religion and science strike us as intellectually more revealing and appealing in helping us today to articulate relationships between the two domains than those produced by theologians and other men of religion with a limited knowledge of science.⁴

Islam and Science: Which Science?

If it is appropriate to ask which Islam is being related to science, the converse question is no less appropriate. Which science, or which part of it, are we relating to Islam? Science is not an entity that is obvious to everyone. The different understandings of the term science in contemporary discourse present another major issue that needs clarification. To begin with, there are disagreements on terminological usage itself, whether the domain of knowledge to which the term 'science' is applied is to be confined to the natural sciences, or to be extended to cover the humanities and social sciences as well. Some people use the word in both senses. Given the fact that the term science has been used in modern scholarship in its broadest sense of an academic or scientific discipline, as in Islamic tradition in which the Arabic term *ʿulum* (sciences) is used, we prefer to adopt this usage. Then there are disagreements on the content of science and its cultural context, whether the content is value-free or much shaped by its cultural context. In other words, there may not be just one way of doing

Festival Publishing Co., Thorsons Publisher Ltd London.; and *The Need for a Sacred Science* (1993), State University of New York Press, Albany.

4. For formulations on the relationships between religion and science seen from the Islamic perspective but which put greater emphasis on the intellectual positions adopted by Muslim philosophers and scientists of the past, see Bakar, Osman (1999), *The History and Philosophy of Science*, Islamic Texts Society, Cambridge, previously published under the title *Tawhid and Science: Essays on the History and Philosophy of Islamic* by Nurin Enterprise and Science University of Malaysia, Kuala Lumpur in 1991.

science with the same characteristics over the ages, but there could have been as many types of science as there have been civilizations. We maintain the view that modern science is just one of the several major forms of science that the world has witnessed in its history. Islamic science, by which we mean science as it has been cultivated in Islamic civilization, is another form of science. This means that in speaking of the relationship between Islam and modern science we would be dealing with issues that are not necessarily the same as encountered in discussions on the relationship between religion and science in Islamic civilization.⁵

In this essay, we are limiting the domain of scientific disciplines for our consideration to the mathematical, natural and cognitive sciences including psychology. Our discussion of the kind of relationships that exist between Islam and science is primarily aimed at these sciences. Given the limited length of this essay, it is not possible to deal separately with each of the sciences in its relations with Islam. Furthermore, rather than dealing with specific details in the relationship, we will focus on its main principles that are common to all the sciences. But these principles would provide us with a clear outline of the structural and essential relationships between Islam and science. Since it is in the nature of the sciences as academic disciplines to share many characteristics, we may find that in many instances the issues we raise and discuss and the conclusions reached are applicable not just to the mathematical, natural and cognitive sciences but to all sciences.

Having adopted the term science to comprehend this particular domain of scientific knowledge and activity, we now need to be clear whether we are only concerned with its epistemological dimension dealing with knowledge content or only with its ethical dimension dealing with applications of that knowledge, or with both. The word 'application' itself requires clarification. Some applications are theoretical in nature, producing results either within or beyond the domain of science proper. The rest of the applications are practical in nature, resulting in the production of techniques and technological products. As a whole, the domain of applications presents itself as the domain of ethical concern. Distinctions thus have to be made between epistemological and ethical

5. For a detailed discussion of the major issues that were set to cause a cultural and intellectual separation between Islamic science and modern science see Iqbal, Muzaffar (2000), "Islam and Modern Science: Formulating the Questions" in *Islamic Studies*, vol. 39 (Winter), no. 4, pp. 517-70.

concerns, because their relationships with religion involve different sets of principles. Likewise, we have to make distinctions between theoretical and practical applications for the same reason.

The Structures of Religion and Science

In our attempt to formulate a comprehensive relationship between Islam and science, it is necessary to examine the structures of both of them and then to relate the basic elements in the two structures to each other. Let us first examine the religious structure of Islam. According to a Prophetic ḥadīth, Islam as a religion (*dīn*) is comprised of three dimensions: *islām*, *imān*, and *iḥsān*.⁶ The nature of each dimension is apparent from both its linguistic and religious content. *Islām* refers to the various acts of submission to the Divine Will and therefore to the domain of the *Sharīʿah*, Islam's Divine Law or moral and ethical-legal dimension which determines the hierarchy of values of all human acts and objects. *Imān* refers to the fundamental truths and realities that must be believed or known, more precisely to the divine and cosmic realities and their correspondences within the human universe. This is the domain of theology, cosmology and psychology. *Iḥsān* is simply the practice of *islām* and the realization of *imān* at the level of excellence. As such, *iḥsān* pertains to a person's internalization of *islām* and *imān*, the former with the view of realizing spiritual and moral virtues that constitute the essential values of the *Sharīʿah*, and the latter with the view of attaining knowledge of the inner realities of all things.

We now examine the structure of science as a branch of knowledge and as an intellectual activity. It is only meaningful to speak of the structure of science if we accept the fact that knowledge has been systematically organized and divided into numerous academic disciplines and these disciplines classified in groups according to some well-defined criteria. Just as knowledge grows through specialization, so the academic disciplines grow in numbers. In Islamic tradition, there was tremendous intellectual

6. This is the famous ḥadīth which tells us of a visit by Archangel Jibraʿīl appearing as a man in a traditional white robe to the Prophet's study circle in the presence of his close companions, with the purpose of teaching them religion (*dīn*). Jibraʿīl posed questions on *islām*, *imān* and *iḥsān* and then he himself undertook to answer them. For a penetrating exposition of this tripartite structural division of the religion of Islam, see Schuon, Frithjof (1972), *Understanding Islam*, Allen & Unwin, London.

activity focused on the issue of organization of knowledge into disciplines and their classifications.⁷ Muslim intellectual culture was also a witness to the creation of new scientific disciplines. Muslim philosophers of science called these disciplines ‘sciences’ (*‘ulūm*) and generally agreed that science understood in this sense is structurally divided into four basic components. The first component is a well-defined subject matter or object of study pertaining to which is established an accumulative body of knowledge in the form of concepts, facts (data), theories and laws, and the logical relationships that exist among them. This body of knowledge constitutes the main content of a science.

The second component is comprised of the basic premises and assumptions that serve as the immediate epistemological foundation of the science under consideration. These philosophers maintain that unlike the knowledge content of the first component which can be established, proved and verified within that science itself, the premises and assumptions could not. The premises are primarily about the nature and reality of the object of study and its ontological status. Their truths have to be assumed in that science but may be established in another science which is more fundamental and comprehensive.

The third component pertains to the methods of study employed in that science. Muslim scholars had generally been guided by the principle that methods of study vary with the nature of the objects being studied. There is no one single method that is common to all the sciences except perhaps the use of logic with its rigorous methods of rational inquiry, analysis and theory-construction.⁸ But for any science, its core method would be the one concerned with how to gather data for analysis and theory formation and how to test and verify truth claims such as formulated in hypotheses, theories and laws. Apparently, the traditional Muslim scientific mind is very much at ease with the idea of diversification of sources of data to even include divinely revealed sources. A science may

7. See Bakar, Osman (1998), *Classification of Knowledge in Islam*, Islamic Texts Society, Cambridge, previously published by Institute for Policy Studies, Kuala Lumpur in 1992.

8. For discussions of issues of methodology in science from the Islamic perspective, see Nasr, S. H. (1980), “Reflections on Methodology in the Islamic Sciences” in *Hamdard Islamicus*, 3:3 pp. 3-13; Bakar, O. (1984), “The Question of Methodology in Islamic Science” in *Muslim Education Quarterly*, 2:1 (Autumn), pp. 16-30.

employ more than one core method. When Ibn al-Haytham (d. 430/1039) wrote *The Book of Optics*, the best Muslim work on optics, he outlined in a clear manner the methods he intended to use in the study of the new science. Its core methodological approach would be a combination of mathematical and physical methods, a departure from earlier studies employing either mathematical or physical method only.

The fourth component concerns the goals sought to be achieved by that science. The main goal of a science is to discover that aspect of reality pertaining to its objects of study. It is to arrive at a complete knowledge of that domain of reality with scientific certainty (*‘ilm al-yaqīn*). By ‘complete knowledge’ Muslim philosophers of science mean knowledge of the essential nature of all things comprised in the domain of reality under study, including knowledge of the relationships between them formulated in the form of laws or universal propositions. This knowledge is arrived at through a long process and this process has been described earlier. Through a progressive refinement of the methods of study described in the third component within the limits of their competency, the accumulative body of knowledge identified with the first component will deepen to the point of revealing the natures of the things sought to be known.

These four components define the theoretical structure of science. All issues raised in the course of discussing these components are epistemological in nature. But the knowledge content of a science has uses and applications. There are its theoretical applications in other sciences and its practical applications in the production of tangible things. It is also extremely important in the context of this paper to identify the nature of the crucial issues involved in both types of applications. In going into this domain of applications, we find that we are confronted with both epistemological and ethical issues even in the case of a science that is desirable or legitimate.

Since we have dealt with epistemological issues, we now concentrate on ethical issues. The first ethical issues are raised by the theoretical applications when these applications are likely to lead to harmful knowledge. Second, there are ethical issues posed by the practical applications of this harmful knowledge leading to the production of harmful and destructive objects. Other ethical issues relate to the actual use of those harmful and destructive objects whatever the purpose of application may be, since the act of producing them is distinct from the act of using them. In all three cases of ethical questions posed above, how much can science and scientists be blamed and held accountable? This is a

question of values, and as such its answer depends very much on the value-system of the culture posing the question.

Our foregoing discussion on the structure of science is largely based on the views of Muslim philosophers of science, but in our view, there is hardly any difference between the traditional Muslim account of the structure of science and its modern version except in terminology. We mean here the structural division of science, not its knowledge content in which, as a matter of fact, there are significant differences ranging from conception of definition to interpretation of truth claims. Traditional and modern sciences may differ from each other in a number of respects, but insofar as they are academic disciplines their theoretical structures are basically the same. This would mean that in our attempt to formulate relationships between science and Islam in the contemporary context, an understanding of the nature and character of the traditional sciences in Islamic intellectual history would be of great help.⁹ Also necessary is a deep understanding of the nature and character of modern science, its strengths and achievements, and its shortcomings and failures so that only the true and the beneficial are to be integrated into the formulations on which we are working.¹⁰

Looking for a Structural Relationship

Having clarified the structures of both Islam and science, we are now in a better position to relate, in an essential and significant way, the corresponding dimensions and elements in the two structures. Given the fact that the structural division of science pertains generally to epistemological issues, it is most appropriate to relate this division to the dimension of religion of Islam dealing with knowledge. This means we are here interested in exploring Islam's inner resources that would enable us to

9. The Center for Islam and Science is to be congratulated for providing an extensive database of Islam and science discourse. The Center's website, www.cis-ca.org, has a section on "Major voices in Islam and science discourse" that serves as a major resource for those interested in this intellectual project.

10. On the difficulties posed by modern science and its worldview to the task of creating a contemporary Islamic science and the various steps needed to be taken in overcoming them, see Nasr, S. H. (1996), "The Islamic Worldview and Modern Science" in *Islamic Thought and Scientific Creativity*, vol. 7, no. 1 (March), pp. 7-22.

shape them into a universal vision of “Islam as a way of knowledge” rather than “Islam as a way of actions and as a way of doing things.” In an earlier section, we made clear that the domain of *imān* as summarized in the six fundamental articles of faith and as understood and interpreted at the level of *ihsān* is precisely the domain that serves as the epistemological foundation of universal sciences like metaphysics, theology, cosmology, psychology and eschatology. The Islamic worldview in which science is to be cultivated and pursued is one that is fully informed by these universal sciences. More to the point, if we would like to see the four structural components of science to be in harmony with Islam, then we have to make sure that they have been shaped by the relevant ideas embodied in those sciences. It is also quite clear why Islamic intellectual tradition is important for our inspiration, consultation and guidance when it comes to the formulation of relationships between science and Islam. The experience of our predecessors in using Islam’s inner resources and developing theology, metaphysics, cosmology, psychology and eschatology in conformity with the religion is invaluable to us. Needless to say, there is always room for improvement in intellectual matters like these, but there is no need to reinvent the wheel if what we are aiming at is a science molded in the crucible of Islam.

Starting with the second structural component, the basic premises or the foundational principles, is it important to bring Islam’s epistemological resources to bear on this component? Well, it is important because we do know that on the basis of their nature and epistemic status the premises of a science may not belong to the category of real knowledge or their truths may be doubtful. As maintained by Muslim philosophers of science, all premises may be reduced ultimately to the following four categories: (1) the category of received opinions or beliefs, (2) the category of generally accepted opinions and beliefs, (3) the category of sensory knowledge or empirical data based on sense perceptions and (4) the category of intuitively accepted intellectual principles.¹¹ In their view, premises in the fourth category are necessarily true and certain and therefore completely acceptable. Acceptable as well are the new premises derived from them in accordance with the best rules of logic. In other words, the truths of

11. See, for example, our *Classification of Knowledge in Islam, op. cit.* (particularly chapters 2, 3 and 4).

rational propositions based on intuition and logic are affirmed and their suitability as premises of a science unquestionable.

Where the premises may be questionable is in the other three categories. It is in the nature of beliefs that they may be true or false. It is therefore necessary to scrutinize premises belonging to the first two categories to ensure that these do not contradict Islamic doctrines. The beliefs and opinions taken as premises, whether these originate from religious sources other than Islam or happen to be generally accepted in a certain culture should be replaced, wherever possible, with explicit Islamic doctrines even if they are not contrary to Islam. The implied idea here is that Islamic doctrines may provide a much richer source of basic premises for the sciences even when we can accept those beliefs coming from other religious traditions.

As for the reliability of sensory knowledge or data based on sense perceptions to be used as premises, the issues involved need to be well understood. We may say that for the particular purpose at hand, by itself, such a kind of knowledge is legitimate and reliable only in a limited epistemological context. The extent of its legitimacy and reliability varies with the nature of the subject matter of the science in which it is sought to be used. Clearly, empirically derived premises are more relevant to empirical sciences like physics and chemistry. But in the case of those sciences in which our approach to the subject matter would involve elements of belief, conjecture and other more subjective considerations to a great extent, the use of empirical data alone would be inadequate. The required premises need to be formulated on the combined basis of empirical and rational knowledge. Then there are sciences in which we have to depend solely on rational or intellectual principles for our premises.

It is clear to us that traditional Islamic disciplines such as epistemology, metaphysics, theology, cosmology, and psychology have an very important role to play in any intellectual project to formulate conceptual relationships between science and Islam.¹² Their main role would be to furnish us with

12. For further discussion on this issue, see Nasr, S.H. (1993), *Introduction to Islamic Cosmological Doctrines*, State University Press of New York, Albany; al-Attas, Syed Muhammad Naquib (1981), *The Positive Aspects of Tasawwuf: Preliminary Thoughts on an Islamic Philosophy of Science*, Islamic

rational doctrines that are more scientifically justifiable to be used as premises of the various sciences. The cosmological doctrines are perhaps the most needed in the task of laying down the foundations of the physical and biological sciences. Premises of the life sciences need to be based on the traditional conceptions of such central ideas as soul and life pertaining to all living things. In the cognitive sciences, among other things, we have to enlist the help of traditional cognitive psychology in clarifying for us the multi-layered meaning of intelligence and its whole range of activities. The consideration of these traditional doctrines for their roles as premises of the sciences in no way nullifies the role of empirical investigations. By all means, let us resort to the empirical investigations as well, wherever possible and pertinent.

The foregoing discussion has raised a number of points. First, it has raised the question whose intellectual task it is to build the foundations of the sciences. In a sense there is not much difference between what we see now in the contemporary sciences and what we saw in Islamic intellectual tradition. In both cases, the majority of the practicing scientists carry on with their scientific works in the disciplines of their specialization without bothering themselves with their foundational principles. It is just a few among the scientists who have been concerned with philosophical issues pertaining to the nature and role of premises in the foundation of the sciences. There are, however, some notable differences between Islamic and modern practices. In contemporary science, the only time the scientific community pays real attention to issues of foundational principles is when there is an epistemological crisis affecting that foundation as a result of some major discoveries within the discipline concerned. The modern Western professional philosophers of science do pay a lot of attention to the theoretical structures of science, but then they are not scientists. But in the case of Islamic science, it was more frequent to find leading scientists continuously engrossed in issues of foundational importance. The main reason for this is that they were both scientists and philosophers. Moreover, they were also deeply interested in the religious sciences. All these have a lot to do with their understanding and appreciation of Islamic teachings on knowledge.

Academy of Science, Kuala Lumpur; and Bakar, O. (1999), *The History and Philosophy of Islamic Science*.

This brings us to our second point of significance as far as the discussion of premises is concerned. We have in mind the significance of the Muslim scientific mind. In concerning themselves with various sciences, including the religious and the philosophical, Muslim scientists were found to have been more sensitive to the need for a holistic view of knowledge. Their awareness of the interrelatedness and unity of all knowledge quite often had important consequences on their search for premises. Unlike the modern trend of easily falling into the pitfall of reductionism, the Muslim search for premises has usually been guided by more holistic views of reality and knowledge. The result is a more solid intellectual foundation for the sciences.

The third point of significance may be linked to the contemporary discourse on Islamization of knowledge that is going on in various parts of the Muslim world. It would not be possible to achieve an actual Islamization of the sciences until we have addressed the issue of the foundational premises and we have put in place, in each discipline, premises that are explicitly formulated and stated in the light of Islamic teachings.¹³

It is also important that the next structural component of a science, mentioned in the foregoing pages, be “Islamically” related to the epistemological dimension of Islam. However, many issues involved in producing the accumulative body of knowledge in this component are similar to those encountered in the second component. We will therefore deal only briefly with this component. The process of formulating new concepts, theories and laws in a science is a dynamic one, involving logic, philosophical ideas and many rational and intellectual virtues. Creativity in thinking and interpretations is crucial to the process. The important thing

13. On contemporary discourse on Islamization of knowledge, see al-Faruqi, Ismail R. and Abu Sulayman, Abdul Hamid (1981), *Islamization of Knowledge: General Principles and Workplan*, International Institute of Islamic Thought, Herndon; al-Faruqi, I. R. (1988), “Islamization of Knowledge: Problems, Principles, and Prospective” in *Islam: Source and Purpose of Knowledge*, International Institute of Islamic Thought, Herndon; al-Attas, Syed Muhammad Naquib (1978), *Islam and Secularism*, Muslim Youth Movement of Malaysia (ABIM), Kuala Lumpur, (reprn. 1993) by International Institute of Islamic Thought and Civilization (ISTAC), Kuala Lumpur; and Stenberg, L. (1996), *The Islamization of Science*, (Lund Studies in History of Religions, No. 6), Coronet Books, New York.

here is again to look for the relevant inner resources in the intellectual tradition of Islam that would help to widen the perspectives of the Muslim scientists and foster intellectual creativity.

Issues of methodology, the third structural component of a science, are no less important in their need to be treated in the Islamic perspective. At the methodological level, the relationship between science and Islam would involve a general discussion of how the religion views the different sources of knowledge accessible to humankind. The most fundamental question that needs to be asked and answered in this matter is how can we humans gain knowledge of Reality either in its partial or total aspects?¹⁴ This question has been answered in the past in different ways by Muslim scholars. On the basis of their answers, we come to the conclusion that we have to develop an Islamic cognitive psychology which is at once traditional and contemporary. In this psychology we would synthesize the traditional exposition of the hierarchy of human faculties of knowing, corresponding to the hierarchy of the cosmos, with modern discoveries in the subject. We then need to apply this newly formulated Islamic cognitive psychology to the specific sciences to determine the methods of study that are most appropriate for each of them.

As for the last structural component, we have already presented an Islamic view of the theoretical aims and objectives of science in our earlier description. The aim of a science to know an aspect of reality needs to be related to the more general Islamic perspective on the purpose of human existence, which is to gain knowledge of Reality. It is through the cultivation of the totality of the sciences that human beings find themselves in the best position to know Reality.

Islamic Ethics and the Societal Dimension of Science

We have earlier asserted that the religion of Islam has an ethical and moral dimension which is to be identified with the teachings of the *Shari'ah*. We have also asserted that the domain of applications of science is the concern of ethics. What we may call the ethical and moral dimension of science as distinct from the epistemological dimension previously discussed, embraces issues beyond the domain of applications to include other aspects of the societal dimension of science. What are these other aspects of the societal

14. For a discussion of this question, refer to the previously cited "The Question of Methodology in Islamic Science."

dimension of science? Certainly important are the issues of a cultural valuation and appreciation of science, science as a cultural institution, and the necessary societal context for the cultivation and progress of science. In light of the above remarks, we may assert that in formulating a comprehensive relationship between Islam and science, the ethical and societal dimension of science needs to be related to the *Sharī'ah*.

In Islam, the *Sharī'ah* is the main source of its value-system. Thus, the applications of science in Muslim society and culture should be guided by the *Sharī'ah*'s hierarchy of values of human acts and objects.¹⁵ In this value-system, every human act must fall into one of the following five categories: (1) obligatory (*wājib*); (2) meritorious or recommended (*mandūb*); (3) forbidden (*ḥarām*); (4) reprehensible (*makrūh*); and (5) indifferent (*mubāḥ*). Clearly, in the domain of applications of science and technology, which is largely the work of non-Muslims, there is an urgent need to categorize them in the light of the above hierarchy. Given the present situation in Muslim societies, the task of categorizing contemporary scientific and technological applications has to be jointly undertaken by scholars of Islamic law and Muslim scientists. To be given top priority are legal-ethical evaluations of applications in fields like genetic engineering, technologies used to produce weapons of mass destruction, and food and medical technology.

Finally, in dealing with issues like the cultural appreciation of science, science as a cultural institution, and the societal context for the cultivation and progress of science, we have to draw from Islam's teachings on the societal dimension of knowledge. We have yet to develop a contemporary Islamic social philosophy that would address this societal and ethical dimension of science. Again the task requires the combined intellectual efforts of Muslim scholars from numerous disciplines, particularly the social sciences.

Conclusion

A comprehensive account of the relationships between Islam and science requires the formulation of the relationship between the epistemological dimension of science and Islamic sciences like theology, metaphysics,

15. For a discussion of this theme, see Bakar, O. (1986), "Islam and Bioethics" in *Greek Orthodox Theological Review*, 31:2 pp. 157-79; also see Bakar, O. (1999), *The History and Philosophy of Islamic Science*.

cosmology and psychology. It also requires a formulation of the relationship between the ethical and societal dimension of science with the teachings of the *Sharī'ah*. What we have done in this paper is to establish the philosophical framework of these complementary relationships and furnish basic principles that need to be applied to specific situations in a more detailed manner. This further work requires the collaboration of Muslim scholars and thinkers representing all fields of study. *Wa'LLāhu a'lam.*