

Reflections on Science and Religion.

Proceedings from the 1st Religion and Science Conference held on
June 18 - 21, 2008

Edited by Charles Ofosu Ampofo

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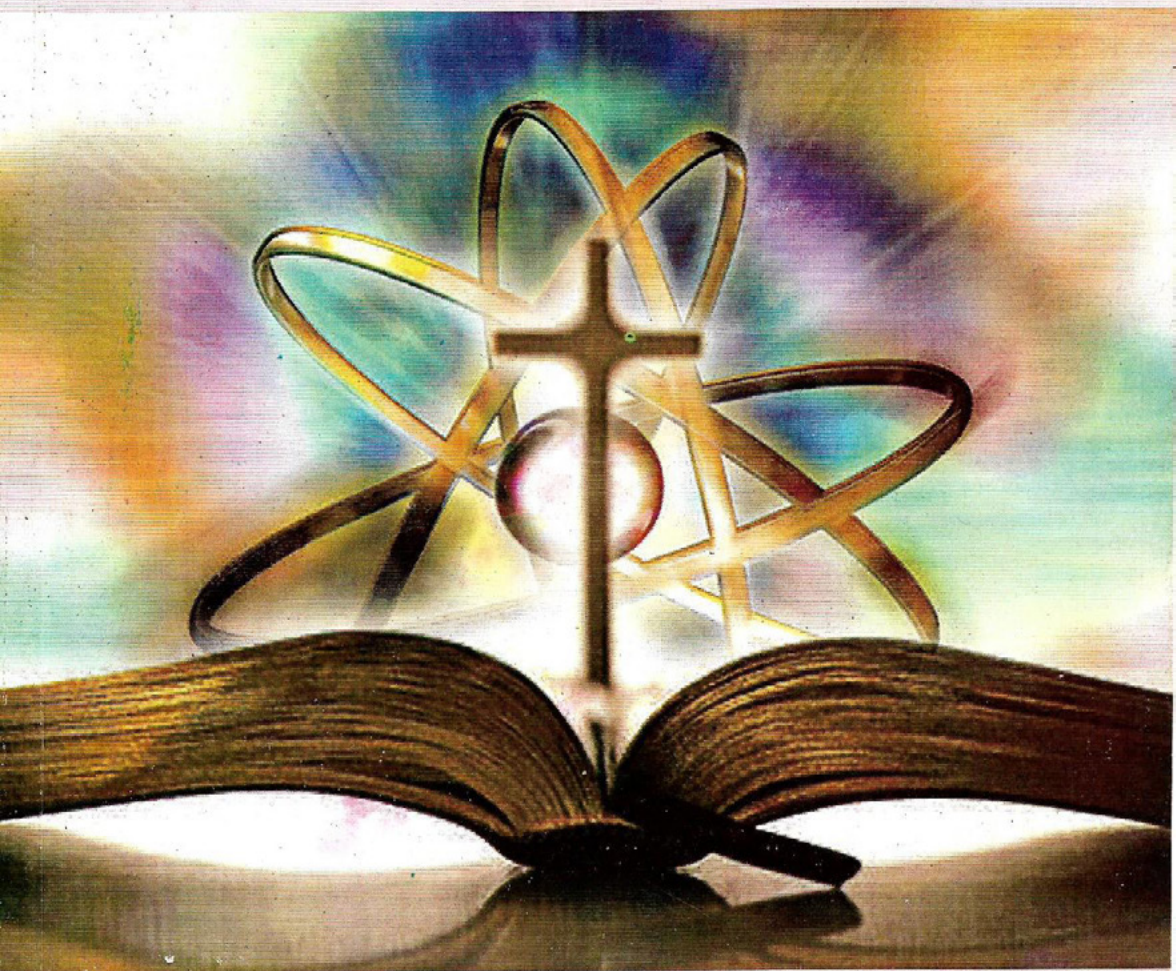
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REFLECTIONS ON RELIGION AND SCIENCE



PROCEEDINGS FROM THE
1ST RELIGION AND SCIENCE
CONFERENCE

JUNE 18-21, 2008



DEPARTMENT OF RELIGIOUS STUDIES

Edited by Charles Oforu Marfo

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EDITORIAL NOTE

This book contains the proceedings of the First National Conference on Religion and Science. The Conference was the brainchild of the Vice-Chancellor of the Kwame Nkrumah University of Science and Technology, Kumasi, Prof. Kwasi Kwafo Adarkwa. It was organized by the Department of Religious Studies, between 18 and 21 of June 2008.

Whilst it was initiated and organized by the above named, this book would not have been possible without the unflinching support of the University community, Conference participants and most especially those who presented papers.

Editorial Team

Emmanuel Asante
Nathan Iddrisu Samwini
Charles Ofofu Marfo

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FOREWORD

The relationship between religion and science is so delicate and important that it must be better understood and harnessed for the nation's socio-economic development. It takes many forms as the two fields are both broad. They employ different methods and address different questions. The scientific method relies on an objective approach to measure, calculate, and describe the natural/physical/material universe. The religious methods, on the other hand, are usually more subjective; it relies on varying notions of authority, ideas (believed to have been revealed), intuition, belief in the supernatural, individual experience, or a combination of these to understand the universe.

Historically, science has had a complex relationship with religion; religious doctrines and motivations have sometimes influenced scientific development, while scientific knowledge has had effects on religious beliefs. The interface is so important and mutually reinforcing that it must be necessarily discussed. In the view of Albert Einstein (1809-1865), "Science without religion is lame and religion without science is blind". In this direction, religion may occasionally answer questions belonging to science and vice versa. Ralph Waldo Emerson has also observed that "The religion that is afraid of science dishonours God and commits suicide". I believe that the religion that we practice in the present Ghana and the present world in general is not afraid of science and vice versa.

Throughout history, religion and science have been two of the most powerful and important human activities. They have affected human history probably more than any other activity. They both ask questions about our universe even though their lines of enquiry differ in various respects. As science continues to better understand the physical world, each question it attempts to answer invariably raises more. Consequently, there will always be mysteries and the void in human knowledge where religious awe can grow. This partly explains why some scientists occasionally slip back into the view of faith.

Religion is a social institution that includes a set of common beliefs and practices generally held by a group of people. The term *religion* refers to both the personal practices related to communal faith and to group rituals and communication stemming from shared conviction. According to Emile Durkheim, social life is impossible without the shared values and moral beliefs which form the collective consciences. In their absence, there would be no social order, social control, social solidarity or cooperation. In short, there would be no society without religion.

Science not only explains many facets of life and the material environment in a way more satisfactory than religion, but also provides confirmations of its explanation in physical results because it is based on

verifiable evidence. This way, theories are validated and the frontiers of knowledge expanded.

For the greater part of the 20th Century, religion and science appeared to be in conflict, particularly on the issue of evolution. Many people (especially in the West) have turned away from religion, with the belief that science has given mankind all the answers. However, it is also true that many scientists disagree with this position. Religious truths do not change, scientific ideas keep changing and their laws change as new discoveries are made. Indeed, aspects of religion and science in themselves clearly diverge, but there exists between the two strong mutual relationships and dependencies.

The interface between science and religion remains intriguing and troubling. Scientists, scholars, and laymen continue to ponder the personal and public issues revolving around science and religion. Nearly everyone somehow strives to come to terms both intellectually and emotionally with the array of rich issues involving personal belief on one hand, and commitment to science and reason on the other. Everyone or group (of people) resolves these issues and conflicts in a different way.

Religious claims and convictions need examination in order to avoid fundamentalism. Science is a challenge to religious people to respond to the questions that can easily be overlooked in religions. In other words, science and scientific findings must challenge religious studies to critically examine religious claims and perspectives. This partly explains why most people accommodate a complex system of multilevel, multidimensional, semi-compartmentalized beliefs and values. By comparison, religious solutions such as the promise of justice and reward in the afterlife do not produce practical and observable results since technical advances reduce the number of things that need to be explained in religious terms.

We all need to promote creative efforts leading to the formulation of effective doctrines and practices for human welfare in the light of contemporary knowledge. We also need to formulate dynamic and positive relationships between the concepts developed by science and the goals and hopes of humanity expressed through religion. Again, it is important to state human values and contemporary knowledge in such universal and valid terms that they may be understood by all peoples, whatever their cultural background and experience, and provide a basis for world-wide cooperation. Without this, there is bound to be suspicion among people and peace will elude us.

Kwesi K. Adarkwah
The Vice-Chancellor

Kwame Nkrumah University of Science and Technology

DEDICATION

This book is dedicated to the memory of the late Ebenezer Abaiyetey, a member of the Organizing Committee who did not live to see the fruit of his labour.

PREFACE

In this book, various topics relating to Religion and Sciences have been discussed. It is worth noting however that a few of them rather relate other disciplines to religion or science, in which case the relationship between religion and science is only remote. Specifically, chapters making the book are briefly presented as follows.

Kwame Gyekye discusses the relationship between religion and science in *chapter one* with an observation that before science, religion was. He notes that even though it is possible for science to throw doubts in the minds of people about the status of religious belief, there is no credible evidence that religious belief or experience will disappear or lose its influence on human beings even in the wake of the emergence of science. Thus, as seems to have happened or to be happening, scientific enterprises need to embrace religious endeavors.

In relation to Kwame Gyekye's discussions, Aboagye Menyeh, in *chapter two*, looks at the fact that religion has been part of human activity since time immemorial and notes that, even though religion and science have co-existed for centuries, there is a lingering question as to whether they are compatible or not. He strives to bring to the fore the seeming perception of existing conflict or incompatibility between religion and science. However, he also shows that religion and science are compatible despite the undeniable fact that religion and science may continue to disagree on emerging ethical and moral issues.

Continuing in *chapter three*, Samuel Brefo Adubofuor takes up the discussions by surveying various models of the religion-science connection described as total independence, conflict/incompatibility, complementarity and symbiosis. He also notes the limitation of science and observes that, as the limitation of science is further exposed, theological discourse is made more relevant and meaningful.

On the same path of surveying, in *chapter four*, Abraham Akrong looks at the relationship between religion and reason (or knowledge and faith) from the early church to the late medieval period and the early modern periods. As Aboagye Menyeh does in *chapter two*, Akrong further explores the areas of similarities and conflicts between religion and science. The relevance of the relationship between religion and science for the Ghanaian society, especially the way it deals with areas of conflict between secular assumptions of the modern world and the religious orientation of traditional culture ends the paper.

In the same stream as Aboagye Menyeh, Daniel Buor elucidates the relative and conjunctive role of science and religion in *chapter five* but, here, with four objectives and in connection with development using

secondary sources. The paper concludes with some recommendations and this is to ensure that religion and science promote development and empirical research directions in tandem to put religion-science-development in broader perspectives.

In *chapter six*, Emmanuel Asante continues with the discussions on the religion-science connection and notes that 'early' scientists strongly believed that science and religion were hardly poles apart. He adds that, as knowledge grew, the place for God seemed to have grown smaller. Further, relating the religion-science connection to development as does Daniel Buor in *chapter five*, he contends that science and religion are partners in truth and development. He concludes that development which aims at promoting the total well-being and the realization of the full potential of human beings cannot be pursued without the complementary roles of religion and science.

Akwasi Osei for his part uses insights from the Baha'i Faith to show the religion-science connection in *chapter seven*. He opines that the perception of rivalry or antagonism is unjustified. Drawing on authority, he demonstrates the religion-science harmony by analyzing the attributes of science and its method of inquiry, and uses these attributes and methods to analyze religion and its claims. Further, he explains that the harmony is crucial for mankind.

In a different stream of discussion, Nathan I. Samwini explores the orientation of Arabs in connection to science in *chapter eight*. He explains that Islam's astronomy was borrowed from Greek and Ptolemaic astronomy, the sciences of the Harranians and of the Nestorians of Jundishapur, although Muslims would be quick to declare the genesis of their scientific discoveries and advances to be Qur'anic in origin. He however contends that Islam is not against science and goes on to look into the contribution of Islam in scientific discoveries today and in the future.

In *chapter nine*, Manickam Kumardoss and Kofi Opoku-Afriyie observes the influence and the subsequent sudden downfall of the Theory of Evolution in the face of tremendous strides in unveiling fabulous facts in modern science. They strive to affirm the modern science inquest leading to the refutation of the Evolution Theory with Biblical facts. In this direction, they attempt to highlight the inerrancy of the Scriptures in the light of the modern scientific findings, as against the back drop of the Theory of Evolution.

Kwame Opoku-Agyeman traces the scientific roots of Akan mythology exemplified by stories of creation and procreation in *chapter ten* and compares these myths with similar myths from other cultures in Africa and elsewhere, especially in the Bible. He explains that life and death, both created by *Odomankoma*, are two sides of the same coin and united in a

cyclical manner by an inevitable eternal chain and that the various myths of creation and procreation have scientific roots.

Kwame Opoku-Agyeman, Lawrence Tufuor, Ebenezer Oteng-Preko and Melvin Nartey set out to explore the intricate relations between various facets of traditional beliefs and practices on one hand and modern science on the other in *chapter 11*. Traditional religion is examined in various respects. Discussions here make it clear that traditional man knew of the absolute need to preserve the environment for the survival of the human species and he took definite steps to achieve this aim through mystery and secrecy. They conclude that modern science needs to acquaint itself with the realities behind these mysteries and find ways of harnessing them for the use of man.

Explored in *chapter 12* is whether it is also possible for one to be religiously incorrect or not by Charles Marfo and Solace Yankson. Drawing data from some languages, cultures and, particularly, religious groups in Ghana, they explain that specific expressions and/or words are particularly associated with specific religions, denominations (of a religion) or occasions and that it is incumbent on one to observe them appropriately.

Charles Ofosu Marfo
Editor-in-Chief

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This work would not have been possible without the indispensable roles played by certain individuals and groups all of who cannot be mentioned here by name. That does not imply that we do not appreciate the contribution of such people.

We acknowledge with gratitude the decision of the Vice-Chancellor of the Kwame Nkrumah University of Science and Technology, Kumasi, to allow the Department of Religious Studies to organize the conference, the first of its kind in Ghana. Even though one of the newest departments in the University, he did count us worthy.

We acknowledge the financial commitment of the Department of Religious Studies which was only made possible by the kindness of the successive heads; that is Emmanuel Asante, Kwabena Opuni-Frimpong and Nathan Iddrisu Samwini. We say well done.

To the participants whose attendance made the conference a reality, we say thank you. Our profound gratitude goes to the contributors to this work. Without your well researched papers this book would not have been possible.

We express our sincere gratitude to the editorial team, which worked tirelessly to bring this work to where it is; for putting the work in readable shape. May God bless you.

The Organizing Committee

Emmanuel Asante

Nathan Iddrisu Samwini

Charles Marfo

Ebenezer Abaiyetey

Ben Andoh

Paul Yeboah

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CHAPTER 1

RELATIONSHIP BETWEEN RELIGION AND SCIENCE: AN OVERVIEW*

Kwame Gyekye
University of Ghana

***Abstract:** Before science, religion was. This was because the conviction by man of his own limitations in a bizarre world that is full of incomprehensible events or phenomena led him to postulate a being and a cause considered unlimited and ultimate. Even though it is possible for science to throw doubts in the minds of people about the status of religious belief and, thus, lessen the enthusiasm for religion, there is no credible evidence that religious belief or experience will disappear or lose its influence on human beings in the wake of the emergence of science. What seems to have happened, however, is that both the religious and scientific enterprises have come to be embraced and are influencing human attitudes to nature or the universe, though not without mutual suspicions or even conflicts.*

Introduction

Before science, religion was. This was because the conviction by man of his own limitations in a bizarre world that is full of incomprehensible events or phenomena led him to postulate a being and a cause considered unlimited and ultimate. Even though it is possible for science to throw doubts in the minds of people about the status of religious belief and, thus, lessen the enthusiasm for religion, there is no credible evidence that religious belief or experience will disappear or lose its influence on human beings in the wake of the emergence of science. What seems to have happened, however, is that both the religious and scientific enterprises have come to be embraced and are influencing human attitudes to nature or the universe, though not without mutual suspicions or even conflicts.

I define religion as the awareness of the existence of some ultimate supreme being held as the origin and sustainer of this universe and the establishment of constant, generally worshipful, ties with this being. Thus defined, a religion would evolve and maintain a system of beliefs about the totality of human experience. I define science simply as nature study – as

*I wish to express my deep appreciation and gratitude to Professor D. A. Akyeampong, Professor of Mathematics at the University of Ghana, whose comments on an earlier draft of this paper I found extremely helpful. I am grateful also to Professor F. K. A. Allotey, a retired Professor of Mathematics and Theoretical Physics at the Kwame Nkrumah University of Science and Technology, Kumasi, who also commented on an earlier version of the paper.

the intellectual enterprise concerned with investigations into natural phenomena, into the structures of the physical world.

The two enterprises – religion and science – are related in that they both have perspectives on reality, but their interpretations of reality differ in several ways. The relationship is based also on the fact that they both affect our attitudes to this complex world differently.

In this paper, I explore the relationship between religion and science. I must state at once that I am not a scientist. I am a philosopher who shows some interest in science. My exploration is based on the statements, views and arguments of scientists, as much of them as I understand. I will confine myself, not to the details of the scientific experiments that gave rise to scientific statements or conclusions, but to the logic of scientific statements. In philosophy of science, philosophers seek to clarify or analyze concepts, statements and arguments of science.

Relationship between Religion and Science before the 17th Century A.D.

For many centuries, the status of religious belief was acknowledged and was unquestioned. Not that observations and inquiries into nature had been lacking in the centuries preceding the seventeenth century of our era, which is often regarded as the starting point of modern science; for, ancient thinkers, particularly the Pre-Socratics, Plato, Aristotle, and Epicurus did make extensive observations about nature or the physical world. Atomism, which is a theory of the origin of the physical world, was in the Western world developed by the philosophers Leucippus (fl. 440 BC) and his disciple Democritus (460-370 BC) and further developed by Epicurus (341-270 BC) and in the Roman world by the poet and philosopher Lucretius in the first century BC. Atomism spread to the medieval Western world largely during the Renaissance, with the work of philosophers such as Nicholas de Cusa (1401-1464), the astronomer and natural philosopher Galileo Galilei (1564-1642), who found atomism to be consistent with his experiments in physics, and others. The atomic doctrine of Democritus contains the statement: "Nothing can be created out of nothing, nor can it be destroyed and returned to nothing" (Sambursky 1962:131). This statement could have been troubling to religious belief, for it obviously flew in the face of the doctrine of *creatio ex nihilo* ('creation out of nothing'), a basic doctrine of Christianity and other orthodox religions.

Aristotle's work titled *Physics* was widely read and discussed during the medieval period; it became very influential. Among Aristotle's assertions are that the world was uncreated (ungenerated: Greek *ageneton*), indestructible (Greek: *aphtharton*), and eternal (Greek: *aion*), that time and motion are incorruptible: they have no beginning and end. The philosophical

ideas of Aristotle reached the Medieval Christian world through translations from the Arabic. Even though they were challenged, they do not, for some curious reasons, seem to have received the official condemnation of the theologians as did the ideas of Galileo or Charles Darwin in subsequent centuries.

The theory of the medieval astronomer Copernicus, that the sun rather than the earth was the center of the planetary system, appeared to conflict with traditional Christian religious ideas, just as it was in defiance of the astronomy of Ptolemy.

Despite all this, the authority and influence of religion remained largely unscathed in those centuries, i.e., before the 17th Century AD. I think one reason that led to this was that science, then, was not an autonomous intellectual enterprise based on and guided by systematic experimentation. Even though observation was not absent from Aristotelian and medieval science, nevertheless their theories could not be tested by further experiment. Thus, not having been able to wean itself from its Greek antecedents, medieval science became a branch of philosophy, to all intents and purposes. Lacking a basis in experimentation, it could not discover or arrive at far-reaching significant scientific ideas that could be considered subversive of orthodox religious doctrine. Without a basis in experimentation, medieval science, like its Greek precursor, was essentially deductive rather than inductive; whereas in its method science is essentially or primarily inductive, notwithstanding the deductive features of the scientific method that are manifested particularly in the application of mathematics to the physical sciences. The overall consequence of the interaction between science and religion in the period before the 17th century was a synthesis between them: science was given accommodation and embrace in the house of God, so to speak. The conflicts that characterized the relationship between religion and science in and after the 17th Century did not occur in the period before then.

The Emergence of Modern Science

The emergence of modern experimental science later in the 17th Century was to change the previously symbiotic relationship between religion and science; it brought about hostility and conflict in the relationship. The new science of the 17th Century and beyond showed itself as a restless and belligerent spirit, unprepared to make overtures with religion or any kind of metaphysics that stood in its way of arriving at what it saw as the truths about the universe. Galileo, regarded as the father of modern science because of his emphasis on and commitment to experimentation as the new scientific methodology, together with other investigators of the seventeenth century, set science free from the restraining influences of the Church and made it

an independent sphere of human thought. Galileo placed himself on a collision course with the Church when he advocated the new Copernican theory which maintained that the earth and the planets revolve around the sun, rather than the accepted Ptolemaic theory in which the sun and the planets revolve around the earth. The Ptolemaic theory was said to be in harmony with scriptural passages that implied that the earth is the center of the cosmos: the sun and the planets revolve around the earth because the earth is the center of the cosmos. Galileo was, thus, seen as challenging the authority of the Church and was condemned after he was tried before a panel of cardinals in 1633, and was condemned for violating an injunction sent to him in 1616 requiring him "not to hold, teach, or defend in any way whatsoever that the earth moves" (Barbour 1997: 15). We learn, however, that "throughout the controversy, and until his death, Galileo remained a religious a man" (Polkinghorne 1998: 6).

Galileo gave up his scientific belief and spent the rest of his life under house arrest. He was forbidden to publish his work titled *Discourses on Two New Sciences* but managed to get it work published in Protestant Holland in 1638, four years before his death in 1642. The *Dialogues* of Galileo remained on the *Index of Prohibited Books* until 1822. In 1984 Pope John Paul 11 appointed a commission to reexamine those events. The commission admitted that "church officials had erred in condemning Galileo" (Barbour 1997: 15). In 1992 after reviewing the commission's findings, the pope said that there are "two realms of knowledge" and that the failure to distinguish them had led theologians "to transpose into the realm of the doctrine of the faith a question that in fact pertained to scientific investigation" (Barbour 1997: 15)⁶ The pope was, thus, asserting the Independence thesis on the relationship between religion and science. I will explain the thesis shortly.

Even though Galileo's trial appeared to be episodic and exceptional, it presaged what was ahead in the relationship between religion and science in the decades and centuries to come. There followed long periods of interminable hostilities, wrangles, disputes, controversies, and disagreements over the relationship between religion and science that have continued to this day and are likely to go beyond this century.

It would be correct to say that conflicts or sharp disagreements between religion and science arise basically because both of them are concerned with the interpretation of reality, with the search for that which is ultimately or absolutely real. The conflict is, thus, grounded on the different perspectives on reality. But the conflict derives also from their methods in arriving at their truths or conclusions. Science requires explanations that can be generalized, facts that are disciplined by experimentation, and experiments that are repeatable and verifiable elsewhere: thus, scientific

methods are objective. Science is concerned about causal relations between empirical events. Religion, on the other hand, is subjective and is concerned about meaning and purpose of life. The question arises as to which of them, if either, offers a more credible or satisfying perspective on reality.

Barbour (2000: 2-4) has identified four ways in which science and religion may be said to interact. These ways are Conflict, Independence, Dialogue, and Integration. Not being a scientist and, thus, not deeply knowledgeable about the really technical or professional details and nuances of scientific arguments, I would avoid such nuanced arguments, even though I hope to say much that will enable us to appreciate the issues involved in the relationship between religion and science as well as the attempts to deal with them. Some scientific theories, such as the evolutionary theories, raise philosophical questions and can be explored from the philosophical point of view.

The Conflict view of the relationship between religion and science simply means that religious doctrine and scientific perspective are incompatible and so cannot in any way be reconciled. It means, therefore, that one cannot logically accept the doctrines or positions of both, for the position of one excludes the other; a person can only choose one or the other, not both. I will in due course provide several instances where religious doctrines are alleged to be in conflict with scientific positions.

According to the Independence thesis, conflicts between religion and science need not arise because religion and science refer to different aspects of reality, employ distinctive methods, serving totally different functions in human life as reflected in their different languages; their objects also are different—science dealing with questions about natural phenomena and, thus, about objective facts, while religion deals with ultimate meaning and purpose and recommends allegiance to particular moral principles and a way of life oriented to the supernatural or the hereafter. Thus, the two are parallel conceptual systems, and because they do not cross each other's path, there should be no conflict between, according to the Independence thesis. They are separate and mutually exclusive realms of human thought and experience, each realm having its own distinctive questions, rules and criteria of judgment. The Independence thesis, thus, tries to steer clear of the Scylla of insistent and unyielding theism and the Charybdis of restless and self-assured scientific enterprise.

On the surface, the Independence view may appear attractive particularly to the non-scientist person with religious faith, but not to the scientist with some religious faith. However, the Independence view of the relationship between religion and science prevents any constructive interaction between them, such as the influence one of them could have on the other, the inspiration one of them could derive from the other, and the mutually relevant

and valuable questions one of them could raise for the other's attention, and so on.

The assumption of the Dialogue view is that while the differences between the methods of religion and science may be different, there may be similarities which must be acknowledged. Science is interested in the question as to why the universe is orderly and intelligible, for instance, but it is not in a position to answer the question satisfactorily. In this matter, through a dialogue between religion and science, religion will be able to provide some answer that may be of interest to the scientist. Similarly, dialogue may arise when one field employs for its own purposes analogous concepts analyzed in the other field. Thus, analogous concepts in science are used by religion to talk about God's relation to the world. The valuable thing about dialogue is that it emphasizes similarities between religion and science such as can be discovered, whereas the Independence view merely emphasizes the differences between them.

The Integration view argues that religion and science can contribute to the development of a metaphysic that has the potential of satisfying the demands and goals of both. This view, however, requires that some of the traditional religious beliefs or doctrines should be reformulated in the light of scientific discoveries or theories.

Natural Theology and Design

One example of the Integration view is natural theology, which infers the existence of God from the evidence of design in nature, evidence that is supported or confirmed by most scientists. The founders of modern science, says Barbour, "frequently expressed admiration for the harmonious coordination of nature, which they saw as God's handiwork. Newton said that the eye could not have been contrived without skill in optics, and Robert Boyle extolled the evidences of benevolent design throughout the natural order" (Barbour 2000: 28). Natural religion/theology has empirical basis for, like science, it draws on, or takes off from, natural phenomena and man's reflections on these phenomena. Natural theology, which also leads to the postulation of the existence of God, results from man's application of reason to the characteristics of nature as an object. Design or the argument based on design is discovered through man's rational enterprise. Traditional African religion, not being a revealed religion, is, I have argued elsewhere, a natural religion (Gyekye 1997: 9). Natural theology, which derives from design, can support revealed theology. It is a conception of design in nature – a design that derives from an act of God—that grounds the orderliness and intelligibility of nature.

It would be correct to say that much, if not the entire, enterprise of science operates from the orderliness of nature and the regularity that

characterizes natural events or phenomena. Orderliness and regularity, expressed or manifested in the laws of nature, are fundamental presuppositions of science. It is the orderliness of nature and the regularity that follows from it that make predictability in science possible. But design also implies that the world in which science functions is a determinist world, a world in which events happen according to the laws of nature. Thus, knowledge of all antecedent conditions and laws of nature would make it possible to predict the entire future. This means that determinism excludes chance. The source of determinism in nature must be a Great Intelligence – the God of the theistic religions, a conscious being.

The seventeenth century physics of Sir Isaac Newton upheld the determinism of the world. Newton maintained the idea of a universe rigidly determined by natural laws fixed by an intelligent creator, God. Newton believed that God “keeps the stars from collapsing under gravitational attraction and intervenes periodically to correct planetary perturbations in the solar system” (Barbour 2000: 70). Thus, for Newton and his followers, God not only designed the laws of nature but sustains them continually. This act of sustenance is an expression of God’s purpose and sovereignty.

In a determinist world, there is no place for chance or contingency; determinism and chance are incompatible. Contingency subverts regularity, orderliness and determinism. Albert Einstein, undoubtedly the greatest of the twentieth-century scientists, strongly believed in the order and predictability of the universe, which, like Isaac Newton, he maintained was a determinist universe. He considered contingency a threat to belief in the rationality or intelligibility of the world, a feature of the world which he thought is central in science. Science merely assumes the intelligibility of the world; but this feature of the world is an aspect of the creative act of God, the creator. Einstein noted: “A conviction, akin to religious feeling, of the rationality or intelligibility of the world lies behind all scientific work of a high order” (Barbour 2000: 53). He expressed “a deep faith in the rationality of the world” (Barbour 2000: 53). And, in searching for unified laws in cosmology, the physicist, James Trefil, writes:

But who created those laws? ... Who made the laws of logic? ... No matter how far the boundaries are pushed back, there will always be room both for religious faith and a religious interpretation of the physical world. For myself, I feel much comfortable with the concept of a God who is clever enough to devise the laws of physics that make the existence of our marvelous universe inevitable.

Trefil (1983: 233)

Quantum Physics and Religion

Physics, the study of the basic structures and processes of change in matter, was undoubtedly the first science that was systematic. Its Greek root, *phusis*, means 'nature', i.e., the material or sensible world of our everyday experience. Thus, the earliest Greek thinkers who paid attention to inquiries about nature, such as the atomists, were called *physikoi* ('physicists') or *physiologoi* ('physical speculators', 'speculators of nature', 'philosophers of nature'). It would be correct, in my view, to say that, among the sciences, physics has exerted the greatest influence on philosophy and theology.

Classical physics upheld the deterministic character of the world and, so, did not present any challenge to religious beliefs. However, deism, the belief that God created the universe and left it to run by itself, thus restricting God's role to that of a clockmaker, was developed in the eighteenth century (Prof. Daniel A. Akyeampong, personal communication). In implying that God does not intervene or operate continuously in the affairs of the world after having created it, deism proposed a doctrine that was at odds with fundamentally religious beliefs. Classical physics affirmed the certainties of prediction. By contrast, quantum physics, developed in the 1920s and was about atomic and subatomic phenomena, maintained that there were inherent uncertainties in the predictions of events. Quantum physics was a rejection of determinism on one hand and an acknowledgement of the openness of the future and its consequent indeterminacy on the other hand.¹

It is the indeterminacy in nature itself that gives rise to the uncertainties in the predictions made by quantum theory. The consequence of the rejection by quantum theory of determinism is that quantum events occur by chance. The notion of chance in quantum phenomena challenges ideas of divine purpose and sovereignty or control. Chance, like indeterminacy, limits the power of God. It is known, however, that a minority of physicists, including Einstein and Max Planck, have stuck to the deterministic theory, maintaining that the uncertainties of quantum theory are to be attributed to temporary human ignorance and that someday appropriate physical laws will be found that will make accurate predictions possible. Einstein wrote: "The great initial success of quantum theory cannot convert me to believe in that fundamental game of dice. ... I am absolutely convinced that one will eventually arrive at a theory in which the objects connected by laws are not probabilities but conceived facts" (Barbour 2000: 67-68). And, in a famous statement that rejects the element of chance, he said: "God does not play dice" (Barbour 2000: 68). To this famous statement of Einstein's Niels Bohr,

¹ I must confess that I do not understand the intricacies and nuances of the quantum theory of physics, just a little enough to enable me to relate some aspects of it to religious beliefs. The little I know of quantum physics is from Ian G. Barbour's two books referred to above.

A Danish physicist considered the founder of modern atomic physics, responded, "Nor is it our business to prescribe to God how He should run the world" (Akyeampong 1993: 20). Bohr's point, I think, is that we should remain agnostic with regard to God's attitude to the world: we do not know, so would Bohr say, whether God plays dice with the world or not. Einstein expressed his confidence in the order and predictability of the universe, which he thought would be damaged by any element of chance that derives from indeterminism – from quantum physics.

However, it must be noted that a number of physicists deny that uncertainty is the result of temporary ignorance but that it is a fundamental limitation that hinders the achievement of exact knowledge of the atomic world. And, I have learned that the French physicist Alan Aspect and his group have "in a series elegant experiments confirmed the correctness of the quantum mechanical prediction" (Akyeampong 1993: 20). The logic of the arguments of anti-Einstein physicists (who may be referred to as 'the indeterminists'), then, is that it is possible to reject determinism, install chance, and yet believe in scientific predictions. What I still find mind-boggling, in the wake of the quantum rejection of determinism, is the possibility of scientific predictions being based on chance, on randomness, on irregularity! Quantum theory seems to present a paradox.

It would be correct to say, however, that even though quantum physics' notions of indetermination and chance must originally have been perceived as in conflict with religious doctrine, nevertheless, the logic of quantum physics appears, at least in part, compatible with religious belief. First, the notion of the openness of the future, which is a logical feature of indetermination, suggests that the human mind or human knowledge is limited and so cannot see far into the future. Beliefs in the limitations of human knowledge are compatible with Biblical ideas. Second, some theologians have argued that the notion of quantum indeterminacy allows room for divine intervention and action: thus, that God determines the indeterminacies left open by the laws of quantum physics (Barbour 2000: xiii and 86-87). If, indeed, God controls or determines all indeterminacies, then it would follow that the traditional idea of predestination could be preserved. Chance would, consequently, have been eliminated. What appears to us, human beings, as chance must be held as really determined by God. In connection with this, let me say that for Akan thinkers, as for Aristotle, a chance event as such would, in fact, be an event whose cause is unknown, not one lacking a cause and occurring randomly (Gyekye 1995).

The logical implication(s) of quantum indeterminacy chime is with the religious doctrine that God controls all the events that appear to human beings as chance events. As part of the development of the quantum theory, Niels Bohr proposed the principle of complementarity, which asserts that

there can be two complementary descriptions of the same reality and that for a full account and comprehension of reality both perspectives are, or would be, needed. I do not claim to comprehend the details of the principle as applied to wave picture and particle picture. But I believe that the principle can be extended and applied to the relation between religion and science, compelling us to recognize that reality is a complex phenomenon that can be grasped from different approaches, which taken together help us to understand man's holistic experience in the world. Religion and science are different languages that *ultimately* express the same reality.

Evolution and Creation

One of the central pillars of the orthodox religions is the doctrine that God created the world. And, according to the Genesis story, God created the world in seven days. The doctrine of creation has been challenged by the theory of evolution. Because the evolutionary change takes place over a very long period of time, it conflicts with the seven days of creation. The theory of evolution, which challenges the idea of creation, also challenges other religious doctrines related to creation. For instance, it eliminates design; it affirms a world without design and, thus, a world without purpose. Thus, it was not surprising that, when Charles Darwin proposed the evolutionary theory in his famous work titled *On the Origin of Species* (1859), he was met with vehement opposition from theologians; the latter of course maintained that evolution and religious beliefs were incompatible.

It must be noted, however, that Darwin believed that God designed the whole evolutionary process but not the detailed structure of particular organisms, that the laws of evolution, not individual species, were the product of design. In his own words, as quoted in (Barbour 2000):

"I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance.... I cannot think that the world as we see it is the result of chance; yet I cannot look at each separate thing as the result of Design"

Barbour (2000: 10).

Darwin's position on design vis-à-vis chance, as presented in this quote, is not very transparent; in fact there is some confusion here. It is not clear whether he fully supports design or fully supports chance. But can both be really jointly supported? Not really. Perhaps what Darwin means is that God designed the entire evolutionary process by creating the *basic* laws of evolution and that inherent in the designed world were potentialities that would be actualized in due course, the actualization occurring by chance, without God having anything to do with it.

The implications here fly in the face of religious doctrine. First, if my interpretation of the quotation from Darwin is correct, it makes God's act of creation tentative and incomplete, whereas the story of the Genesis says that 'God saw everything that he had made, and, behold, it was very good' (Genesis 1: 31). Second, it suggests that after creating the so-called evolutionary laws God left the theater of human affairs – the affairs of the physical world, without further divine intervention in the affairs of that world: a position that is inconsistent with the Biblical view of God's sovereignty, his unrelenting love for man and his unflagging interest in man's aspirations and well-being. Third, it makes the wrong suggestion that the perfect God would leave anything to chance.

Evolution merely denies that our complex world was created by God; but it cannot deny that the simplest particles from which the complex world evolved were created. The question, "who created the original infinitesimal particles from which the complex world emerged?" would always be asked. To this question the response of evolutionary science in terms of chance would not be satisfactory, for it would make every event or phenomenon that occurs in the world a chance event, a position that would make the scientific enterprise *itself* well-nigh impossible. A former professor of physics at the University of Ghana who had been an agnostic for several years later admitted that the foundational particles out of which this complex world would have emerged could not have come about by chance but could only have been brought into being by a Great Intelligence and that, if this Great Intelligence was that identified with God, then he would believe in God (personal communication from two of the Physics Professor's British colleagues in the Physics Department of the University of Ghana some years ago).

In short, the evolutionary theory presented several challenges to the Christian religion. Among these are: a challenge to the Biblical doctrine that God directly created the world and did so in seven days; a challenge to the doctrine that God designed the world; a challenge to the religious belief that God directly created all humanity and endowed man with a nature; and a challenge to the status of ethical values. As regards the status of ethical values, evolutionary theory would lead to the relativity or subjectivity of ethical values and would, consequently, reject the objectivity of values, for on the evolutionary theory values would be in a flux. Yet, the notion of the objectivity of values is very essential for the stability and smooth running of the human society. Religious belief, on the other hand, would generally affirm the objectivity and universality of ethical values.

Evolution and Human Nature

According to religious doctrine, God created man directly and "in His own image" and endowed him with intelligence and moral will to be able to

respond to the demands of righteousness and justice. Man is, thus, *not* the result of an evolutionary process, but of a creative act. The Creator must have determined certain essential or intrinsic characteristics about man. In this way, God endowed man with a nature: human nature or human essence, with its complex and ramifying implications for human behavior. Evolutionary science, however, being essentially atheistic, denies the reality of human nature, for there would be no God to have a conception of it; that is, there would be no God to have fixed or determined it. Charles Darwin's view, already referred to, that the whole process of evolution was designed by God implied that the human soul, among other entities, was *not* directly or immediately created by God, a position that was in conflict with a crucial religious view of human nature.

Neuroscience and Human Nature

The Christian religion, perhaps like other religions, maintains the body/soul dualism, that a human being consists of two distinct entities or substances – body and soul (mind). They are distinct in that their natures are essentially different: while the body is a material, spatial, and mortal substance, the soul is an immaterial, non-spatial, and immortal substance. The soul is often identified with the self. (The terms mind and consciousness are used by dualist metaphysicians as equivalent to the soul or self.) The Christian dualist conception of human nature, which is anchored in the Bible, has been rejected by *some* neuroscientists (i.e., scientists who investigate the human brain) and materialist philosophers influenced by the investigations of neuroscience. These brain scientists and materialist philosophers reject the body/soul or mind/body or brain/mind dualism by rejecting the nonphysical attributions of the soul or mind or self and reducing mental states or mental events to brain states or brain events. They, thus, identify mental states with brain states. In their terms, then, statements about the mind are to be translated as statements about the brain or the central nervous system, which is a physical system.

Thus, for some neuroscientists and scientific materialists matter (or, the physical substance) is the fundamental reality. Mind or self is not held by them as real, certainly not as primarily real. And, consciousness may even be part of matter. But such a view cannot be upheld, for science cannot really account for the presence of conscious beings in the world. The reason is that no amount of subatomic particles will give rise to consciousness. Something outside the complex of physical laws is required to explain the rise of consciousness.

However, the researches, explanations and arguments of some other neuroscientists have led to the affirmation of the doctrine of the body/soul or mind/brain dualism. This doctrine has a long history behind it, as it

goes back to Socrates, Plato, Saint Augustine, the Church Fathers, Saint Thomas Aquinas, Rene Descartes, and many other contemporary scientists and philosophers. Popper and Eccles (1977: viii) deploy detailed but complex explanations and arguments to defend the interaction of consciousness (i.e., soul) and the brain.² It is stated in the book that Eccles, the brain scientist, is “a believer in God and the supernatural”, while Popper is “an agnostic”. Thus, in Eccles, as in many other scientists, science and religion meet.

Notwithstanding what has been said in the foregoing paragraph, Barbour thinks that “most scientists today do not accept either a body/soul or a brain/mind dualism” (Barbour 2000: 132). Even so, it would be correct to assert that scientists who are Christians or hold some religious faith would affirm the body/soul dualism as an aspect of their faith, for it is the religious or metaphysical doctrine of dualism that constitutes the entire basis for beliefs in personal survival following the demise of the body.

The Conception of Man as a Unity

A conception of man as a unity derives from Aristotle’s discussion of the soul in his *De Anima*. But Aristotle realizes that a conception of man as a unity of soul and body subverts the notion of personal survival after death, for – if the soul and the body are united – the disintegration of the soul follows concomitantly with the disintegration of the body at death. This makes the soul a mortal – not immortal – substance. Realizing that the conclusion was fundamentally in conflict with the conceptions of the soul held in Greek thought long before him, Aristotle recoils from the idea of the unity of man.

However, some contemporary scholars, according to Barbour, interpret the Bible as holding “a view of man as holistic, not dualistic” (Barbour 2000: 132). He says that “many theologians today have tried to reclaim the biblical view of the self as a unified activity of thinking, feeling, willing, and acting” (Barbour 2000: 135). Thus, it is claimed that the Bible holds that man is a unity – a unity of body and soul. I doubt very much that the unity of man can really be said to be a perspective of the Bible in the light of the logical implications of this notion. One such implication, as already alluded to, is that it destroys the Biblical doctrine of the immortality of the soul and life after death. The contemporary notion of the unity of man is most probably influenced by neuroscience – the science of the brain – which generally sees the brain as that which is primarily real and to which, for some neuroscientists, mental phenomena are (to be) reduced.

²Sir John Eccles (of Cambridge University) was awarded the Nobel Prize for Neurophysiology in 1962 and Sir Karl Popper (of London University) is a famous philosopher of science.

As I come to the end of this address, I would like to say something about the relationship between religion and science in Islam based on my knowledge of Arabic philosophy. It would be correct to say, I think, that in Islam the relationship between culture – of which science is a part – and religion has historically been an integrative and cohesive relation; the two are intertwined, not separable. In consequence of this relationship, conflicts and disagreements between scientists and theologians do not seem to have arisen in the history of Islam, certainly not the type of interminable conflicts one can read of in Christendom. There does not appear to be much of a debate arising of possible conflicts between science and doctrines espoused in the Qur'an (the Islamic religious book). Thus, there were no real endless, inter-generational internal conflicts as such. Conflicts that may have preoccupied the attention of Muslim theologians were scientific statements made by Western or Christian scientists that posed challenges to the doctrines of Islam. Thus, such possible challenges to Islamic religious belief were externally-not internally-induced. And attempts were made by Muslim theologians to denigrate such challenges and stem their damage to Islamic belief.

One example was the elaborate and complex arguments deployed by the Muslim philosophical theologian al-Ghazali (AD 1111) to refute some of the scientific or physical ideas of Aristotle and his adherents that had found their way into the Islamic intellectual culture through translation of Aristotle's works into Arabic in and after the tenth century AD. Such ideas include the world as uncreated, the eternity and indestructibility of the world, the indestructibility (eternity) of time and motion – for they have no beginning or end, the notion of the necessary causal connection between natural events – a notion that subverts the doctrine not only of divine intervention in mundane matters but also of the existence of miracles which interrupt the usual course of nature, and other Aristotelian ideas about nature (Greek: *physis*). Al-Ghazali refuted these ideas about nature in his famous work titled *Tahafut al-Falasifa* (translated as *The Incoherence of the Philosophers*). This work, which was translated into Latin and given the title of *Destructio Philosophorum* (*The Destruction of the Philosophers*), was in the course of the twelfth century in turn refuted by another Muslim philosopher, Averroes (Ibn Rushd, d. 1198),³ in a work titled *Destructio*.

Destructionis (*The Destruction of the Destruction*). However, Averroes's refutation of Al-Ghazali and, thus, his defense of the physical ideas of Aristotle, did not receive much philosophical or theological attention in the Muslim world. It was Al-Ghazali's refutation that gained theological currency and ascendancy in the subsequent decades.

³ Averroes was a contemporary of St. Thomas Aquinas.

Now, the reason why the scientific or physical ideas of Aristotle did not attract continuous debate or discourse among Muslim scholars was because in the Islamic religious world the Word of Allah as contained in the Qur'an was held supreme and overriding, taking precedence over all other sources of knowledge: it was, thus, not subject to questioning and debate. Thus, any simmering controversy about ideas or theories of the natural world was submerged under the waves of doctrinal orthodoxy. In this way, internally-induced conflicts that affected religious belief could not—and did not—arise within the ambience of Islamic religious doctrine.

Summary

As I come to the end of this address, I summarize what I have said and then draw some conclusions on the relationship between religion and science as follows:

1. Both religion and science are concerned about our understanding and interpretation of reality, even though their interpretations generally differ.
2. Many of the assertions and arguments of the scientists and philosophers of nature before the 17th Century of our era conflicted with religious beliefs, but they were not met with the kind of the theological belligerency that descended on the assertions and arguments of subsequent, i.e., modern, scientists. The relationship between religion and science then was symbiotic.
3. The emergence of modern experimental science, with its far-reaching and significant discoveries and conclusions, disrupted the hitherto somewhat cozy relationship between religion and science.
4. Natural theology proceeds from human reflections on their experiences of the natural world, reflections that led them to a conviction of the existence of a supreme being that created the world; thus, natural religion, like science, has an empirical and rational foundation.
5. While classical physics affirmed determinism and the certainties of prediction, quantum physics rejected determinism and rather affirmed indeterminacy in nature, the notion of chance, and the uncertainties of prediction. The notion of chance in quantum physics does violence to the concept of divine purpose and control. Quantum physics subverted the order and regularity of the universe upon which the scientific enterprise itself depends and operates. However, the logic of quantum indeterminacy casts doubts on the seriousness of its consequences for divine control and intervention.
6. The Biblical doctrine of creation has been challenged by the theory of evolution that maintains that the world was not directly created by God but evolved gradually from infinitesimal particles. Evolutionary theory eliminates design and affirms chance and randomness. It

challenges Christian doctrine in several ways and rejects the objectivity of ethical values. But the evolutionary theory itself bristles with problems.

7. Evolutionary science rejects the notion of human nature fixed by God beforehand. This means that the human soul was not directly created by God, a position that is antithetical to religious belief.
8. The dualist – i.e., soul/body – conception of human nature, affirmed by all religions, is rejected by some neuroscientists (or, brain scientists) who maintain that mental states or events are brain states or events. But some other neuroscientists not only accept the soul/body dualism but defend the interaction of consciousness (soul) and brain.
9. Aristotle had argued for a conception of man as a unity, but later had to abandon it because of its consequences on the notion of personal survival at death. The claim by a number of theologians that the Bible maintains the unity of body and soul cannot be defended in view of its logical implications for the immortality of the soul. In contemporary times, the idea derives from, or is influenced by, neuroscience.

Conclusion

I bring into focus the nature of the relationship between religion and science as follows: Several attempts have been proposed that allow for interaction rather than conflict between religion and science. The interaction stems basically – and ultimately – from the fact that both religion and science are concerned fundamentally about reality. For this reason, the immediate assumption is that there must be areas of belief and goal that overlap. For this reason, religion and science must be seen as presenting complementary accounts of reality.

Before the emergence of science, religion, remember, had established certain notions or doctrines about the physical world: these, or at least some of them, challenged science and set scientists to explore them. Thus, religion may, in some way, be said to have been an important factor in the rise of science. Thus, Albert Einstein stated in 1948: “While it is true that scientific results are entirely independent from religious or moral considerations, those individuals to whom we owe the great creative achievements of science were all of them imbued with the truly religious conviction that this universe of ours is something perfect and susceptible to the rational striving for knowledge” (Einstein 1948: 9). Earlier, in an article published in *New York Times Magazine* in 1930, Einstein wrote that “the cosmic religious feeling is the strongest and noblest motive for scientific research” (Einstein 1930: 2). And, in a Symposium on Science, Philosophy and Religion (1941), Einstein said that “science can only be created by those who are thoroughly imbued with aspirations toward truth and understanding. ‘This source of feeling however springs from the sphere of religion’ (Einstein 1954: 36-40).

How the cosmos is orderly and intelligible cannot be answered within science itself. Science will have to depend on religious belief in asserting the origin of cosmic order and intelligibility. In the phenomenon of natural theology there is a common ground between religion and science, as both of them depend on empirical experience for their rational arguments and conclusion.

Scientific knowledge can be utilized to tease out religious doctrines, i.e., to clarify and help remove obscure points in religious doctrine, as in the complementarity principle of Niels Bohr. That the world is based on design by a supreme intelligence – God – is a proposition accepted largely by both science and religion, though with necessary adjustments. Nature as a law-abiding machine expressed in fixed natural laws constitutes the basis of the order and regularity of the universe, which make scientific prediction possible and generally accurate. God cannot be swept away by the natural laws He established. God might be conceived to act in ways consistent with scientific theories, even though it is possible for Him, by virtue of divine omnipotence, to act in ways that disestablish the established laws of nature.

Even though quantum physics appears to reject the determinism of natural laws and, thus, affirms the indeterminacy and chance in nature as well as the uncertainties of scientific predictions, nevertheless, it appears – from the positions of Einstein, Max Planck, Laplace, and others—that the assertions of quantum physics must be regarded as tentative and that further detailed work will confirm that even the subatomic world is deterministic: it may be concluded that all this, together with the logical implications of quantum indeterminacy, brings quantum physics into the embrace of religious doctrine.

Scientists do not all agree and at all times on particular scientific statements or conclusions, which should have been the case *if* scientific methods and statements were absolutely objective. The disagreement among scientists themselves stems either from the *philosophical* character of a number of scientific statements, or from the fact that scientific statements raise *philosophical* questions, which generate responses that may differ among individual scientists. This means that there is some subjectivity in scientific discourse as there is in religious discourse, though the degree of subjectivity is much higher in the latter. This makes the relationship between religion and science one of a closer integration.

The fact that there have been innumerable distinguished scientists since the beginning of modern science and even before (such as Copernicūs, Galileo, Kepler, Newton, Boyle, John Eccles, John Polkinghorne, Daniel Akyeampong, Francis Allotey) that have had religious faith gives the lie, it seems to me, to the putative conflict or incompatibility between religion

and science, or exaggerates the depth and seriousness of the conflict. In these great scientists, religion and science meet; in these great scientists there can be a dialogue – a constructive relationship – between religion and science; in these great scientists there can be an integration of religion and science.

It is this foregoing statement that constitutes the foundation for the confident assertion that religion and science will continue to be bed-fellows in the twenty first century and beyond. The reason for this confident assertion is twofold. One reason derives from the wonders of nature. Aristotle asserted that 'philosophy began in wonder' (Greek: *ek tou thaumazein*). We can assert, similarly, that religion and science also begin in wonder: in the wonders and mysteries of the created universe that will not go away, in the enigmas and puzzles that constantly beset human life; in the human capacity and the restless spirit of man to wonder, speculate and imagine and, thus, seek to know and apprehend that which is beyond or behind the cloistered walls of man's limited vision.

The other reason for the ever-presence of religion and its unrelenting influence is anchored in man's awareness of his own limitations – limitations which will ever lead him to postulate an unlimited being and seek to do obeisance to this being. Science is a progressive intellectual enterprise and, thus, produces cumulative knowledge and is expected to produce more significant and startling results in the decades to come. I stated at the very beginning of this lecture that before science, religion was. I end the lecture by stating that, in spite of science with its anticipated discoveries in the future, religion will continue to exist, influence and shape the lives of the inhabitants of the world, including scientists, in this century and beyond.

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CHAPTER 2

RELIGION AND SCIENCE: ARE THEY COMPATIBLE?

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Abstract: *Religion has been part of human activity for all cultures since time immemorial. Modern science, in the context of the experimental method as opposed to the earlier observational and speculative science, is a relatively newer human endeavour which was given impetus about four centuries ago in Western Europe. Even though religion and science have co-existed for centuries, there is a lingering question as to whether they are compatible or not. There have been diverse opinions. In this paper, I have tried to bring to the fore the seeming perception of existing conflict or incompatibility between religion and science but have shown on the contrary, that religion and science are compatible. This view is buttressed by the fact that the scientific method originated from Judeo-Christianity. Evidence is also provided to show that several eminent scientists, notably those who emerged before and during the scientific revolution, were very religious people. Examples have been given to show that some modern scientific phenomena agree with the Bible. However, it is expected that religion and science may continue to disagree on ethical and moral issues in regard to genetic engineering, embryo studies, cloning, euthanasia, etc., in this 21st century and beyond.*

Introduction

There is no doubt that science and religion are two distinct human endeavours which have been pursued side by side since the emergence of science centuries ago. However, this cohabitation has not always been easy and therefore, there are many who feel that there is a conflict between science and religion. Today, the question as to whether religion and science have anything in common, or are mutually exclusive, still persists and it appears this perception will continue for some time. The following cartoon¹ illustrates the perception (that there is conflict between religion and science).

¹ <http://rasmssenanders.blogspot.com/> (01/2007)



The Oxford Advanced Learners Dictionary (5th Edition, 1995) defines the word “*compatible*” as “of people, ideas, principles, etc., that can exist together without problems or conflict” If we therefore paraphrase the topic, we may ask, “*Can religion and science co-exist without problems or conflict?*”

Overview of the Relationship between Religion and Science

Historically, science and religion have had a complex relationship. Religious doctrines could influence scientific development while scientific knowledge could also affect religious belief. Gould (1999) is of the view that science and religion deal with fundamentally separate aspects of human endeavour and therefore it follows that, when each stays within its own domain, they can coexist peacefully. On the other hand, a “*conflict view*” suggests that science and religion are competing for authority over the nature of reality and that religion has been gradually losing a war with science as scientific explanations become more advanced and acceptable by many. These two views however do not go far to account for the variety of interactions between science and religion, which range from “*antagonism*” to “*separation*” to “*close collaboration*”.

What is Religion and Science?

Religion: Religion, according to the Oxford Advanced Learner’s Dictionary (5th Edition, 1995) is “a belief in the existence of a god (monotheism) or gods (polytheism), especially the belief that the god(s) created the universe and gave human beings a spiritual nature which continues to exist after the death of the body”. Templeton and Herrmann (1994) are of the view that “religion as a belief in the existence of a god has been part of the human experience from the very beginning, and it remains the most general characteristic of humans in every culture – whether highly developed or relatively primitive.”

The vast majority of ancient religions were polytheist (i.e. belief in the existence of several gods) as distinguished from monotheism or theism (belief in one god). Examples of theistic religions are Judaism, Christianity and Islam. We also have various forms of traditional religion whose adherents believe in a supreme god/goddess, but worship them through animate or inanimate objects.

The main thrust of any religion is to let people know about their spiritual relationship to a supreme god and also to inculcate in them the spirit of morality. The end result is a spiritual transformation leading to inheriting an everlasting life after death in 'heaven'.

Science: The pursuit of science, particularly in medicine and astronomy, dates as far back as early cultures in the so called "Fertile Crescent" (Egypt, Babylon, Sumner (now Iraq)). The word science, originally coined by William Whewell in the 19th century² originates from the Latin word *scientia*, which means knowledge. Science, according to the Oxford Advanced Learner's Dictionary (5th Edition, 1995) may therefore be defined as "*that body of knowledge acquired through careful observation, and measurement of phenomena or experimentation.*"

The impact of science and its application (technology) on culture and everyday life since the beginning of the scientific revolution has been tremendous. Mankind is, indeed, heavily indebted to science and technology in every facet of our lives. In fact, it is said that the achievements of modern science over the last century are more than the combined achievements of science up to the end of the 19th century!

In this paper, I focus on theistic religions which, as stated earlier on, believe in an all powerful, all-knowing, perfect person who is immaterial, and who has created the universe and everything within it and to whom humankind owe worship, obedience and allegiance. Further, I will narrow down to the compatibility or otherwise between the Judeo-Christian religion and science. The reason is that from literature, debate between science and religion has predominantly been shifted to Judeo-Christianity and 'Western science'.

Fundamental differences between religion and science

One may ask, what are the fundamental differences between religion and science? Diverse opinions about the difference between religion and science have been expressed as follows:³

² http://en.wikipedia.org/wiki/History_of_science/ (04/2008)

³ See <http://www.physicsforums.com/> (04/2008)

- Science is material and religion is immaterial.
- Science deals with the 'physical world of matter and energy'. Religion deals with the 'spiritual world'.
- Science depends on the outcome of observation and experimentation. Religion depends on faith.
- Questions about ethics and moral values and purpose of life lie outside the realm of science. Religion involves moral judgment and the purpose of life.
- Science depends on theories or statements that can be tested or verified and if proved to be false abandoned, modified or replaced altogether. Religion deals with matters about God which cannot be proved or disproved.

The early beginnings of scientific enterprise: Harmony between religion and science

The idea that science may illuminate the work of the Creator or the 'Divine' predates Christianity and even goes back to the 5th century B.C. to Pythagoras who is credited to be the pioneer of Mathematics. Pythagoras believed that numbers were literally 'gods', to which he associated the major Greek gods with the numbers 1 to 10. From the 13th century to the 17th, the Pythagorean notion of an underlying cosmic harmony gradually gave rise to the idea that the Judeo-Christian God had created the world according to a divine mathematical plan - the laws of nature. To discover and understand these laws was to decipher God's plan, and it was essentially therefore a religious act.

Jaki (1974), a leading science historian, has noted that the "The scientific quest found fertile soil only when faith in a personal, rational Creator had truly permeated a whole culture, beginning with the centuries of the High Middle Ages. It was that faith which provided in sufficient measure, confidence in the rationality of the universe, trust in progress, and an appreciation of the qualitative method, all indispensable ingredients of the scientific quest." In most ancient civilizations such as Babylonia, Egypt, Greece, India, Rome, Persia, China and so on, science developed to a certain level but it stopped at some point. For, these civilizations felt that there was something ethically wrong about science. So, could science have developed without Christianity? Perhaps, but in fact it couldn't have. In other words, science and Christianity are closely related. Modern science was therefore born out of the Judeo-Christian belief that God is rational and personal. It is this belief which gave the impetus for modern science to flourish in Western Europe. This is portrayed by the text which Lord Rayleigh prefixed to his collected scientific papers *The works of the Lord are great, sought out*

of all them that have pleasure therein. Francis Schaefer, a philosopher, notes that 'It was the Biblical belief that the world was created by a reasonable God that gave scientists confidence in being able to find out about the world by observation and experimentation'. Indeed, an appreciable number of Christian scientists, such as Nicolaus Copernicus (1473-1543), Galileo Galilei (1564-1642), Isaac Newton (1643-1727), etc., emerged.

Other famous scientists of the era of the scientific revolution who believed that "*science exalted God*" include Joseph Lister (pioneer of antiseptic medicine), James Simpson (first to use chloroform in surgery), Edward Jenner (discovered small pox vaccine), Louis Pasteur (discovered pasteurization to kill germs in liquids), and Gregor Mendel (pioneer in genetics). The list is by no means exhaustive.

I have been trying to show that modern science grew out of Christianity; Christianity gave the philosophical basis from which science and its motivation was launched. Perhaps the following statement from Albert Einstein sums it all: "*Science without religion is lame, religion without science is blind*".

Scientific revelations in the Bible: Holy Scripture supported by modern science

Isaac Newton once said "Space is constituted by God's omnipresence." God, apart from being omnipresent, is also omnipotent and omniscient. God is all knowledgeable and therefore the originator of science. The creation account in Genesis clearly shows science at work. Physics is seen at work in the creation of matter and light (electromagnetic) energy, and the suspension of the planets in place. Similarly, the principles of chemistry are seen at work in getting the right elements for the materials which were to constitute every form of matter in the universe; and there is the application of principles of biology and biochemistry in the creation of vegetation and plant, birds and animals. In effect, God is the one who lines up everything that science thinks *is* science and therefore, without God, there can be no science.

Though not a science book, there are several statements in the Bible which are very consistent with established scientific facts. These verses strengthen the belief for the existence of an Omniscient Creator. Again, the consistency also demonstrates that God is not opposed to science. Science is only a means to study God's creation and, through it, we can learn more about Him. Indeed, there are verses in the Bible that are consistent with astronomy (e.g. Isaiah 40:22; Job 26:7; Genesis 15:5; Jeremiah 31:35-36; etc.), cosmology (Jeremiah 10:12; Hebrews 11:3; Isaiah 40:22b; Psalm 104:2-

⁴ <http://www.y-origins.com/index.php?p-home/> (2008)

⁵ <http://www.bible-quotes-science-info.com/art/einstein-theory-relativity.htm/> (30/01/2008)

3; etc.), meteorology and fluid dynamics (Eccl. 1:6; Job 28:2; etc.), hydrology (Job 26:8; Job 36:27-28; Eccl. 1:6-7; etc.), physics (2 Peter 3:10; Psalm 40:4;⁶ etc.), chemistry (Genesis 2:7; Genesis 3:19; Psalm 103:14), biology⁷ (e.g., Leviticus 17:11), mental and spiritual well being (Proverbs 3:7-8; Proverbs 16:24; Proverbs 17:22; etc.).

The list is by no means exhaustive but the above statements from the Bible show clearly that God is not opposed to science. God is Omniscient! Science is only a means to study God's creation and, through this endeavour, one can learn more about Him. In fact, recent scientific discoveries in astrobiology, molecular biology and genetics reveal the work of design by a Creator. Unfortunately, many scientists today, are not willing to accept this fact, for: *"The god of this age has blinded the minds of unbelievers, so that they cannot see the light of the gospel of the glory of Christ, who is the image of God."* (2 Cor. 4:4-6).

The perception of existing conflict between religion and science

Science grew up in a Christian tradition as has already been shown and, indeed, many of the pioneers of modern science were Christians. The question may be asked why people believe that there is an ongoing conflict between science and religion in general and Christianity in particular. This perception is widespread in the advanced or industrialised countries, particularly Western and Eastern Europe. Perhaps the current decline in the influence of Christianity in these countries, to the extent that many chapels have been either closed down for lack of patronage or turned into museums or something else, buttresses the point.

Charles Alfred Coulson, an English mathematician and theoretical chemist, a Methodist lay preacher and a committed Christian, who believed in the unity of science and faith, was well respected for his views not only on religious and moral issues but on scientific matters as well. Coulson's answer to the question was that it was due to the "atomisation of knowledge".⁸ In other words, what was once part of religion became separated from it as more had to be learnt and presumably they had to be understood without the hypothesis of God. So the role of God eventually

⁶ Ruy Miranda believes that Albert Einstein who had a Jewish background was perhaps inspired by Psalm 40:4 to postulate the hypothesis that "time is relative" leading to a comprehensive publication on the Theory of Relativity.

⁷ The Bible in Genesis 1 describes biogenesis. The creation of plants, birds, animals and other creatures "according to its kind" stresses the reproductive integrity of each kind of animal and plant. Today it is well established that these reproductive systems are programmed by their genetic code.

⁸ www.askwhy.co.uk/truth/ (2008)

dropped out from the quest for scientific knowledge. Christians, like Coulson, also argued that if the first scientists were Christians, then it stands to reason that they would not have willingly abandoned their religion for their science.

Charles Darwin began as a deeply religious person but, through a lifetime of observing nature, proposed his theory of evolution which was in contradiction to his religious conviction. He wrote in his article on evolution that "natural selection was absolutely incompatible with the Word of God" which was clearly an attempt to marginalise the power and authority of the Creator, God. For if that was true, then the creation account in Genesis is a mere fairly tale; untrue. The implication is more serious, for that would imply that the revelation of God to man, as Christians know from the Bible, is a delusion. Worst of all, it would have demonstrated that Christians are in bondage to a belief based on scriptures and irrespective of any evidence and common sense, they will still cling to that belief.

Darwin's theory of evolution clearly marked the seeming conflict between religion, particularly Christianity, and science. Incidentally, the loopholes in the theory of evolution are yet to be filled.

Some of the Early Conflicts between Religion and Science **Earth-centred versus Sun-centred Planetary System**

During the Middle Ages, Ptolemy proposed that *the sun revolves around the earth*, a model known as the geocentric (earth-centred) system. This model was supported by Aristotle and also by the Roman Catholic Church at that time. Later the heliocentric (sun-centred) system was put forward by Copernicus and this was strongly supported by Galileo. Sadly enough, Galileo's advocacy in support of the suggestion that *the earth revolves around the sun* was met with a hostile reaction by the Church. This was considered as a heresy because the Bible says that the "*Earth (world) is firmly established, it cannot be moved*" (Ps 93:1; Ps 96:10; 1 Chronicle 16:30) let alone rotate. Ps 104:5 says "*He set the earth on its foundations so that it should never be moved.*" Also, Eccl 1:5 says "*The sun rises and the sun goes down and hastens to the place where it rises*". Joshua 10:13 also says that "*the sun stood still.*" It was obvious that the Church at that time gave a literal meaning to the Scriptures, the sun seemingly going around the earth. At his trial in Rome, Galileo argued that his heliocentric belief was not opposed to the teachings of the church and that the Bible was not meant to provide scientific explanations. He said that "scripture does not reveal what is in the heavens, but rather how to get to heaven." For his punishment, he was ordered not to "hold or defend" the idea that the earth moves and the sun stands still at the centre. He was also condemned to house arrest in 1633.⁹

⁹ [http://en.wikipedia.org/wiki/Galileo---Galilei/\(15/05/2008\)](http://en.wikipedia.org/wiki/Galileo---Galilei/(15/05/2008))

In 1992, Pope John Paul II acknowledged that the Church was wrong in condemning Galileo for his belief. It is gratifying to note that the Pope also advised theologians to keep abreast with scientific advances to determine whether it would be necessary to "introduce changes in their teachings". In March 2008, the Pontifical Academy of Sciences of the Roman Catholic Church unveiled a statue in honour of Galileo as one of the oldest members of the Academy and also in preparation toward the celebration of 2009 as the International Year of Astronomy which coincides with 400 years since Galileo first used a telescope to make observations on the planets.¹⁰

Clearly, this conflict which was seen as "forces of repression" (religion) against "forces of progress" (science) was unnecessary and could have been avoided if the Church had allowed the Bible to speak for itself; that is, rightly handling the Word of Truth (2 Tim. 2:15).

The Question about Origin

For thousands of years, human beings have been fascinated about what they see around them on earth and in the skies. The question is how did humans and everything else come into existence? There are two views for the answer to this question: the Biblical point of view (Creation Account) and the scientific point of view (The Big Bang and the Theory of Evolution).

The Biblical Account of Creation of the Universe

Genesis chapters one and two give account of how the universe came into being. The very first verse (Gen 1:1) shows that in the beginning, God created the heaven and the earth. God created the universe and everything within it. The creation presents a picture of a single, all powerful deity, separate from earthly realities, whose creative activity was orderly, purposeful, and good. The New Testament, in Colossians 1:16, lends even greater distinction to the work of God by revealing his ongoing concern for the order of this material world as "*For by Him were all things created, that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers: all things were created by Him.*" and Hebrews 1:3 also emphasizes this point. Indeed, there are several other verses in the Bible which categorically state that God created the universe. Example Ps. 8:3-4; Ps. 19:1; Ps. 50:6; Ps. 97:6; Isaiah 45:12; Ecc.3:11; John 1:3.

¹⁰ <http://www.universetoday.com/2008/03/14/galileo-to-return-to-vatican/> (03/2008)

The Scientific Account of the Origin of the Universe ("The Big Bang Theory")

The Big Bang theory describes the contrary to the Biblical account. It describes how the universe came into existence without reference to any supernatural being, God. In a nutshell, it says that about 15 billion years ago, all of matter in the universe was compressed into a tiny, infinitely hot and dense point (singularity) the size of a dot on a page. This dot spun faster and faster until it exploded with a "big bang", thus creating the universe and everything including the energy in it. The galaxies which were formed from the explosion immediately began to move apart at terrific speeds near to the speed of light (186,000 miles per second or 300 million metres per second) and are still moving apart till today. If the galaxies are moving apart, then it means the universe is expanding. The explosion also left traces of heat radiation which have been measured as the cosmic background radiation by Arno Penzias and Robert Wilson of bell laboratories, who were actually awarded the Nobel Prize in Physics in 1978. The cosmic background radiation seemed to have confirmed the theory of the Big Bang, leading to its current acceptance by a vast majority of cosmologists and astronomers.

Though the Big Bang Theory and the Biblical account of creation cannot be reconciled in several ways (as has generally been argued in various works), some Christian scientists believe that, at least, the theory has vindicated the Bible since it (the theory) points to a moment of creation by a supernatural being, God. The idea that the universe is expanding also seems to be consistent with some statements in the Bible as has already been pointed out. The Bible says in Job 26:7 that "*He stretches (expands) out the north over empty space; He hangs the earth over nothing*" and, in Isaiah 42:5, we read "*Thus says God the Lord that created the heavens and stretched them out; He that spread forth the earth and that which comes out of it.*" These verses show a universe which is expanding. It appears therefore that there is some "degree of agreement" between the Bible and science that the universe has an origin. Stephen Hawking, whose work in cosmology supports the Big Bang Theory, had this to say: "In this century (20th), science has come to understand how the universe began from a tiny point, fifteen billion years ago. No matter how incredible it sounds, it seems that the church's ideas of a moment of creation were right from the beginning."¹¹

The Biblical versus Evolution Account on the Origin of Life: According to the Bible, God created man in His own image and *breathed into him the breath of life so that man became a living soul* (Genesis 2:7). God also

¹¹ <http://www.windmillministries.org/CH3.htm/> (02/2008)

created all other living creatures. Genesis 1:20-25 says *"And God said: Let the waters bring forth swarms of living creatures'..."* *"And God said: Let the earth bring forth living creatures according to their kinds..."* God therefore created life. He has power to give life and has the power to take it back. He told Adam and Eve: *"In the sweat of your face shall you eat bread, till you return unto the ground; for out of it were you taken: for dust you are, and unto dust shall you return (Gen.2:19).*

Evolutionist however argue that human beings, as well as all the animals and plants that inhabit the earth, evolved from a less complex life form or substance over a long period of time without the intervention of any supernatural being. Life began by accident – blind chance. According to the evolution theory, human beings for instance evolved from the chimpanzee between about 50,000-100,000 years ago. A cover article titled "How We Became Human" in Time Magazine (October, 2006) says, by comparing the human genome to the genetic record of the chimpanzee, a chimp is only 1.23% different from a human being. However, it has been argued that these similarities in the genetic records of humans with animals do not prove evolution. For real evolution to occur, one species must change or evolve into another species.¹²

Today some Christians have accepted evolution as an acceptable theory and therefore not in conflict with the Bible. In 1996, Pope John Paul II stated that the conclusions reached by scientific disciplines cannot be in contradiction with divine revelation and he went further to accept the scientific conclusion that evolution is a well established theory. However, some evangelical Christians have difficulty reconciling evolution and a traditional belief in God as the Creator and sustainer of the universe.

Conflict between Divine Action and Science

Apart from believing in a Creator God who continues to sustain the universe, theistic religions also believe in miracles and prayers. God still performs miracles such as has been recorded in the Bible and also responds to prayers. Some scientists think miracles and prayers cannot be logically explained in terms of the laws of nature and therefore are unacceptable as real. Some even declare the impossibility of miracles. But Craig Rusbult is of the view that "Christians do not have to choose between science and miracles because there is no conflict."¹³ Why because science deals with the physical world and religion deals with spirituality.

¹² <http://www.windmillministries.org/> (04/2008)

¹³ <http://www.asa.org/ASA/education/science/faith-science.htm> (04/2008)

Conflict between Religion and Science on Ethics and Morality

Strong ethical/moral concerns have been raised by both religious and non religious people in respect of scientific pursuits such as the following:

Abortion: Religion frowns on abortion because it is believed that human life begins at the instant of conception. Thus, abortion is a form of murder which is religiously and morally wrong. But scientists and others who are opposed to the religious stand argue that human personhood begins later in gestation or at birth. They note that a pre-embryo is just a fertilized ovum which does not have any human shape, skin, brain or other organs and therefore the opposition to abortion is not justified.

Euthanasia: Euthanasia is "the intentional termination of life by another at the explicit request of the person who dies." This may be referred to as "*Voluntary euthanasia*" However, other definitions include both voluntary and involuntary termination of life. Only God the giver of life can terminate that life in the human being. A patient's request to terminate his or her own life or a doctor's prescription to end the life of a patient in order to end his or her physical pain or suffering is ethically and morally wrong and by all religious standards.

Blood transfusion and organ transplant: The Jehovah's Witnesses sect prohibits the use of blood transfusion. However according to the Watch Tower Society, Jehovah's Witnesses believe donation of organ for transplant is a matter of individual decision. Jehovah's Witnesses are often assumed to be opposed to donation because of their belief against blood transfusion. However, this merely means that all blood must be removed from the organs and tissues before being transplanted¹⁹. Majority of religions generally, are not opposed to blood transfusion and organ/tissue transplant but at the same time, some are of the view that the decision should be left to the discretion of the patient.

Genetic engineering: Genetic engineering is a scientific pursuit whereby molecular biologists can manipulate ("redesign") DNA molecules practically at their will. The subject has been one of the most controversial ethical issues since 1997. By encouraging genetic manipulation or cloning, the world sees one of the most important values disappear. Individualism will be destroyed.

Even though there may be some advantages some Christians believe genetic engineering is tantamount to manipulating or tampering with God's creation. In Leviticus 19:19 (also Deut.22:9-11) we read "*You shall keep my statutes....You shall not let your cattle breed with a different kind. "You shall not sow your field with two kinds of seed..."*" These two verses from

scripture give an indication of avoiding cross pollination between two different kinds of seed or cross breeding two different kinds of animals. The stand on the matter, for some Christian religious denominations is rigid because to them "God alone is the master of human life and of its integrity" and therefore the world must be "wary of the potential of genetic engineering for fundamentally altering God's sacred creation"

Scientists remain divided on the matter. For example, a Nobel Prize-winning biologist and Harvard Professor, George Wald has this to say:¹⁴

"Recombinant DNA technology [genetic engineering] faces our society with problems unprecedented not only in the history of science, but of life on earth. It places in human hands the capacity to redesign living organisms.....It presents probably the largest ethical problem that science has ever had to face. Our morality up to now has been to go ahead without restriction to learn all that we can about nature. Restructuring nature was no part of the bargain....For going ahead in this direction may be not only unwise but dangerous. Potentially, it could breed new animal and plant diseases, new sources of cancer, novel epidemics."

Genetically Modified foods (GM foods): Genetically Modified Organisms (GMOs) refer to plants, animals and micro-organisms that have been modified by genetic engineering in ways that cannot be achieved using natural breeding techniques. Genetically modified (GM) foods are foods made from GMOs that have had their DNA altered through genetic engineering (Harrison 2007).¹⁵ GM foods were first put on the market in the early 1990s. The most common modified foods are derived from plants such as soybean, corn, canola, and cotton seed oil.

Islam, Judaism, and Christianity agree that the process of genetically modifying plants or food animals is not in and of itself intrinsically wrong and can benefit mankind says, Judith N. Scoville,¹⁶ an ethicist at Northland College in Ashland, Wisconsin. However, some religious groups express wariness of genetically engineered foods fearing that they might contain genes from animals that their faith does not permit them to eat. Generally, religious groups advocate prudence and regulation on the use of Biotechnology in agriculture.¹⁷

Embryonic Stem Cell Research: Sometimes doctors at fertility clinics are able to produce extra fertilized eggs, also called embryos. These are not

¹⁴ See Genetic Engineering: Science vs. Religion at <http://www.echeat.com/> (07/2008)

¹⁵ http://en.wikipedia.org/wiki/Genetically_modified_food/ (04/2008)

¹⁶ <http://pewagbiotech.org/> (05/2008)

¹⁷ <http://www.agbioworld.org/biotech-info/religion/catholic.html/> (04/2008)

implanted in a woman's womb. They may however be donated for use in medical research called stem cell research. Stem cells are seen by many scientists engaged in this field as having an unlimited application in the treatment and cure of many human diseases and disorders including diabetes, cancer, strokes, etc. The process of derivation of an embryonic stem cell causes the death of the embryo. Killing an embryo, in order to extract its stem cell, is considered a form of homicide²⁵, and therefore stem cell research is generally opposed by some religious groups.

Cloning of humans and animals: The process of cloning is seen by religious people as 'playing' God. The report in 1997 of sheep-clone Dolly received swift condemnations by several religious leaders.¹⁸ The Roman Catholic Church's view on human cloning is that, it should be "considered contrary to the moral law, since it is in opposition to the dignity of both human procreation and of the conjugal union." This stand is supported by conservative Christians such as Southern Baptist. However, there is great diversity of opinion among other Christian denominations.

In a CNN/USA Today Gallup Poll held in January 2003,¹⁹ 1000 respondents were asked 'Do you favour or oppose scientific experimentation on the cloning of human beings?' 77 percent were opposed as against 17 percent in favour. When 2002 were asked 'Is your objection to research on human cloning based more on the belief that science is not safe enough but could be in the future, or the belief that it is morally wrong?' 72 percent said it was morally wrong and 19 percent said science is not yet safe. Of 518 who were asked 'Do you approve or disapprove of cloning that is designed specifically to result in the birth of a human being?' 88 percent expressed disapproval as against only 9 percent who approved. Clearly, in the USA cloning is unacceptable by the majority. I believe the results could be the same elsewhere where religious and moral convictions are very strong, especially in Africa.

Conclusion

There is a perception particularly in industrialised western societies that there is conflict or incompatibility between religion and science. However, in this presentation, I have tried to show that religion and science are not at war, neither are they incompatible. It has also been shown that the scientific method indeed has its roots in Judeo-Christianity as evidenced by the fact that several eminent scientists notably those who emerged before and during the scientific revolution during the sixteenth and seventeenth centuries in Western Europe, were devoted Christians.

¹⁸ <http://www.msnbc.msn.com/id/3076930/> (05/2008)

¹⁹ <http://www.pollingreport.com/science.htm>

In fact the trend of some religious people becoming scientists has continued till today, some of them having won Nobel prizes. I have also shown that a lot of scientific phenomena as they are known today, agree with what God the Omniscient inspired authors of the scriptures to write in the Bible. It has been said that God reveals Himself to us through His Word and His creation, visible and invisible. Scientists therefore in actual fact do not create. They research into what God has already put in place for the good of mankind. In the process, they discover or uncover God's laws which unfortunately, are not very obvious to the inquisitive mind. Albert Einstein once said *"If we knew what it was that we were doing, it would not be called research."*

Scientists like all other human beings created in God's image are only stewards of God's creation. All scientific endeavours should therefore be seen as unravelling the laws which God himself has put in place for the good of mankind. Every scientific achievement should be welcomed but should be ascribed to the glory of God, the Creator. In James 4:10,11b, we read *"As each has received a gift, use it to serve one another; as good stewards of God's varied grace – in order that in everything, God may be glorified through Jesus Christ. To Him belong glory and dominion forever and ever, Amen."*

Some of the Current pursuits in science on the other hand have met with disagreement and opposition by religious groups on the basis of ethics and morality, and it is most certain that on these matters such as abortion, genetic engineering, euthanasia and cloning, religion and science may continue well into the 21st century and beyond to agree to disagree.

Finally, let us remind ourselves of the words of Lord Kelvin, father of Thermodynamics: *"If you think strongly enough, you will be forced by science to believe in God, who is the foundation of all religion."* But, *"The fool says in his heart there is no God."* (Psalm 14:1)

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CHAPTER 3

CHRISTIANITY AND SCIENCE: FRIENDS OR FOES

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Abstract: *This paper attempts to explore the relationship between Christianity and science. It surveys the various models of the relationship hereby described as total independence, conflict/incompatibility, complementarity and symbiosis. Both the total independence and conflict/incompatibility models represent the negative views of scholars who assume a "zero interaction" between science and Christianity and thereby eliminate Christianity from the arena of meaningful intellectual discourse. The complementarity and symbiosis models originate from scholars with positive perceptions of the relationship between Christianity and science. The complementarity model views the biblical and scientific accounts of natural phenomena as having complementary rather than contradictory purposes. Its close associate, the symbiosis model, builds on the weaknesses of the latter, by projecting the considerable network of relationships between science and Christianity and the mutually supportive roles of scientific and theological ideas. This makes it possible to examine the influence of science on Christianity and vice-versa. As the limitation of science is further exposed, theological discourse is made more relevant and meaningful.*

Introduction

This paper explores the relationship between science and Christianity. According to Tertullian, "What indeed has Athens to do with Jerusalem? What has the Academy to do with the Church?" (*Prescription against Heretics*, 7).¹ This statement presupposes that Christianity has nothing to do with science and vice-versa.

Science is understood in various ways. It is a systematic study of the material world – method of obtaining knowledge that is objective and verifiable. It is thus an activity which is at once intellectual, practical and social. Secondly, science is a body of systematic knowledge built up through experimentation and observation and having a valid theoretical base. There is thus a distinction between the vast body of empirical 'facts' called science and the activity producing that (Russell 1986: 625).

¹ The apologetic work of Tertullian (195-230 AD), an early Christian apologist; see Stevenson (1987: 167).

Modern science may be said to have originated in Western Europe in the sixteenth century around the time of the Renaissance and the Protestant Reformation (Russell 1986). Since then its relationship with Christianity has been conceived in a variety of ways.

The seventeenth century was a transitional age. The new scientific approach to reality developed by the Nikolaus Copernicus (1473-1543), Galilei Galileo (1564-1642), Johann Kepler (1630-71), and Sir Isaac Newton (1642-1727) appeared to be in conflict with traditional religious worldview. The scientific view held that the earth was not the centre of the universe, that the movements of the physical universe could be understood by principles of mechanics, and that the human body was itself subject to the same principles (Gingerich 2004: 13-22).

Models of the Relationship between Science and Christianity

The conception of the relationship between science and theology include the total independence model, the conflict/incompatibility model, complementarity model and the symbiosis model (Russell 1988:625).

The *total independence model* has been adopted by scholars who reject the possibilities of meaningful interaction between science and Christianity, or faith and reason. This 'zero-interaction' view overlooks the historical evidence, which points to a continuous series of strong interactions over many centuries. The presumed total independence model derives from a Thomist approach (after Thomas Aquinas) that separates the natural (or secular) from the supernatural (or religious) and restricts the scope of the fall and redemption to the supernatural realm.

Secondly, there is the *conflict/incompatibility model* which was strongly developed after Darwin (1809-1882) by scholars who wished to let science assume a cultural supremacy over the church in late Victorian Britain (i.e. 1837-1901). The scientific discoveries and theories by Galileo and Darwin were episodes used by logical positivists to undermine the credibility of traditions that were apparently based on the Bible. On the basis of empirical verification, the logical positivists produced a philosophical principle which debunked religious statements as meaningless and whilst projecting scientific knowledge as ultimately meaningful (McGrath 1999: 71-80).

The third model is that of *complementarity*. It is a view that originates from St Thomas Aquinas and popularized by Francis Bacon (1561-1626) in the 17th century (Jones 2006: 644). Francis Bacon spoke of 'two books', the book of nature (science) and the book of Scripture (divinity), each of which had to be read and understood. As both have the same author, they could not be in conflict. However, because each had a different purpose they could not be mixed. It was thus an error to seek scientific data in the pages of Scripture. Problems often arose where Biblical and scientific evidence appeared to clash. In that situation it became necessary to recognize the

complementarity of their modes of explanation. Using Augustine's concept of accommodation, John Calvin believes "the Holy Spirit accommodated his language to that of common speech in order to teach spiritual principles" (Russell 1988: 625). Hence Biblical accounts of the days of creation, of the structure of the cosmos, of the sun (as opposed to the earth) standing still and of a literally universal flood would be susceptible to a non-literal interpretation. In other words, the biblical and scientific accounts of natural phenomena must be seen as have purposes that are complementary rather than contradictory, with the Bible having spiritual and eternal purpose.

The complementarity model is supported by Thomas Forsyth Torrance (1978 Templeton Prize winner) in his discussion of Einstein's essays on science and religion. Torrance envisaged "an exercise in conjoint thinking where theological science and natural science have common ground within the rationalities and objectivities of the created order but where they each pursue a different objective" (Torrance 1980: 8).

Despite the merits of the complementarity model, it fails in a number of respects, particularly by ignoring the considerable network of relationships between science and theology disclosed by recent historical scholarship. This brings us to the fourth model termed *symbiosis* which takes into account these observations. This model considers the historical, scientific and theological ideas that are mutually supportive and owe much to one another (Russell 1988). The symbiosis model affirms the view that much of "human knowledge is culture-dependent, but it does not prejudice the independence of data either in the Bible or in the natural world. It merely recognizes that in the interpretation of such data, theological and scientific ideas are often intermingled in one brain, as they are indeed in one society" (Russell 1988). Some degree of mutual influence is thus expected between science and Christian thought.

Influence of Science on Christianity

One of the earliest influences science had on Christian theology is the development of *natural theology*. The scientific discoveries have served as the basis of Christian apologetic in English literature from Boyle to Parley (Russell 1988: 626). The argument from design, albeit in a weakened form, has survived the attacks of Darwinism.

The second is Newton's theory of a mechanical universe which has generated urgent questions of divine intervention in the running of the machine God created. This has stimulated ideas of deism and its derivatives such as unitarianism.²

remains apart and permits His creation to administer itself through natural laws – a view prevalent in the seventeenth and eighteenth centuries. Unitarianism stresses the oneness of God and denies the divinity of Jesus Christ and the Holy Spirit. They are committed to freedom, reason and tolerance as the context essential to a religion that is truly personal and social.

A third influence of the science on Christianity is in the area of biblical interpretation. It goes, at least, as far back as Galileo's famous quip of 1615 that, in Scripture, 'the intention of the Holy Ghost is to teach us how one goes to heaven, not how heaven goes' (Russell 1988: 626). This was engendered by his telescopic discoveries in vindication of Copernicus. Since then the discoveries and theories of science have necessitated the revision of traditional interpretations of Scriptures. They include ancient views about the age of the earth, the structure of the universe, the extent of Noah's flood and origins of biological species (including human beings). Thus for Einstein, religion is dependent on the activity of science, because science makes manifest something of the objective rationality inherent in the universe and helps to purge religion of the 'dross of its anthropomorphism' (Torrance 1980: 7).

Influence of Christianity on Science

The origins and growth of science since the Reformation can be substantially attributed to liberating biblical insights that the movement engendered. This is seen in the writings of many men of science and in the "morphological similarities between science and religious theories" (Russell 1988: 626). Four of such insights are hereby presented for consideration.

The first concerns the laws of nature. The emergence of the concept of the 'laws of nature' in the seventeenth century has been attributed to inspiration from biblical doctrines associated with the text of Job 28: 26 and Proverbs 8: 29.

The second relates to the experimental method in science. It was encouraged by the questioning manipulation which occurred in English Puritanism and continental Calvinism as an alternative to the abstract reasoning of ancient pagan cultures. The experimental method was seen as fully compatible with biblical injunction to 'test all things' (I Thess. 5: 21; Rom. 12: 2; Ps. 34: 8).

Thirdly, controlling the earth: Bacon and his followers saw in Scripture (Genesis 1: 26; Psalm 8: 6-8, etc.) a clear mandate for altering the natural world for human benefit.

The final one focuses on the glory of God. There was a view, even among the early church fathers that scientific research would add luster to the divine name. This view was strongly kindled in the seventeenth century. Thus John Kepler (1571-1630), in studying those heavens which declared the glory of God (Psalm 8, 19, 50), exclaimed he was 'thinking God's thoughts after him'. This attitude greatly motivated the scientific exploration of nature. It is thus no wonder that some of the prominent scientists in history have been Christians or, explicitly, God fearing like Galileo, Copernicus, Newton, Boyle, Dalton, Faraday, Maxwell and Kelvin (Bruce 2006: 646). Even when

generations after Darwin and Einstein are supposed to have explained everything away, many scientists today still believe in God.

Scientists usually seem to have less of a problem with religious faith than those in the arts and social sciences. A poll of American scientists by the scientific journal *Nature*, as reported by Bruce (2006: 647), shows that the percentage of those who believed in a God one could pray to was as high as in a similar survey 80 years ago. This suggests that reports of the 'death of God' (initiated by Nietzsche) seem to have been greatly exaggerated. God really is not dead.

Limits of Science

Mathematics, science, history and personal experience constitute different ways of knowing. The claims of Christianity are grounded in historical records and experience. The way God revealed himself in Christ is accessible not by experimentation, but only from ancient historical documents which have to be assessed in the appropriate way. The way we know God is the way we know people, that is, by experience (Bruce 2006: 647).

Science says a lot about mechanisms and processes, cause and effect, but its reductionism is a poor tool to describe the major realities of life – human relationships, love, beauty, meaning and purpose of existence, and so on (Bruce 2006: 648). There are limits to what science can do. It can answer 'how?' questions, but it has no tools to address 'why?' questions like 'why is the universe there at all?' or 'why is the universe so orderly that we can do science?' Questions like 'why is there so much suffering?', 'what is the meaning of life?' or 'who am I?' go beyond what science can deal with into realms where there are no measurable data or controlled experiments. Logical positivism rejected these questions as unscientific and therefore meaningless, but God wants us to consider them as stated in Romans 1:18-20.

Science and faith as partners over values, reality and nature

In his preface to *Christian Theology and Scientific Culture*, T. F. Torrance affirms what Einstein sees as the 'strong reciprocal relations and dependencies' between science and religion. However Einstein admits that "the aim of natural science is limited, to determine how facts are related to, and conditioned by each other" (Torrance 1980: 7).

Science is very good at solving problems, but it does not tell us what to do with the answers (Bruce 2006: 648). It may discover something remarkable, like the energy in the atomic nucleus, but it will not tell us whether to make a bomb, a nuclear power station or a cancer treatment out of it, or whether to leave it alone. The fantastic advances in the biosciences know no moral limits or how to set their discoveries in the wider human

context. People have realized that we need to have a source of values to drive science in the right direction, and science itself cannot give the needed values to us, because it was not designed to do so, but rather to work within the values which faith in Christ can provide as its guide and gatekeeper (Russell 2006: 648-9). Science and Christianity thus become partners over values, reality and nature.

Conclusion

The study of science and Christianity often tends to be antagonistic, with science being on the offensive and Christianity on the defensive. However, the discussion so far indicates that it need not be so. Rather the relationship between the two could be mutually beneficial, with Christianity providing the inspiration and the mandate for scientific advancement, whilst science helps to establish grounds for clarifying and deepening Christian truths.

The issue then is a call for dialogue rather resorting to polemics. It has been suggested that a valid ground for further dialogue is to explore "the interrelationship between theological discourse and natural scientific discourse" for the sake of "the unitary rationality of the created universe" (Torrance 1908: 34). For Christians a thorough going dialogue with science and submission of theological conceptions to the critical questions such dialogue addresses will help purge our minds of pseudo-theological as well as pseudo-scientific notions.

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CHAPTER 4

RELIGION AND SCIENCE – A CHRISTIAN PERSPECTIVE

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Abstract: *The paper makes a survey of the relationship between religion and reason or knowledge and faith from the early church to the late medieval period and the early modern periods to explore the various ways in which the relationship between religion and reason (science) have been defined. The paper further explore the areas of similarities and conflicts between religion and science and the various ways in which theologians have addressed the issue of science and religion. Finally the paper addresses the issue of the relevance of the relationship between religion and science for the Ghanaian society especially the way it deals with areas of conflict between secular assumptions of the modern world and the religious orientation of traditional culture.*

Introduction

Religion and Science are two of the most important knowledge systems that are influencing the choices that affect and shape our lives and therefore must engage our attentions, especially the relationship that can and should exist between them. The old enlightenment idea that, with increase in scientific knowledge, religion will decrease in importance and eventually disappear has not happened. In fact, what we have today is the visibility of religion as a philosophy that directs and influences the lives of many people and the driving force behind cultural revivals and identity retrievals that deal with identity (Cox 1995: xvi). If anything at all, the contemporary scene shows that religion is growing in popularity and importance even as science expands the frontiers of knowledge about our world and our lives.

The expansion of the frontiers of scientific knowledge is deepening our sense of the mystery and complexity of our world. The present state of our knowledge of the universe is seriously challenging the old mechanical cosmology that undergird modern science as an adequate and realistic framework for dealing with emerging knowledge of our universe (Clayton 1997: 145). Other challenges and questions from our ever expanding knowledge of the complexity of the universe is calling for the re-examination of the Newtonian mechanical universe of modern science because the idea that this complex universe came out of pure accident may be scientifically

plausible but not entirely intellectually satisfying (Lauer 2003: 373-375). The fanaticism of conservative creationists aside, the subject of the creative principle of the universe calls for a serious intellectual reflection by both scientists and theologians, given our state of knowledge of the universe today. The old anthropic principle which postulate that the origin of anything implies something greater which runs from Aristotle thorough Aquinas to Descartes and made popular by William Paley in his argument from design, gives strong indications of creative principle worthy of intellectual consideration in our attempt to unravel the mystery of the origins of the universe (Clayton 1997: 131 – 132). More importantly, advances in science and its application to human life are raising moral issues that need religious insight in addressing them. Here, religion could act as sacred canopy that can provide us with meaning and thus prevent human knowledge from leading us to meaninglessness anomie and chaos.

The Ghanaian society is today influenced by both science and religion in the sense that they both exercise tremendous influence on our lives and the choices that affect our lives. The influence of science comes through the intellectual structures that undergird the modern world and that of religion through the world-view that under gird our culture. We encounter the tension between science and religion when, in course of our lives, we are called upon to negotiate between tradition and modernity.

The significance of reflecting on the relationship between religion and science is important for any educational institution which is devoted to the academic study of science and technology for the development of our society. Indeed, the work of the intellectual study of science and technology is not complete until the scientific method and the scientific approach to knowledge percolate into our society. For this reason, the processes of the engagement of science with our society should influence the way the university produce and disseminate knowledge (Gibbon 1999).

The integration of scientific and technological knowledge and thinking into our society, which is also influenced by traditional culture, brings us face to face with the issues of religion and science, especially the place of religion in the modern secular world. Furthermore, the engagement of knowledge of science and technology with our society requires a sound knowledge of religion as an important influence on our culture. This will save us from distorted views of religion that may not help us to engage religion properly as an important system that has bearing on our culture and our way of life. When we take our engagement with Ghanaian society seriously, we shall realize that the human subject who is the target of our scientific and technological knowledge is also a cultural being whose life and choices are shaped by religious norms, values and beliefs.

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Finally, the challenges of modern society is inviting the universities to move away from the traditional idea that saw the university as an ivory tower that should be insulated from the hazards and trappings of society so that it could meditate undisturbed on the pure forms of knowledge. Indeed the relevance of university education for our society will be measured to large extent by ways in which its dialogue with society can impact its procedures of knowledge production and dissemination. However, it seems that the idea of active engagement with society and the market place is yet to make a significant impact on the general frame-work of methodologies of knowledge production and dissemination in our universities. The challenge of the universities today is how it can engaged, and interact with society and the market in non technical language that will break down the rigid frontiers of the disciplines which often box knowledge into narrow fields of specializations. The human subject who is the beneficiary of our research can be divided into specialized fields as a convenient method of study, but in reality the human subject is a whole unit that needs a multi-disciplinary approach. And the opportunity of dialogue between science and religion and indeed the humanities could begin a process of inter-disciplinary, multi-dimensional methodologies for our research and dissemination of knowledge.

Religion and Reason in Historical Perspective

The introduction of Christianity into the Graeco-Roman world initiated one of the most important dialogues between religion and reason or revelation and knowledge. The early Christian apologists presented Christianity as a rational religion whose truths can be demonstrated by rational arguments because Christianity deals with a god that is stable and reliable unlike the Greek gods that are capricious and unreliable. The Christian God, the apologists believed, can be rationally deduced from the world as its creator by proofs. The idea that the Christian God is a God that can rationally be deduced from the world allowed the Christian apologists to identify the Christian with the God of the philosophers. This allowed them to borrow a lot of theistic categories from Greek philosophy in presenting Christianity to the world. This led the early Christian theologians to identify the Christian God with the God of the philosophers who created the world yet independent of it like Aristotle's unmoved mover or Plato's uncaused causer. The significance of this period for Christian theology was that it started a tradition in Christian theology in which the definition of the relationship between religion and reason (or revelation and knowledge) became an important function of theology.

Invariably the early Christian theological traditions saw harmony in the relationship between religion and reason as two systems that can complement each other. The philosophy of these early Christian theologians

was that true religion does not contradict reason and vice versa. In the Augustinian tradition for example, religion was seen as the foundations of reason; *Credo ut intelligam* (meaning *I believe in order to understand*). This Augustinian tradition that saw faith or belief as the foundation of reason dominated the medieval ages and St. Anselm's famous dictum, "Faith seeking, understand" – *Fides quaerens intellectum* – saw faith as aid to understanding in the sense that faith helps human beings to understand the world as the creation of God who must exist of necessity (ontological argument).

The harmony between reason and religion that characterized the middle ages was raised to a very high intellectual level by St. Thomas Aquinas in his medieval synthesis in which he demonstrated on rational grounds the harmony between Christian theology and Aristotelian philosophy. According to Aquinas, religion or revelation provided the premises for theology and reason demonstrated the truths of theological propositions. Aquinas by this method of synthesis between reason and faith was able to develop the rational grounds for the philosophical proof of the existence of God by the use of Aristotelian philosophy and categories. In the scheme of Aquinas, reason is able to prove the existence of God but it is only revelation that can reveal to us the nature and character of God.

One can make the critical point that, from the early church up to the middle age, the relationship between reason and religion was interpreted in various ways that expressed the idea of harmony, but on the whole religion and reason were seen as complementing each other.

In the Protestant reformation, the harmony was maintained but reason was made the instrument that led one to discover the place where one can discover God – scripture. For example in Calvin's *philosophia Christiana*, the job of philosophy was not to demonstrate the existence of God but, rather, to lead the believer to scripture where he/she can encounter God (Akong 1991: 89).

Trends in late medieval philosophy, especially nominalism, made a strong case for the particular against the universal that has dominated medieval philosophy. The most important consequence of the nominalist critique of scholastic epistemology was to force scholastic rational philosophy to give empirical knowledge as much respect and significance as logical or analytic truths. This shift led to the emphasis on practical utility of knowledge and its pragmatic use for life and the idea that the validity of knowledge does not only have to depend on consistency with general theory but also its practical application to life (Akong 1991: 83).

The nominalist tradition together with trends in the Renaissance prepared the grounds for the emergence of scientific revolution that gave prominence to knowledge based on observation from experience or inductive reason

out of which the scientific method emerged. The struggles of the early scientist with the establishment were as much about the new revolutionary ideas about the universe as about the defense of inductive reason and the scientific method. The struggles of the early scientist to gain credibility for their inductive reason procedures led very early to the very rigorous procedures for the establishment of scientific truths which gave credibility to scientific knowledge and led to the great advances in scientific research.

Science and Religion in the Modern World

As noted earlier, nominalism of the late medieval period made it possible for a case to be made for the production of knowledge based on inductive reason. One could therefore make a link between the nominalists traditions of the medieval period and the antecedent processes that lead to the rise of modern science.

Many modern philosophers like Whitehead believed that the rise of modern science was made possible by the Christian world-view, especially its lineal time scale that characterizes creation with a beginning, time of redemption and time of fulfillment. They argued that the Christian doctrine of creation presented an intelligent orderly world which is contingent rather than necessary and whose changes could be studied over time. This led to the idea that nature is good and stable, but not divine, and human beings could study it and experiment with it because it was contingent (Barbour 1990: 17). The desacralization of nature therefore encouraged scientific study of nature as contingent reality that subject to observable changes.

The philosophers further argued that the lineal timescale under the direction of a reliable immutable God created confidence in the created order that allowed people to study it in order to discover its regularities that formed the basis of the scientific laws of nature. The lineal cosmology as opposed to the cyclical cosmology of the ancient world allowed for sustained observation over time out of which observations could be made about nature. The idea of the laws of nature was based on confidence in the ability of the immutable creator to sustain creation over time and because he is reliable creation will not be subjected to capricious changes.

However in the course of the development of science in the modern period, the scientific methodology based on the laws of nature started presenting special challenges to Christian theology when a mechanical cosmology was made the frame-work or paradigm within which the laws of nature were interpreted (Clayton 1997: 145-146). Such a mechanical universe did not have place for God or any transcendent reality. The special challenge for Christian theology was that it became difficult to find place for God in a world mechanically conceived. And the central issues that have dominated the relationship between science and religion since the enlightenment has

been how to find a place for God in the phenomenal world of mechanical causality or justify religion on the basis of a rationality defined by the logic of positivism. For enlightenment philosophers like Immanuel Kant, God cannot be found in the phenomenal world that operated on mechanical causality but rather in the world of values and meaning which he calls the *naumenal* world. And indeed much of the task of modern theology has been the different ways, methods and procedures that theologians have devised to find a place for God in the mechanical world of modern science.

By far, the greatest challenge of science to religions lies in the scientific method and this is because of the popular belief today that the credibility of religion has somehow been undermined by science (Barbour 1990: iv). This is especially the case when the method of science which is based on material causality is construed as a process that naturally leads to materialism or what Barbour (1990:4) calls metaphysical naturalism. The road from scientific method to materialistic philosophy starts when scientific method and knowledge is canvassed as the only source of knowledge and matter as the fundamental reality of the universe (Barbour, 1990: 4-5). These forms of epistemological reductionism as one finds in logical positivism can easily lead to one dimensional materialistic interpretation of the world ostensibly as a consequence of the scientific method.

Furthermore, the sheer novelty of knowledge produced by the scientific revolution has made the scientific method very popular as a credible and significant form of knowledge production. And with great strides in science and technology, scientific knowledge and its empirical methods has emerged as a highly priced mode of knowledge embraced by most people as the most reliable form of knowledge production and therefore the preferred body of knowledge that can help human beings understand the world and human life. Sometimes the scientific view is presented as the only authentic voice on all matters dealing with the world and human life. It is this one dimensional view of reality that comes from the epistemological reductionism modern science that comes into sharp conflict with the religious understanding of the world and human life.

What has been described as scientific metaphysic or epistemological reductionism has its counterpart in Biblical literalism that makes absolute claims about the religious view of reality. In the history of the West, these conflicts have been addressed in different ways. There are those who believe that science and religion are independent systems that have different models of knowledge of reality. There are still others who believe that there is harmony between religions and science because, as Galileo puts it, "The same God is revealed in both scripture and nature, so there cannot be conflict between science and religion (Barbour 1990: 8). There is corresponding group of theologians who also believe that there is harmony between religion

and science because, for Aquinas for example, if God is the primary cause that acts in the secondary material which science studies, then science and religion are different but complimentary. And therefore, Aquinas could describe the world as the rational revelation of God because one can get to knowledge of God through the world.

There are other theologians who have addressed the relationship between religion and science on the basis of theology of nature. They believe that the existence of God can be inferred from the world and therefore religion and science can be in harmony. This is mainly found in the Thomistic tradition in its various interpretations. The advocates of the natural theology further believe that science can help us in the formulation of doctrine when we take into account the scientific knowledge of the world. Arthur Peacocke for example believes that God creates through the natural process. Or, again, as Teilhard de Chardin argues, one can discover the existence of God through the evolutionary process (Barbour 1990: 27). There are a group of scientist who believe that science without the aid of religion experience can lead us to postulate God or, as Paul Davies claims, there is spirituality implicit in science (Clayton 1997: 155).

By far the most creative response of theologians to the challenge of scientific knowledge to religion is what might be called synthetic system in which science and religion are integrated into a comprehensive metaphysical system for understanding the world. The advocate of this synthetic approach argue that religion and science can come together to provide general categories by which different types of experiences can be interpreted in a way that will overcome the dualisms that have limited knowledge in the Western intellectual tradition (Barbour 1990: 28).

Process philosophy championed by Whitehead has come out with philosophical perspectives that have been used by many theologians for dealing with the problems of the relationship between science and religion. According to the process philosophers, nature is characterized by change, chance, novelty, as well as order. This makes the world incomplete and a process that still is coming into being. The process philosophers believe that this way of viewing nature can help overcome the dualisms of nature and spirit, mind and matter that have plagued Western philosophy and hence set up barriers that make it impossible for us to see reality as a unity in its various diverse and complex expressions.

On the basis of the perspective provided by process philosophy, the process theologians see God as still the source of creativity and novelty and God continues to create. And God as creator and sustainer interact reciprocally with the world even as God acts through nature; God transcends the world but is also immanent in it. In the same vein, Charles

Hartshorne one of the great process philosophers, has suggested the idea of a diapolar God who is a God who is unchanging in purpose and character but changing in expression and relationships (Barbour 1990: 28).

The celebrated German sociologist, Max Weber, argued that the one of the important marks of a modern society as opposed to traditional society is secularism. The modern world is thus presented as rationalistic and secular world. When the so-called secularity of the modern world is exaggerated, then the modern world is presented as a world that must of necessity be in conflict with religion.

One observation that comes from our analysis so far is that the rise of modern science led to the dominance of scientific explanation as the preference explanation in dealing with matters related to the world and human life. This process gradually gave rise to scientific world view or cosmology, the Newtonian mechanical universe in which one is supposed to account for causality in the world by material naturalistic explanation alone without recourse to any spiritual explanations whatsoever. The development and the nurture of this one-dimensional secular mechanical view of life is the point at which religion comes into sharp conflict with science. But one can conceivably accept scientific methods and explanations without necessarily accepting the one-dimensional mechanical cosmology of the modern world (Clayton 1997: 146). Indeed, when religion and science each claims sole monopoly of knowledge about the world and human life, the differences between religion and science become exaggerated and they are almost put into a contradictory relationship.

I believe that, as we come to appreciate the complexity of the world and human life, we can come to the realization that the complexities of the world and human call for different interpretative schemes for understanding our world. Indeed, in our intellectual development today, it seems that we are gradually overcoming the initial antagonism between science and religion, and we are reaching the stage where the intellectually honest thing to do is to acknowledge the limits and possibilities of both science and religion.

Scientific Method and Procedure

Modern science from its beginnings in seventeenth and eighteenth century developed very rigorous methodological procedures to establish the validity of inductive reasoning as credible source of knowledge production to silence its critiques who doubted that inductive reason can yield reliable knowledge. Despite some technical problems with the inductive method like the logical basis of projecting present regularities on to the future and regressively into the past, the continuous refinement of the scientific method and the impact of science and technology on our lives have established the inductive

process of science as credible form of knowledge production comparable to deduction.

The achievements in science and technology has given prominence and value to inductive reason and so much so that a group of philosophers, the logical positivists, advocated the use the criterion of verifying scientific truths as the standards for the proof of the validity and truth of philosophical statements. They therefore came forward with their verification test of the meaningfulness of a statement. The difficulties into which the logical positivists ran illustrate one significant point about the empirical methods of science. The empirical method as a mode of knowledge can only apply to certain aspects of our lives and experiences. The problem as the case of the logical positivism showed is that human experience is wide and varied and therefore each aspect of our lives experiences requires the type of knowledge form that is appropriate to its subject matter. This limitation of empiricism as the basis of evaluating the truth value of statements show that there are important aspects of human life and experiences that will require different methods of evaluation. And, as Wittengenstein pointed out, language like is a game that requires different rules for different games. In the same way we cannot reduce knowledge of different aspects of life to only one form of language, the scientific empirical language.

Technically, the method of science falls under rubrics of inductive reasoning. Inductive reasoning is based on conclusions from observation based on sense perception. These observations are formulated into hypothesis as ampliative evidence for the prediction of future events regressively into the past. Ampliative reasoning or inductive reasoning makes inference from observation to non observation which means that it goes beyond the content of its premise. This was the difficulty that was detected by David Hume about inductive reason and came to the conclusion that the acceptance of conclusion from inductive reason is based on psychological connection and experience rather than on logic (Salmon 1999: 55-56). The introduction of new instances that can alter the initial observation, which is an important part of the scientific method, makes scientific hypothesis provisional subject to further correction. But the provisionality of scientific hypothesis is the same process that allows for the constant innovation in scientific hypothesis. This makes the scientific procedure a dynamic process characterizes by novelty. Thomas Kuhn has however made us aware of the complex process that new finding go through before they attain the position of a hypothesis (Roslston 1987: 9). The reason for this digression into the philosophy of scientific change is to show both the limitation and possibilities of science method as a form of knowledge production.

Nature and Procedure of Religion

The subject matter of religion deals with so many different aspects of life and, therefore, it is difficult to use a *per genus et differentia* definition without excluding many religions from the class of religion. We can regard religion as *sui generis* but this does not mean that we cannot view it from different perspectives – philosophical, sociological, psychological, etc. The dominant 19th century definition of religion as belief in spiritual beings proposed by E. B. Tyler is too closely related to the evolutionary theory of religion which tends to tie religion too closely with spiritual beings as the core elements in religion to the exclusion of the socio-cultural aspects of religion and also the function of religion as the fountain of world-views for cultures and identities for individuals and communities. What will be relevant for our purposes is the function of religion as a system of meaning or the normative function of religion that shape people's view of the world. This function of religion brings about the essential nature of religion as a system of production and preservation of knowledge that deal with meaning and purpose from the point of view of transcendent reality or what lies beyond our normal experiences which is usually described in symbolic terms.

Religion because of its subject matter and its function tend, unlike science, to protect its truths and knowledge systems with strong taboos and other sanction mechanisms. Therefore, religion tends to be conservative and very slow to accept changes unlike science whose very procedure is based on constant change, provisionality and novelty.

Furthermore, the subject matter of religion deals with transcendent reality which is beyond every day experience, mostly, in the realm of the boundary experiences between normal human experience and the transcendence. The symbolic language used by religion in these boundary situations may bring religion into conflicts with the scientific language and its view of the world.

Since much of the subject matter of religion deals, on most occasions, with transcendent reality or the reality beyond our immediate experience, it uses the language of mythology as a way of dealing with these transcendental experiences beyond space and time. The language of myth is not so much concerned with facts but, rather, with meanings and values and the perspectives these shape. The function of the language of mythology is to suggest and reinforce certain specific religious truths. For example, the Christian account of creation in Genesis is based on ancient cosmology whose religious background may be lost to us. But, nevertheless, it seeks to maintain the vision of a god who created the universe and on whom the world depends.

The intention of the creation account in Genesis is to affirm that the world was created by God and the world is dependent on God. This dependence on God is expressed in the Christian doctrine of *creatio-ex-nihilo*,

which means that God created the world not from an already existing material like in Greek mythology but that everything came from God alone. The Genesis account is also celebration of the wonder of creation and gratitude for the benefits of dependence God's gift of grace that sustains the world. The creation stories do not pretend to be scientific explanation of events in the past but rather to locate the human experience within a larger framework of significance, which shows the essential nature of reality and the place of humanity in it. Finally, the creation stories also have the theological intent of distinguishing God from the world as independent of the world unlike pantheistic religions where God is closely identified with the world.

When the theological intent of the creation narratives which are expressed in mythological is treated as a factual scientific account of the creation, then we have a situation where the theological intent and purpose of the creation narratives is lost. When this happens, then religion is venturing into the realm of science which is not its province, properly speaking. On the other hand, when science too, because its tremendous knowledge about the world, moves into the realm of speculation about the origin of the world, then it becomes speculative metaphysics and not science.

St Augustine perceptively claimed that creation came with time and space. If this is true which, I think it is, then I believe that it will be difficult to explain the origin of the world before space and time in spatio-temporal language as big bang theory seeks to do. The temptation of science to build speculative metaphysics on the basis of its predictive capabilities betrays its limitations imposed on it by its own methodological procedures. When science ventures into this speculative metaphysic about the origins of the world, then it comes into conflict with religious stories about creation whose purpose is not a scientific explanation about the world but rather the theological affirmation that the world is dependent on God as its Creator and sustainer.

Charles Hartshorne, one of the process philosophers argued persuasively that the world as the product of an accident is less plausible than the world as a product of creator even if it is difficult to conclusively prove it (Hartshorne 1948). The world as the product of chance, as speculative scientific metaphysic proposes, and the world as a result of activity of a creator, though difficult to prove conclusively, are two contending and equally attractive options about the origin of the world.

It seems to me that what the future holds for us is how the religious view can complement the scientific view and vice-versa. The idea that evolution is God's way of creating the world held by some scientists and theologians seems to be a reasonable suggestion worth considering. If the procedures of science are not viewed from the point of view of metaphysical naturalism occasioned by the Newtonian mechanical universe one cannot see how the scientific procedure in themselves can by necessity exclude

God because most of the early scientists did not believe that the scientific method and procedures excluded God. As noted earlier, Galileo saw harmony between the revelation of God in the bible and nature. This comes close to the theological school of nature that sees God as the primary cause of secondary material causes. In the same vein if one operates with the open universe of process philosophy one can find a place for God in the world. And therefore there is no logical reason why God cannot work through nature.

Science and Religion in modern Ghana

Ghana, as nation, came into contact with modernity through the traders on the Coast, the missionaries and the colonialists. But this world of modernity has structures, ideologies values and ideas that come into shape conflicts with traditional culture and the religion that undergird it. The challenge posed by the modern world to the Ghanaian society today can be categorized into two main areas – Scientific thinking and local culture, clash of world-views and meanings.

(a) *The place of scientific thinking in local culture:* The problem posed by the relationship between science and religion comes clearly in the issue of scientific knowledge and thinking in a culture influenced by traditional categories of thought. One of the most important requirements of modern development is the development of scientific thinking as a cultural infrastructure that will help the people acquire scientific thinking and attitudes that will integrate scientific ideas into everyday life of the people in the sense of forming the habit of seeking scientific explanation and answers. Scientific thinking is the building block for the development of a modern culture which will truly make our society part of the scientific discourse of globalization.

This means that our education system should be able to inculcate the critical and probing attitude of scientific culture into students. The goal of achieving scientific thinking will affect the way we teach scientific subjects in the school, so that the teaching of scientific subjects will also have the added goal of developing the enquiring mind in students that leads to creativity. The development of scientific thinking among students will make it possible for scientific thinking to percolate into the general society which will provide an alternative to the entrenched the magico-mythical schemes of interpretations that still influence the way we think and interpret events that affect our lives.

(b) *Clash of world of values and meanings:* One of the major flash points of the encounter between traditional culture and religion and modernity is the clash of world-views values and meaning that affect our schemes of

interpretation of life and how to negotiate the tension between the logic of modern and traditional thought (Akropong 2003). The central issue is how do we integrate the modern secular world in our local culture which is still influenced by categories of thought derived from traditional religion which is predisposed to magico-mystical interpretation events. This is the challenge that face us on the personal and collectively levels as a society .

Conclusion

The main argument of the paper is that, viewed from the historical perspective, the relationship between science (reason) and religion have been configured and defined differently. The history of this relationship shows that, for the most part especially starting from the early Christian era, the relationship between religion and reason (science) was seen in term of harmonious and complementing relationship.

But, in the recent past, especially starting from the enlightenment, there has developed an antagonistic relationship in which reason (science) was seen as superior and, for religion to have validity, it must be certified by reason. Today, the antagonistic relationship has been replaced with one that acknowledges the potential and limitation of both religion and science and, therefore, the need for dialogue and co-operation for the common human understanding of the place of human beings in universe.

For us in African (and Ghana in particular), the challenge of scientific secular orientation of modernity pose a great challenge for us as we try to navigate the rough contours of the clash between traditional religion that influence our culture and the scientific world-view that is shaping the modern world and the direction of globalization.

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CHAPTER 5

RELIGION, SCIENCE AND DEVELOPMENT

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Abstract: *The aim of religion and science is the welfare and prosperity of man, even though there are some variations in their approaches in interpretation of phenomena and in confronting human problems. This paper attempts to elucidate the relative and conjunctive role of science and religion in development using secondary sources. The objectives are fourfold. Firstly, it examines the methodological approaches to the study of the two fields of knowledge. Secondly, it explores areas of interaction between the two, focusing on how religious facts and models have been confirmed by science. Thirdly, the core objectives in religion that are in tandem with development are examined. Fourthly, the supernatural phenomena in religion, miracles and prophetic predictions, as against the approaches in science, and implications for development are discussed. To ensure that religion and science promote development and empirical research directions in tandem to put religion-science-development in broader perspectives, the paper concludes with some recommendations.*

Introduction

The 21st century dawned with teething and traumatic challenges to development globally and regionally with Third World countries and, especially, sub-Saharan Africa groping and grimacing in the arena of underdevelopment. The era witnesses astronomical growth of certain economies in Asia, notable among which are China and India; a development which is stunning to Western countries and posing serious challenges to their economies. Simultaneous to this economic boom in Asia is the gradual cascading of the United States (US) economy into recession. Yet, this era is the peak of globalisation which is supposed to improve international commodity exchange, resulting in economic prosperity of nations. Ironically, it is also the period of increasing knowledge in science and technology which is supposed to reduce human burdens and stimulate growth and development. Additionally, it is a period of excited religious fervour and pluralism that purports to address the spiritual and material needs of humanity.

Science seeks to confront the material challenges of humanity; of providing food, clothing and shelter and quality health to enable man to carry out the daily rounds of life. It also aims at delving into the natural burdens of humanity such as earthquakes, volcanic eruptions, terrific hurricanes, disease infections, etc. which keep baring their teeth at humanity almost on a weekly basis worldwide. Recent environmental disasters such as the hurricane 'Katrina' in the United States and the tsunami in the South-East Asia reveal the inability of environmental scientists to forecast such catastrophes. For the United States that poses as the giant of scientific achievements to continue suffering from such disasters only indicates that both developed and developing countries are vulnerable to such disasters, which could then be identified as global phenomena.

The degradation of the environment perhaps poses the greatest challenge to the efficacy of science in addressing human problems. The depletion of the ozone layer and its catastrophic effect on ice thawing and consequent flooding in both tropical and temperate regions, destruction of aquatic life through the damage phytoplankton, base of aquatic food web; global warming and its effects on life forms all make it appear that science has a greater challenge to grapple with and that it is incapable of getting over such burdens. The rampant woodcutting in developing countries and our failure to carry out effective afforestation and re-afforestation programmes are human weaknesses that increase the potential for environmental decay. Such circumstances increase the burden on science. For the problems posed by human health, the least said about them the better. Health problems have defied the effectiveness of medical technology. The HIV/AIDS scourge has made medical technology rather vulnerable. What relative roles do science and religion play to reverse such trends in order to propel development?

Solutions to some of such occurrences such as ozone depletion and global warming call for human intervention which is more a moral and divine than science issue. Failure of some developed nations such as the US to endorse the Montreal Accord which could have helped reduce infusions of chlorofluorocarbons to reverse the trend of ozone depletion is escalating the trend. Indeed, hope in science finding solutions to such environmental predicaments is waning. In the search for solutions, religious adherents and pundits, drawing on history of display of miraculous powers of religious leaders, hope religion has solutions to all such problems. They rely on faith other than science in addressing the mounting problems of humanity. Could such moral issues best be addressed by religion? Does science have solutions to basic human behaviour? That science strives at objectivity is conceded; yet objective value does not exist externally, but is an internal affair created by human (or God in humans only). Cashed in a metaphor, religion supplies the moral compass and science supplies the vehicle for development.

There are other global crises apart from economic, the environmental and health. Development has been conceptualised not to mean mere economic growth, reference to micro and macro indicators, but also to embrace political, cultural and human rights dimensions. Political problems keep engulfing the globe. The Middle East crises still continue to engage global attention. The recognition of the states of Israel and Palestine by Arabs and Jews respectively has created camps in the global political system which has negative implications for global peace. Other troublesome spots are scattered over Africa and Asia. The naked violation of democratic values to perpetuate political dispensations continues to undermine Africa's political systems. Kenya, Zimbabwe, Democratic Republic of Congo, Sierra Leone, Liberia and Togo have been classic examples of such political cacophony and confusion. There is also moral pollution, especially of sexual morality. The sanctity of sex is grossly undermined and moral turpitude assumes preponderance. Against what is rather odd even in the animal kingdom, homosexuality and lesbianism are gradually becoming phenomenal. Pre-marital and extra-marital sex are rather the norm. Moral issues are rather stale and considered mundane. Yet, they have serious implications for development given that they are recipes for corruption which is a stinging canker that ultimately corrodes the general welfare of populations. Developing countries for instance are battling with corruption that undercuts efforts at improving general welfare. It cannot be estimated the harm acts of moral misconduct such as pre-marital and extra-marital and carnal sex have done to human health. On issues of morality, what relative roles do religion and science play? In a discussion on the relationship between religion, science and development, such an important phenomenon cannot be glossed over. The health argument could be pushed beyond such bizarre practices and include unhealthy lifestyles such as alcoholism, smoking and general intemperate practices. The training process to build capacity (the development of mental capacity and cognition) is influenced by such lifestyles. What role do religion and science play in addressing such issues?

There is some convergence between religion and science. Several religious literatures make references to facts that were confirmed years after by science. The Bible, for instance, revealed facts about hydrology (Ecclesiastes 1:7); sphericity of the earth/solar system (Revelation 7:1), nutrition (Acts 15:19:20), etc. Whereas religion recognises some of its bases in science, science recognises religion as poles apart with it. Besides, whereas scientific explanation is based on causality, religious interpretation is based on meaning (Rolston 1987). Moreover, whereas several religious interpretations are based on faith, scientific explanation is based on reason and empiricism, leaning on positivism.

Another area of convergence in religion and science is prediction/prophecy both of which have implications for development. Planners rely on oncoming events to make realistic planning. Religious literature, especially the Bible, is full of fulfilled prophecies some of which are place-specific. The Bible is full of prophecies about end-time events (Isaiah 7:14; Daniel 2; Daniel 12:1; Joel 2:30, 31; Matthew 24:37, 38; Matthew 24:29; II Timothy 3:1-5 etc.). Today, science is attempting to predict in areas of meteorology, social phenomena, economics, environment, etc, yet, lacking precision and accuracy. The tsunami and hurricane hydrological and tectonic disasters, and of the recent earth tremors in China have revealed the vulnerability of science. One flaw of some religious predictions is that they are not time-place-specific.

Development is supposed to bring joy to humanity, and joy does not rest solely on the excess of material goods. There could be millionaires who are so stressed and depressed that they see life as a failure. Suicides are caused by persons who are of no mean social standards. On the other hand, there are social mediocrities who have joy and satisfaction because of the hope they have in a future welfare state, a heaven that guarantees eternal life and a life full of joy and satisfaction, without pain and death. Adherents of major religions such as Christianity and Islam have found satisfaction in life, even amidst hardships, due to such hope. Seen as an 'opium of the masses', adherents rather see religion as a source of hope, a buoyancy to a better life.

In the science-religion-development discourse, we see naturalists and spiritualists/moralists emerging on the scene: empiricism against faith, positivism against hope. Notwithstanding, we have the influx of science into religion and vice versa and the intersection has implications for development. We have religious scientists who are using science to justify religious models and philosophies. In religion is found miracles that confound science; models and statements that have been validated through scientific scrutiny. Yet practical methods have been used in religious domains, combining with divine power, to ensure human progress. The possibility of amalgamation of science and religion to produce sustainable development is the focus of this paper. For the purpose of this paper, the Bible would be cited to support religious phenomena and models.

The objectives are to:

- a. examine the methodologies of science and religion and the common perspectives between the two;
- b. analyse the concept of development;
- c. examine the confirmation of religious models and facts by science;

- d. discuss the role of miracle and faith in addressing human problems;
- e. analyse the predictability of religion and science;
- f. examine a common ground; how religion and science, as bedfellows, could promote development.

Methodologies of Science and Religion

The relationship between religion and science has been a focus of the 'demarcation' problem. Statements about the world made by science and religion rely on different methodologies. Religions rely more on revelation while science relies on observable, repeatable experiences. Some scholars say the two are separate, while others propose an interconnection. The kinds of interactions that might arise between science and religion have been classified using four-pronged typology: conflict, independence, dialogue and integration (Barbour 1997, 2000; Haught 1995; Peacocke 1981). There is conflict when either discipline threatens to take over legitimate concerns of the other; independence treats each as quite separate realms of enquiry; dialogues suggest that each field has things to say to each other about phenomena in which their interests overlap whilst integration aims to unify both fields into a single discourse. To Einstein (1949), science can only ascertain what is, but not what should be, and outside of its domain value judgements of all kinds remain necessary. Religion, on the other hand, deals only with evaluations of human thought and action. This thought gives an indication of the methodology. A totality of these methods would result in their reconciliation for the progress of society. Indeed, the argument that the rise of early modern science was due to a unique combination of Greek and Biblical thought (Cohen 1994) supports this proposition.

In generic logical form science and religion are more alike than is often supposed (Rolston 1987). An implication of this is that positivistic and scientific views that exalt science and downgrade religion involve serious misunderstanding of the nature of both scientific and religious methods. At the same time, in material context, science and religion typically offer alternative interpretations of experience, the scientific interpretation being based on causality, the religious interpretation based on meaning. The conflicts between scientific and religious interpretations arise because the boundary between causality and meaning is semi-permeable. In a generalised way science mixes observation, theory and inference, but these ingredients with their blending are more complex than at first appears, and not until something of this complexity is appreciated can one appreciate a scientific method and then profitably ask how far religious inquiry differs from it. A scientist attempts to operate out of theory in an 'if-then' mode over the facts. A schematic of this would find a theory arising out of the facts, followed by deduction back down to further empirical-level expectations,

those then being related back to observations to confirm or disconfirm the theory, more or less, and to generate revised theory, from which new conclusions are drawn, after which the facts are again consulted. This is sometimes called a hypothetico-deductive model; and, by such developments, a theory comes to have a developmental history (Hempel 1966).

Science and religion share the conviction that the world is intelligible, susceptible to being logically understood, but they lineate this under different paradigms. In the cleanest cases we can say that science operates with the presumption that there are causes to things, religion with the presumption that there are meanings to things. Meanings and causes have in common a concept of order, but the type of order differs. 'Cause' has proved a difficult notion to explicate. Some scientists have tried to reduce it, or to substitute for it, bare functions between variables. But most scientists find it difficult to escape the conviction that the variables are efficaciously connected. In a stretched sense, or in loose everyday use, cause refers to any contributing factor in an explanation (as with Aristotle's four causes) and it may include deliberations, reasons, and even meanings. But in science cause is restricted to outward, empirically, observable constant conjunctions, attended by an elusive notion of necessary production of consequent results by the preceding spatiotemporal events.

Meaning is the perceived inner significance of something, again a murky but crucial notion. Occasional apprehension of meanings does not constitute a religion, any more than occasional recognition of causes constitutes a science. But where meanings are methodologically detected out of a covering model, which is thought to represent an ultimate structure in reality, one has some sort of religion or one of its metaphysical cousins in philosophy. Science holds that causality runs deep in the nature of things; religion holds that what is highest in value runs deepest in the nature of things.

How do religion and the physical science methodologies differ? How do the two relate to matter? How do religion and biological sciences explain life? Physical science has simultaneously a great distance from, and serious implications for, religious belief. Life belongs centrally to both religion and biology; mind belongs to religion and psychology; society to religion and sociology. But physics excludes life, mind, and society; it restricts its focus to matter-energy. When inquiring about atomic particles, compounds, and catalysts, or about mass, radiation, and binding forces, physics and chemistry come at reality at too low a level to touch guilt and forgiveness, faith and love, good and evil. Experiential religion is light years away from the stuff of physical science. Yet the impact of physical science on religion has been as great as has that of the life and human sciences. Its descriptions

of the natural world, though dealing with pre-religious levels, are so sub-ultimate that everything afterward is coloured by its paradigms.

Science transforms our experience of life, as it does of matter, but here moves closer to the immediate, vital context of religion. Jesus announced, 'I have come that they may have life, and have it abundantly' (John 10:10). Regarding the origin of life, Darwin posited instead small variations in degree within a surplus of offspring, a struggle for survival, and a natural selection by which the more fit survive. Though he had no theory for the variations, genetics was subsequently to supply one, and Darwinism plus genetics is commonly called neo-Darwinism or the synthetic. There have been contradictions in the theory since, such that confidence in the theory is waning. How far do explanations and promises of religion and of bioscience overlap and compete? The secret of life was once thought to be hidden in the Spirit of God, but now seems rather lodged in DNA and RNA. When a woman is infertile or diseased, or neurotic, ought she to cry out to the Son of God or to hope for a more abundant life through biochemistry or both? How should we understand the mixture of the scientific and the spiritual in the life process? The religious could cite historical instances in which life has been formed disregarding the natural process. The formation of life in the wombs of Sarah and Rebecca, wives of Abraham and Zechariah respectively, who had exceeded their menopause (Genesis 20:1, 2; Luke 1: 13, 18, 57) defies scientific explanation. The conception and birth of Jesus without normal sexual relations is more stunning and intriguing (Matthew 1:18-25). How should we understand the mixture of the scientific and the spiritual in the life process? A common boundary where the two could fuse could provide a strong basis for prosecuting the development agenda.

Dynamics of Development

Two general approaches are involved in the issues of development: the fight against poverty and the analysis of long-term economic and social development (Szirmai 2005). These two approaches have stood the test of time. One of the characteristics of the first approach is a strong involvement with the problems of developing countries and their inhabitants. Most people who study development issues do so because they feel that present levels of poverty, misery and injustice are simply unacceptable. Their aim is to arrive at concrete recommendations for action. This approach is linked with development policies and strategies at international, national, regional or local levels. The long-term approach emphasises that economic growth in its modern form is intimately associated with the economic development of the Western countries since the mid-eighteenth century (Landes, 1998). Implicit in almost every use of the term 'development' is the notion that

some countries and regions of the world are extremely poor whereas other countries, representing a relatively small fraction of the world population, are very prosperous.

Development conceived as economic growth is a quantitative concept and basically means more of the same. Yet, even if we limit ourselves to the economic sphere, it is clear that economic development is more than economic growth alone. Economic development refers to growth accompanied by qualitative changes in the structure of production and employment, generally referred to as structural change (Kuznets 1966). Of particular importance for developing countries are increases in the share of the dynamic industrial sector in national output and employment and a decrease of the share of agriculture. This implies that economic growth could take place without any economic development. An example is provided by those oil-exporting countries, which experienced sharp increases in national income but saw hardly any changes in their economic structure. Another important qualitative change is technological change: the ongoing process of change in process and product technologies, resulting in radically new modes of production and new product ranges (Abramovitz 1989).

Development involves more than economic growth and changes in economic structures. Additional requirements for the use of the term development are a decrease in poverty and malnutrition, a decline in income inequality, infant and maternal mortality and illiteracy and improvement in employment situation. Most of these indicators are captured in the Millennium Development Goals (MDGs) (The World Bank, 2008). A country can grow rapidly, but still do badly in terms of literacy, health, life expectancy and nutrition (Sen 1999). In an era of environmental degradation, the environmental factor counts much in development issues. Criticism of growth fetishism led to the emergence of so-called 'social indicators': life expectancy, literacy, levels of education, infant mortality, availability of telephones, internet and other communication infrastructure, hospital beds, licensed doctors, availability of calories, etc. Development thus implies the welfare and satisfaction of the mass of the population which is based on the factors of growth, economic development and pragmatic policies that ensure equitable distribution of national resources. If development is basically about the welfare and satisfaction of the citizenry, then the religious issues come to play, since moral and spiritual weakness which is a religious factor seriously affects human welfare and satisfaction, in which case moral and spiritual weakness could be conceptualised into the development debate.

The role of corruption in economic development has been outlined in several development literature (Gray and Kaufmann 1998; Institute of Social Studies 1999; Kaufmann 1997; Klitgaard 1998; Kurer 1993; Mauro 1998).

Corruption and mismanagement are responsible for the collapse of most firms and economic and industrial institutions mostly in the government sector. Corruption is a moral/spiritual issue which lies within the ambit of religion and sociological theories, other than science, to address.

Attitudes of scientists towards religion

Attitudes of scientists towards religion are mixed. In the 17th century, founders of the Royal Society largely held conventional and orthodox religious views, and a number of them were prominent Churchmen (Harrison 2008). While theological issues that had the potential to be divisive were typically excluded from formal discussions of the early Society, many of its fellows nonetheless believed that their scientific activities provided support for traditional religious beliefs. Clerical involvement in the Royal Society remained high until the mid-nineteenth century, when science became more professionalized (Turner 1978). Among contemporary scientists about 40% hold strong religious beliefs which closely matched those of a similar 1916 poll (Larson and Witham 1997). Prominent scientists advocating disbelief in religion include evolutionary biologist Richard Dawkins and Nobel Prize winner physicist Stephen Weinberg.

According to a 1996 survey, belief in a god that is 'in intellectual and affective communication with humankind' and belief in 'personal immortality' are most popular among mathematicians and least popular among biologists. In total, about 60% of scientists in the US expressed disbelief or doubt in such a god (Larson and Witham, 1997). This compares with 58% in 1914 and 67% in 1933. Among leading scientists defined as members of the National Academy of Sciences, 72% expressed disbelief and 93% expressed disbelief or doubt in the existence of a personal god in 1998 (Larson and Witham 1998).

Prominent scientist, Albert Einstein, supported the compatibility of religion and science. In an article originally appeared in the New York Times Magazine in 1930, he wrote: "Accordingly, a religious person is devout in the sense that he has no doubt of the significance and loftiness of those supernatural objects and goals which neither require nor are capable of rational foundation. They exist with the same necessity and matter-of-factness as he himself. In this sense, religion is the age-old endeavour of mankind to become clearly and completely conscious of the values and goals and, constantly, to strengthen and extend their effect. If one conceives of religion and science according to these definitions then a conflict between them appears impossible" (Einstein, 1949).

Religion and Scientific Discoveries

There is a relationship between some religious concepts and philosophies and scientific discoveries. Scientific discoveries have come to justify some

religious teachings. The book of Ecclesiastes in the Bible for instance confirms the focus of the science of hydrology as follows: "All the rivers run into the sea, yet the sea is not full; to the place from which the rivers come, there they return again" (Ecclesiastes 1:7). As noted earlier, the sphericity of the earth is confirmed by the book of Revelation as follows: "After these things I saw four angels standing at the four corners of the earth, holding the four winds of the earth, and that the wind should not blow on the earth, on the sea, or on a tree" (Revelation 7:1). This very text partly explains the planetary wind system. The current relief structure of the earth confirms Noah's floods. Contemporary historians of science, David Lindberg and Ronald Numbers write that, "There was scarcely a Christian scholar of the Middle ages who did not acknowledge Earth's sphericity and even know its appropriate circumference" (Russell 1997).

Of greater compatibility of religion and science are health principles. The Bible and the Qur'an caution against sexual immorality. The apostle Paul warns against the health effects of sexual immorality in his epistle to the Corinthians. "Flee sexual immorality. Every sin that a man does is outside the body, but he who commits sexual immorality sins against his own body" (I Corinthians 6:18). Today the health effects of fornication are visible to all. Sexually transmitted infections including HIV/AIDS are among the most traumatic health problems humanity is confronted with. Additionally, there have been studies regarding prayer and medicine to find any causal or correlative link between spiritual supplication and improvement of health. Surveys by Gallup, The National Opinion Research Centre and the Pew Organisation, conclude that spiritually committed people are twice as likely to report being 'very happy' than the least religiously committed people (Myers 2007). An analysis of over 200 social studies that "high religiousness predicts a rather lower risk of depression and drug abuse and fewer suicide attempts, and more reports of satisfaction with life and a sense of well-being" (Smith, et al. 2003).

God's directives on clean and unclean foods given to the Israelites (Leviticus 11) have now been justified by modern medicine as damaging to human health. There was injunction on the eating of the flesh of rats and other rodents, pigs, dogs, cats, crabs, snails, etc. The secondary mode of transmission of bubonic plague is the eating of rats, squirrels and other rodents infected by fleas whilst the primary mode of transmission of yersiniosis is the eating of pigs, rabbits, horses, rodents, dogs and cats which are prohibited under the health laws in the Bible. The eating of crabs, prawns and snails is the primary cause of angiostrongylosis (Warrell et al. 2003). All the aforementioned issues affect development. Thus it could be emphasised that, religion and science mutually make efforts at improving upon the quality of life.

Science, Miracle, Faith and Development

Science has played a major role in human development. It has sullied the vehicle that has carried human progress. We may recount developmental feats including, communication, nutrition and health, the environment, agriculture and industry energy production, etc. In all such developments, it requires objective value in man to make its objective achieve fruition. Objective value does not exist externally, but is an internal affair created by humans (or by God in humans only) and project or imposed by humans on the external world. This is the solution of dualism, and has been dominant since they days of Descartes, both in science and theology. Purpose, mind, and value enter the world discontinuously in human beings; all the rest is mechanism.

Throughout history, civilisation has depended upon science and religion as the two principal systems of knowledge that have guided its development and channelled its intellectual and moral powers. The methods of science have allowed humanity to construct a coherent understanding of the laws and processes governing physical reality and, to a certain degree, the workings of society itself. The insights of religion have provided understanding on the deepest questions of human purpose and initiative.

Science and religion have often been regarded as conflicting, even mutually exclusive spheres of human endeavour, in powering development. That the vitalising agency of religion has frequently succumbed to the forces of dogmatism, superstition, and theological factionalism is a conspicuous fact of history. The enlightenment, in fact, marked a crucial turning point in releasing human consciousness from the shackles of religious orthodoxy and fanaticism. The results of this artificial split between reason and faith can be seen in the scepticism, alienation and corrosive materialism that so pervades contemporary life. Taken together, science and religion provide the fundamental organising principles by which individuals, communities and institutions function and evolve. Utilising the methods of science allows people to become more objective and systematic in their approach to problem solving and their understanding of social processes, while drawing on the spiritual inclinations of individuals provides the motivational impetus that begets and sustains positive action.

Perhaps one advantage of religion over science is the resources of miracle and faith available to the former, especially in the area of health which is a bane to human development. Health is a vehicle for achieving development, and also an end of development. Medical science is battling with issues of disease and infirmity. It is for over twenty-two years, battling with the problem of HIV/AIDS for which a solution is still far-fetched. In the Bible are hundreds of instances of miraculous healing and even the resurrection of the dead. We could recount Jesus' healing of the servant of the Roman

centurion (Matthew 8:5-13); of Peter's mother-in-law (Matthew 8:14, 15); of the woman suffering from haemorrhage (Matthew 9:18-22); of the dumb and deaf (Matthew 9:32-34), etc. The supernatural powers of Jesus were demonstrated beyond human understanding, defying science with the resurrection of the ruler's daughter (Matthew 9:23-26; John 11:43, 44).

After His ascension to heaven, historical records testify that Jesus' disciples also carried out the ministry of miraculous healing and the resurrection of the dead (Acts 3:1-8; Acts 9:36-40; Acts 28:8; etc.). The supernatural/faith healing covered mental health, which is a dent on medical technology. Try as medical science does through laboratory search, it is still battling with the health problems of humanity. Where they succeed, healing is not thorough; just an attempt to scratch the surface. Faith healing is thorough because it is assumed to be carried out by the agency of God who Himself is the Creator. Today, such miracles are on a lower scale. It is the hope of religious adherents that dedication to the cause of the truth and to spiritual things could revive the manifestation of supernatural powers in the Church. Other aspects of supernatural powers in religion include provision of food and control of natural disasters which threaten the existence of this civilisation. The provision of manna by God to the Israelites during the forty years of their sojourn on the desert (Exodus 11), Jesus' feeding of the five thousand with five loaves of bread and two pieces of fish (Matthew 14:13-21) demonstrate the ability of God to provide for His people without human effort. Hunger is becoming a serious global problem which religion, through faith, could address.

The phenomena of natural disasters constitute a great bane to the current civilisation. The tsunami, hurricane 'Katrina' and other disasters that saluted the 21st century reveal the vulnerability of environmental technology. Moses' commanding of a path to be created through the Red Sea for the Israelites to walk through (Exodus 14:15-31), Jesus' stilling of the storm (Mark 4:37-39), and He walking on the sea (Matthew 14:25) are indications of the power of faith to overcome environmental hazards. Through religion, natural phenomena that assail development are brought under control. Most religions, especially, Christianity, rely on prayers to put their requests to God. Where science has failed, religious adherents resort to prayers for finding solutions to their problems. A classic contemporary example is the lowering of the level of the Akosombo Dam in 2007 which created a serious energy crisis in Ghana. When all scientific techniques had been exhausted without solution, religious leaders proclaimed a week of fasting which, surprisingly, yielded results. After the period of fasting, the rains began to fall in torrents. The natural person, yielding to the convictions of science, would consider this as a coincidence, but not by divine intervention.

Reliability of Scientific and Religious Predictions

Predictions are of significance to development. They aid in the planning process and guard against unforeseen events that frustrate development. Some scientific predictions have some degree of error whilst others are wholly defied by the unpredictability of nature. Despite the sophisticated equipment used in the meteorological industry, some forecasts are subject to failure. Seismic gadgets are unable to accurately predict oncoming tremors. This explains the numerous unforeseen tremors that traumatise humanity. On the contrary religious prophecies have been accurately fulfilled. One classic example of the fulfilment of religious prophecy, with precision, is the passing of successive kingdoms depicted in the dream of king Nebuchadnezzar (Daniel 2). The prophet Daniel interpreted the human image seen by king Nebuchadnezzar as predicting kingdoms that would emerge on earth unto the establishment of the kingdom of God. The human image was divided into five parts: head of gold, chest and arms of silver, belly and thighs of bronze, legs of iron and feet partly of iron and partly of clay. Each of the first four divisions represented a kingdom (empire). The last division, a mixture of iron and clay, was a fragmentation of the fourth kingdom.

The head of gold represented the kingdom of Babylon. The kingdom of Babylon was overthrown by Medo-Persia whose reign was halted by Greece under Alexander the Great. Finally, Medo-Persia was overrun by the Romans who were broken up by the Barbarians. The kingdom of Rome was split into ten petit kingdoms including the Vandals, Ostrogoths, Anglo-Saxons which constitute current states of Western Europe. The mixture of iron and clay was interpreted as a combination of weak and mall states. Daniel explained that efforts would be made to unite the fragmented kingdom, but without success since iron cannot mingle with clay. The Maastricht Treaty was signed in 1992 to unite Europe. Sixteen years after the signing of the treaty, Europe is still struggling to attain a holistic sovereignty with a political head. This prophecy has been fulfilled with precision. Besides, prophecies about the darkening of the sun and the moon (eclipses) and falling stars (Matthew 24:29), of political crises, famines, earthquakes and pestilences (Mathew 24:7), of hurricanes and destructive sea storms (Luke 21:25) have been fulfilled. Despite the fact that some religious prophecies are not time-specific they are reliable for planning against emergencies.

The Moral/Spiritual Factor

Religion supplies the moral fervour as a basis for compliance with state policies. Science does not have such momentum to inspire compliance. There are moralists who are irreligious who attempt to obey state laws and contribute to socio-economic development within the framework of the

statutes and bye-laws. The naturalist-atheist may obey laws and contribute to development out of his own conviction on right and wrong. Perhaps, his obedience might be motivated by the fear of being prosecuted for law-breaking. On the other hand, the religious who believes in a supreme being whose Spirit convicts of lawlessness faces a two-pronged obligation: his own conviction of the need to follow rules to ensure development and the conviction by the Spirit of God to be obedient. Of the operation of the Holy Spirit, Jesus said: "And when He (the Holy Spirit) comes, He will convict the world of sin, and of righteousness and of judgment" (John 16:8). The apostle Paul remarks, "I can do all things through Christ who strengthens me" (Philippians 4:13).

Besides the enabling power of the Holy Spirit which Christians especially believe could strengthen their appropriate action, the belief in judgement and eternal condemnation is a further urging factor in ensuring right doing. The wise man, Solomon, in concluding the book of Ecclesiastes wrote: "Let us hear the conclusion of the whole matter: Fear God and keep His commandments, for this is the whole duty of man. For God will bring every work into judgement including every secret thing, whether it is good or whether it is evil" (Ecclesiastes 12:13, 14). The Bible prohibits 'works of the flesh' most of which are contrary to state laws and affect health, forbidding those who indulge in such practices from entering into the kingdom of God (heaven). "Now the works of the flesh are evident, which are: adultery, fornication, uncleanness, licentiousness, idolatry, sorcery, hatred, contentions, jealousies, outbursts of wrath, selfish ambitions, dissensions, heresies, envy, murders, drunkenness, revelries, and the like; of which I tell you beforehand, just as I also told you in time past that those who practice such things will not inherit the kingdom of God" (Galatians 5:19-21). Science produces the tangibles but the distribution and use of such depends on moral values which religion could enhance. Indeed, even in the production of such material needs of man, it calls for respect for decent moral values which calls for some internal momentum, a spiritual factor. Science has no control over human moral behaviour. It is for such reason that techniques for producing explosives to facilitate the extraction of raw materials is used to produce conventional weapons that are used to destroy human lives and the environment. There are however instances where religion and development have been in conflict, especially where religious values and those of the state are at variance.

Conclusions

Science produces the material needs of humanity through the discovery of tools and techniques to process raw resources into finished goods. Yet, it lacks the moral inspiration to act and to inspire others to act; and moral inspiration is significant in both the production and distribution processes and in ensuring equity, justice and fairness which all count towards human welfare and satisfaction. Religion is the tool that inspires morality. It places a double obligation on man to respect moral values. Whereas science provides the vehicle for development, it is religion which provides the direction for the vehicle to move.

The enterprise of building human capacity, of fostering constructive personal, community and institutional change, is increasingly being recognised as the fundamental purpose of development. When viewed as capacity building, development is concerned principally with the generation, application, and diffusion of knowledge. If it is accepted that knowledge is both spiritual and material in nature, the methodologies of science and the insights of religion can provide the essential tools for erecting harmonious and equitable patterns of living when working together in a synergistic manner. Taken together, science and religion provide the fundamental organising principles by which individuals, communities and institutions function and evolve. Utilising the methods of science allows people to become more objective and systematic in their approach to problem solving and in their understanding of social processes, while drawing on the spiritual inclinations of individuals provides the motivational impetus that begets and sustains positive action. Religion and science should therefore exist in a symbiotic relationship; complementing each other in the process of development. If the capacities of the world's peoples are to reach the levels needed to address the complex requirements of the present hour, the resources of both reason and faith will have to be tapped. While science can offer the methods and tools for promoting social and economic advancement, it alone cannot set direction; the goal of development cannot come from within the process itself. A vision is needed, and the proper vision will never take shape if the spiritual heritage of the human race continues to be regarded as tangential to national policies and programs.

To put the science-religion-development debate into broader and clearer perspectives requires empirical research on certain key themes. It is proposed that the following areas be explored: The compatibility of each of the major religions with development; attitudes of selected renowned scientists to religious values and methodologies and attitudes of selected religious scientists to the synergy between religion and science in facilitating development.

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CHAPTER 6

RELIGION, SCIENCE AND DEVELOPMENT

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Abstract: *The Scientists who lived before the 'modern' Science in the sixteenth century strongly believed that science and religion were hardly poles apart. For examples, Johannes Kopler (1571-1630) described the scientific enterprise as "thinking God's thought after him". Robert Boyle (1627-91) promoted the printing and the publishing of the New Testament for the native people of North America. Sir Isaac Newton (1642-77) was a deeply religious man who devoted as much to theology as to physics. These celebrated scientists and many more did not see any conflict between science and religion. To them total human development called for both enterprises of science and religion. As knowledge grew, the place for God seemed to grow smaller. As Berry (1996:11) notes, science is perceived by many today to have done away with the 'God hypothesis that the development of the human and human's society does not call for God. It is the contention of this paper that science and religion are partners in truth and development and that in spite of the seeming different methodologies and ways of accessing truth, there need be no barriers between real science and real faith; that development which aims at promoting the total well-being and the realization of the full potential of human beings cannot be pursued without the complementary roles of religion and science.*

Introduction: The Problem

A survey conducted by the Church of Scotland in 1995 revealed that one of the three main reasons why people have difficulty in accepting religion is science. It is not so much that science has rendered religion untenable but that it seems to have made religion irrelevant. Science seems to have made God the 'God of the gaps,' one who is invoked to explain that which is yet to be scientifically explicable. The assumption is that cosmology described by the model of the hot 'Big Bang,' with the universe expanding from singularity some twelve to fifteen billion years ago, and the evolutionary theory has rendered belief in the creator God superfluous. Science has made belief in God no more than an optional extra for those inclined that way. Science is perceived to have done away with the need to believe in

God in order to explain origin, and technology (understood as a set of humanly engineered practices that employ mechanical means to accomplish particular ends intended and unintended) is assumed to be able to meet our needs for material security and comfort. It is, therefore, no longer necessary to believe in God today in order to make sense of the world. God is here squeezed into the ever increasing gaps in our knowledge. God has been confined to events we cannot yet explain (Berry 1992: 22).

Technology and Belief in God

Since the Industrial Revolution, some have taken technological developments as an indication of the implausibility or irrationality of any supernatural world-view. Technological advance in medicine, transportation, agriculture and communications, it is claimed, have effectively elbowed God off the natural scene. The assumption is that technology is not compatible with the existence of a realm above the natural order; that technology has refuted supernaturalism. The philosopher, Ray Billington, in his work, *Religion without God*, avers in the spirit of those who claim that technology has dethroned supernaturalism. As cited in Groothuis (2006), he puts it as follows:

"In our own time, study of our genetic structure and, in particular, the discovery of the human genome, has thrown the question of God's place in the human life into even more intense relief. If we can now choose not only what sex we wish our children to be, but also whether they should be dark or fair, tall or short, brainy or just average, healthy or taking their chances as in the past, what role is left for God?"

Groothuis (2006: 682)

The basic assumptions underlying the claim that technology has displaced supernaturalism or God may be formally stated as follows:

- Primitive cultures did not only explain what they hardly understood in terms of the supernatural but they also sought supernatural intervention in these areas. Their ignorance of the laws of nature disposed them to this supernatural interpretation of reality. According to this assumption religion is the outcome of human's ignorance in respect of scientific laws or laws of nature.
- Modern science, which trades on a supernatural view of the world, has explained almost all of these previously inexplicable phenomena on the basis of the laws of nature. With modern science the human has come of age and has no need of the supernatural. Better data or new scientific theories have made divine interventions unnecessary.

- Modern technology is absolutely dependent on modern science for its existence. Therefore, any individual who uses modern technologies is using something that owes its existence to a non-supernatural conception of the world. In the same vein, one who uses and benefits from modern technology should hold a non-supernatural conception of the world in order to be rationally consistent.

Misleading Assumptions

The assumption that supernaturalism is born out of ignorance of the natural laws is somewhat misleading and seriously presumptuous. We agree with Groothius (2006) that we do not need modern scientific understanding of natural laws such as the law of gravity or hydraulics to recognize events that transcend the unaided powers of nature. The ancients were not so superstitious as to be incapable of drawing a distinction between an oddity of nature from a supernatural event. As Groothius (2006: 682-683) observes: "One need not understand hydraulics in order to recognize that Jesus' walking on water is an event that transcended the powers of water, air and flesh." Also, in Groothius (2006: 683), C. S. Lewis is noted to have observed correctly when he wrote that "Belief in miracles, far from depending on an ignorance of those laws of nature, is only possible in so far as those laws are known."

Science and Religion are Reconcilable

The widely held view that there is an irreconcilable conflict between science and religion is hardly tenable. Albert Einstein is credited to have observed that "Science without religion is lame and religion without science is blind." Reacting to a reported comment of a prominent churchman that "no educated person could believe in miracles; any such belief was a hangover from a pre-scientific age when we knew far less about the cause of natural events than we do now," fourteen professors of science in British Universities, six of which were fellows of Royal Society were explicit about the weakness of the case against miracles:

It is not logically valid to use science as an argument against miracles. To believe that miracles cannot happen is as much an act of faith as to believe that they can happen. We gladly accept the virgin birth, the Gospel miracles and the resurrection of Christ as historical . . . Miracles are unprecedented events. Whatever the current fashions in philosophy or the revelation of the opinion polls may suggest, it is important to affirm that science (based as it is upon observation of precedents) can have nothing to say on the subject. Its 'laws' are only generalizations of our experience .

Berry (1992: 1)

Yet there are scholars who are of the opinion that an intense religious outlook can be a serious hindrance to the pursuit of science. For such scholars religion and science are irreconcilable. To ensure serious pursuit of science, religion must be played down. Some theologians have also argued that science is to blame not only for the ecological problems of the planet, but for the mechanistic ways of thinking which are effectively robbing us of our very humanity (Atkinson 1996: 112). The argument is that far from enhancing humanity, modern technology which is dependent on modern science is dehumanizing us. Critics have reacted to this position which seems mistakenly to imply that science qua science is the same as scientism which, by definition, has no place for spiritual values.

Religion need not hinder interest in science. Neither must religion hinder interest in scientific investigations. Scientific investigation is the sure foundation for the development of technology, which is *sine qua non* to societal development. It is possible for religious persons to acquire scientific knowledge and outlook. But, as Gyekye (2005: 9) observes, for a religious person to acquire scientific knowledge and outlook satisfactorily, "one should be able to separate religion and science, based on the conviction that purely scientific knowledge and understanding of the external world would not detract from one's faith in an ultimate being." There need not be a conflict between believing in a being that created the world of nature and seeking knowledge through scientific inquiries about this world from the human perspective. One totally agrees with Gyekye (2005: 9) that that "it is possible, indeed, for one's sustained study of nature to lead to the affirmation of one's faith in a supreme being or deepen one's knowledge and understanding, or convince oneself, of the existence of this ultimate, supreme being."

Science, in my view, is intended to facilitate a life of ease for the human. The true scientist is the servant of the creator. The true scientist participates in God's creativity. The early scientists, Galileo, Copernicus, Newton, Boyle, Dalton, Faraday, Maxwell and Kelvin, and many other modern scientists were explicit and often devout believers. The sixteen century scientist, Johannes Kepler (1571-1630) defined the scientific enterprise as "thinking God's thought after him." In a similar vein, many of today's scientists still believe in God. All of this is to say that, with a few vociferous but hardly representative exceptions of scientists and theologians who hold contrary views, there is an intellectual rapprochement between science and the idea of belief in the supernatural. As Bruce (2006: 647) notes, a poll of American Scientists recorded in the science journal, *Nature*, indicates that the percentage of American scientists who believed in a God one could pray to was as high as in a similar survey of eighty years ago.

Epistemological Difference

At the heart of the distinction usually drawn between religion and science is the question of differing epistemology. Scientific epistemology has empirical orientation in the sense that critical observation and experience constitute the source of knowledge. Albert Einstein defined science as "methodical thinking directed toward finding regulative connections between our sensual experiences."¹

Scientists seek knowledge by studying how things work; what causes plants to grow, animals to mate, minerals to form, and so on. They do this by testing an idea (or hypothesis) by means of experiments and other information (from history, other tested hypotheses and so on). As Berry (1992: 19-20) notes, the more tests a hypothesis survives without being disproved, the more likely it is to be right.

Science is concerned with 'how' questions even though some of these 'how' questions could be formulated as 'why' questions. For example, 'why are insect-pollinated flowers brightly coloured? There are, however, questions the scientist cannot waste time on. Berry (1992: 22) cites the Nobel Laureate, Sir Peter Medawar who stated the limitations of science clearly: "That there is indeed a limit upon which science is made very likely by the existence of questions that science cannot answer and that no conceivable advances of science would empower it to answer." These questions are ultimate questions such as: 'How did everything begin? What are we all here for? What is the point of living? What is our ultimate destiny? Popper (1978: 347) observes that "Science does not make assertions about ultimate questions – about the riddles of existence, or about [human's] task in this world." Empiricist positivism in its doctrinaire form dismisses such ultimate questions "as non-questions or pseudo questions such as only simpletons ask and charlatans of one kind or another profess to be able to answer" (Berry 1992: 22). Yet a peremptory dismissal of such ultimate questions hardly addresses the issue and leaves those who raise such questions dissatisfied given that, for them, the ultimate questions and their answers make sense.

The inability of science to give answers to the ultimate questions of existence clearly indicates that we should look beyond science for answers of these questions which are at the heart of the human existence. As Medawar (1984: 66) notes, there is a *prima facie* case for the existence of a limit to scientific understanding. The limits of science call for complementary approach to causation. Berry (1992: 23) contends that "The significance of

¹ This is contained in Einstein's response to a greeting sent by the Liberal Ministers' Club of New York city published in *The Christian Register* (June, 1948); also published in *Ideas and Opinions* (New York: Crown Publishers, 1954).

the complementarity approach to causation is that it removes the problems of inevitable determinism expected of events in a mechanical universe”.

From the perspective of religion, epistemology is defined and informed by two things, namely, historical records and personal experience. Access to God is not by experimentations, but only from ancient documents (Revelation) which have to be assessed in the appropriate way. Besides, we know God by subjective experience. Religious people point to religious experiences as initiators and sustainers of faith. William Alston argues that religious experiences provide one with knowledge or justification for God's existence just as experiences of such things as trees, houses and people provide us with knowledge or justified beliefs about the material world (Wood 2006: 240).

Critics have called for independent verification of God's existence before accepting religious experiences as veridical. Responding to this objection, Alston insists that such a demand betrays double standard on the part of empirical positivism. Alston maintains: “We do not require independent verification that we are not all deceived about the existence of the material world before accepting perceptual experiences as veridical. To demand this of religious experiences and not material-object experiences is unfairly to apply a double standard” (Wood 2006: 241).

The Question of Science's Objectivity and Humanities' Subjectivity

The common view is that sciences are ‘objective in the sense that they are determined by their objects of inquiry, whereas the humanities are ‘subjective,’ that is they are largely the product of individuals.

This perception of science and humanity has been identified by Snow (1961) as a prime cause of the gap between the culture of sciences and humanity. People in the sciences accuse those in the literary and humanistic culture of wallowing in private subjectivity. The humanists, in turn, accuse scientists of attempting to impose a detached and impersonal objectivity which distorts authentic human existence. The scientist deals with lawful and repeatable events while the humanist deals with unique and particular ones.

We must insist that the gap between the sciences and humanities and, for that matter, the gap between science and religion defined and informed by the perception that science is objective and religion is subjective is grossly exaggerated. Here we agree with Barbour (1966: 176) in his observation that: “both subject and object play important parts in all inquiry, that personal involvement is present in all fields, and that no simple contrast of lawful versus unique events can be defended”. It means that we cannot draw sharp distinction between the sciences and humanities. Instead of the sharp dichotomy between the sciences and humanities, “we have a

spectrum with varying degrees and types of personal involvement and varying types of interest in the lawfulness and uniqueness which are characteristics shared by all events" (Barbour 1966: 176). From the perspective of epistemology, the knower participates in all inquiry. In the popular stereotype, however, scientific inquiry is considered objective because it is assumed that the inquiry is determined by the object of knowledge, not by the knowing subject. In the light of actual scientific inquiry, however, this conception of objectivity is hardly tenable. As Barbour (1966: 176) again notes, "[T]he object of study cannot be known in its existence 'independent of the observer,' for it is influenced by the observer in the very process of measurement". It is for this reason that the conception of objectivity as sharply distinguished from subjectivity must "be modified to allow for the contribution of the scientist as experimental agent, as creative thinker, and as personal self" (Barbour 1966: 176-177). Indeed the scientist's assessment of scientific theories is made not by the application of formal rules but by the personal judgment of the scientist (Barbour 1966: 177). In agreement with Barbour, we will submit that the idea of objectivity should not be discarded, but it should also not be affirmed as if it is totally devoid of subjectivity. From this perspective, objectivity should be reformulated to include the contribution of the subject. Barbour (1966: 177) correctly calls for the reinterpretation of objectivity as "*intersubjective testability and commitment to universality*."

The extension of this ideal of objectivity construed as *intersubjective testability and commitment to universality* to the humanities would reveal a degree of subjectivity or personal involvement considerably greater than in sciences. Yet we cannot overlook the fact that there are some similarities between science and religion in terms of method.

Religion, like science, can be thought of as having an experiential and interpretative component. It must, however, be conceded that both "arise from dissimilar areas of experience which reflect dissimilar aspects of reality, despite the presence of certain parallels in their methodologies" (Barbour 1966:264) Humans ask diverse kinds of questions, and the kinds of answers people seek always depend on the context of inquiry.

A study of the methodologies of science and religion also reveals the selective character of both of them. The scientist shows interest in regular patterns that are at least statistically lawful. In doing this, the scientist omits from his scientific analysis and consideration the individuality and concreteness of particular events. For the scientist, a onetime event can be studied only in so far as it exhibits recurrent and orderly features. Furthermore, scientific inquiry takes its point of departure from publicly observable sense data. Though the data of scientific inquiry are hardly devoid of interpretation, they are reproducible within the context of a

scientific community because of the reliability of observation processes and the lawfulness of the events being studied. The scientist uses concepts that can be treated quantitatively. Scientific selectivity is also informed by the limits of the object of scientific study. Science studies what is, not what ought to be.

From this perspective, science is 'ethically neutral' in the sense that its findings can be used in the service of a variety of human goals. Even though the scientific enterprise is hardly value-free, for it embodies within its activities such human values as cooperation, honesty and freedom of inquiry, "it does not provide a basis for decisions in personal and social ethics (Barbour 1966: 265). Religion, like science, is also selective. It touches on existential issues. Religion raises questions about the objects of human's trust, loyalty, and worship – matters of 'ultimate concern.' Religion deals with issues concerning human's orientation in a framework of meaning. The life of the religious community centres in the great transitions of life – birth, marriage and death – the issues of love and justice, the celebration of formative historical events such as sacraments and festivals, and above all, the worship and service of God. This shows that religious beliefs should be assessed as interpretations of existential issues – historical events, religious experience, and life-situations.

Some Basic Difference

Some basic differences between the two fields – religion and science – have been identified at the following levels:

- The degree of personal involvement and range of selfhood affected are greater in religion than science even though the distinction is not absolute as existentialists claim.
- Religion's recourse to revelation in historical events has no parallel in science even though the role of revelation in human understanding is not as isolated from experience and interpretation as neo-orthodoxy avers.
- The intersubjective testability of religious beliefs is severely limited as compared to that of scientific theories or even scientific paradigms – though this need not lead to the abandonment of critical evaluation, since testability in religion, as observed by Barbour, should be compared not with that in science but with that of competing interpretation of religious experience and alternative worldviews.

Despite these differences between science and religion, it must be asserted that the contrasts are not as absolute as most theologians and philosophers have maintained. We have noted in agreement with Barbour that:

"science . . . is a more human enterprise than is usually assumed, and that there is a "spectrum" of degrees and types of personal involvement in fields of inquiry. Religion, for its part, presupposes cognitive assertions which are subject to critical evaluation. Such evaluation does not yield conclusions with the reliability of scientific results to be sure, but . . . some of the same criteria are applicable"

Barbour (la 66:268)

Science, Religion and Development

Both science and religion aim at individual and collective well-being. While pragmatic approaches to meaningful enhancement to material well-being informed by the application of science and technology must play a central role in development initiatives, "tapping the spiritual roots of human motivation provides the essential impulse that ensures genuine social advancement."²

The spiritual perspective on development is informed by the recognition of the vital link between the practical and spiritual aspects of human life which leads inevitably to a reframing of what constitutes well-being and of the possible mechanisms for attaining such well-being.

In an article: "Science, Religion and Development: Some initial Considerations," prepared by the Institute for Studies in Global Prosperity, it was observed that "the difficulties encountered during almost five decades of development work . . . directly speaks to the need for new development concepts and models".³ In the same article it is noted that "it is clear that a complex but vital set of questions concerning human nature and purpose needs to be incorporated into development thinking."⁴ A domain of issues at the heart of human identity and motivation needs to be given attention in development thinking. This is precisely because development initiatives that neglect the values, traditions and perceptions of the central stakeholders in the development process, namely, the people themselves, always fail. We must also submit that civilization does not arise merely from material progress, but rather is defined by and founded upon the ideals and shared beliefs that weld society together. Indeed the human experience is uniquely defined by the transcendent component of life. We are here dealing with the "dimension of existence that enhances, ennobles and provides direction to human beings".⁵ The transcendent component of life "unlocks the creative capacities within human consciousness and safeguards human dignity."⁶

The recognition of the transcendent component of life underlines the need for a critical consideration of the roles that science and religion play

² www.globalprosperity.org/initialconsiderations.html? 510=4

³ http://www.onecountry.org/e123/e12302as_SRD_Perspective.htm
(Vol. 12, Issue 3, October-December 2000)

⁴ Ibid (3)

⁵ Ibid (3)

⁶ Ibid (3)

in the development process. Throughout the history of human existence civilization has always been dependent on science and religion. Science and religion have been the two principal systems of knowledge that have informed the development of civilization and guided its intellectual and moral motivation. Religion has provided insights relating to the deepest questions of human existence—the questions of purpose, initiatives and motivations. From time immemorial religion has provided a solid foundation for cultural identity and has decisively shaped world civilization based on differing but not exclusive positions of ultimate value represented by the various faith communities: benevolence and mercy in Buddhism, morality and ethics in Confucianism, respect for tradition in Shintoism, devotion and mystical unity in divine Self in Hinduism, obedience and perseverance in Judaism, love for God and one's fellow human beings in Christianity and total submission to the will of Allah in Islam.

Development is hardly an end in itself. It is about people, societies and life. Development is value-laden. Tsele (2001) emphasized this conception of development when he observed as follows:

It would be misleading to assume that development programs have no particular value basis. In fact there are rules and norms that guide program activities. Most programs are based on values of efficiency, prudent use of economic resources, in some instances some form of mutuality or consultation between donors and recipients, particular norms of accountability to donors, and specific criteria for selection and sectional concentration policies such as preference for rural/woman over urban/male. Tsele (2001:211-212)

“Development is a holistic enterprise, which aims at promoting the total well-being and the [realization] of the full potential of human beings” (Asante 2007: 10). Development is concerned not only with material but also with moral, intellectual and spiritual needs of humans as well. Here quantitative conception of development is useful only when it becomes a means to the end of qualitative human growth and well-being.

Religion as a Resource for Development

Throughout the past decades, development thinkers have repeatedly encountered issues related to values and beliefs. This is precisely because development is not a value-free enterprise. The enterprise of building human capacity, fostering constructive personal community and institutional change is the fundamental purpose of development. At the heart of such a conception of development is the convergence of science and religion. Religion is a resource for qualitative development.

An appreciation of religion as a resource for development calls for the identification of specific sectors in which religion could play a positive but complementary role in relation to science in the promotion of development. Without discussing them, we shall draw attention to sectors where religion could enhance qualitative development as follows:

- Conflict prevention and peace building
- Holistic Development
- Governance
- Management of natural resources
- The preservation of cultural, social and spiritual excellence

Conclusion

In conclusion, we wish to reiterate Einstein's statement: "Science without religion is lame and religion without science is blind." Science and religion are partners in truth yet in the minds of many the two cultures are perceived to be in conflict. This work has argued that in spite of the seeming different methodologies and ways of assessing truth, there need be no barriers between real science and real faith. I agree with Barbour that "it will reflect the greater humility displayed by both scientists and theologians in disavowing any sweeping claims of all-inclusive truth" (Barbour 1966: 4). Science has need of religion and religion has need of science.

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CHAPTER 7

RELIGION AND SCIENCE A BAHAI PERSPECTIVE

Akwasi Osei
The Baha'i Faith

Abstract: *Since the days of Papal Inquisition, religion and science have been seen to be in conflict. While science is seen as objective and systematic, religion is considered subjective and private. This perception is fuelled by the general misunderstanding of the nature of science and religion. This paper uses insights from the Baha'i Faith to show that the perception of rivalry or antagonism is unjustified. Drawing on the writings of Abdu'l-Baha, who was one of the three key Personalities of the Baha'i Faith, and science philosophers like William Hatcher, Karl Popper and W. V. Quine, the paper demonstrates the harmony by analysing the attributes of science and its method of inquiry, and uses these attributes and methods to analyse religion and its claims. The paper shows further that the harmony between the two is crucial to avoid materialism on one hand and superstition on the other. It shows where religion can take moral leadership to guide science in areas like stem cell research and science can also regulate religion to avoid superstition if mankind is to progress in peace.*

Introduction

We have come a long way from the medieval days of Papal Inquisition when the Church persecuted 'witches', heretics and scientists who contradicted the then current thinking. A venerable scientist like Galileo (1564-1642) was forced to recant the truth of his scientific finding supporting Copernicus (1473-1543) that the earth revolved around the sun. Unlike the courageous Socrates (c. 469 BC–399 BC) in earlier times elsewhere in Greece who chose to be killed, he recanted. Copernicus himself and Bruno (1548-1600) had earlier been persecuted. René Descartes (1596–1650), Galileo's contemporary, had completed his first major work in physics but he concealed it on learning of the persecution of Galileo. God knows what we have lost as a result. Eventually it took Pope John Paul II in 1992 to openly pardon Galileo and apologise to him for the wrong done in persecuting him, and thereby formally ending the Inquisition.

But there are still some areas of mistrust and antagonism including man's age on earth and HIV/AIDS management. Scientific evidence says condom use reduces the incidence of HIV/AIDS and the Roman Catholic Church,

for instance, says 'no way'. Some churches refuse medical treatment, immunisation and blood transfusion. And the old question following Charles Darwin's Theory of Evolution still remains: was the ape our grandfather through evolution or the dust through special creation? I propose to answer that question in this paper.

Basis of Conflict – Three Reasons

The conflict between science and religion (eg. the fact that religionists say man is only 6,000 years old and scientists say he is some millions of years old) is not a mere perception. It is a reality. So what is the basis of this conflict? William S. Hatcher (1935-2005), a Baha'i mathematician and philosopher, examined this question and came out with three answers in Hatcher (1977) as follows.

1. Imagination Presented as religion: The first reason as provided by Hatcher (1977: 18) is that what is presented to us as religion may, in fact, not be religion at all, but rather vain imagination. Careful analysis shows that misconceptions of religious truth are borne out of rigid and literal interpretation of the scriptures. Such misinterpretations of scriptures lead religionists to insist that the world was created in six days of twenty-four hours each, that man is six thousand years old and that the stars will fall to the earth in the 'last days'. A typical example is the three-tier concept that God lives in heaven up there, we on earth and hell is underground. We know better now that the underground is only another part of the world. Yet when we pray and lift up our heads upwards, where are we saying God is? Such a belief in the geographical location of heaven is based on verses like: 'Thus saith the Lord, the heaven is my throne and the earth my footstool' (Isaiah 66:1; Acts 7:49). Literalists take this verse to mean heaven is up there in the heavens beyond the earth. This presupposes that if we could go far up enough in the heavens we probably would see God. On August 7, 1961, Major Gherman S. Titov (1935-2000) orbited the earth as the second Soviet cosmonaut to have done so. He returned to the earth and scorned religion that he had not seen God up there.¹

But is it a true religious teaching that heaven is up there in spite of the black and white lettering in the scriptures? Such a belief is a figment of our imagination resulting from our stubborn refusal to see the figurative basis of scriptural understanding. Anglican Bishop John A. T. Robinson (1919-1983) of Woolwich says that if men of religion insist on a God who is a 'Big Daddy Up There' he would be prepared to go along with the atheists, and

¹Rabbi Nosson Slifkin, *Space Odysseys*, <http://www.ilaw.com/Commentary/odysseys.html> (06/2008).

that we have smashed our metal images of God only to substitute them with mental images (Robinson 1963). Abdu'l-Baha (1844-1921), the leader of the Baha'i Faith in his days, said 'leaders of religions have fabricated a set of superstitions and rituals which are at complete variance with the underlying thought' (Abdu'l-Baha 1923: 448). When saints of religion present their vain imagination for religion, gurus of science will only repudiate religion as imagination. No wonder Karl Marx (1818-1883) said religion is the opium of the masses², Sigmund Freud said religion is a universal obsessional neurosis³ and Friedrich Nietzsche (1844-1900) nailed the coffin with his proclamation of the death of God (*Nietzsche 1974*). With this perception of religion, any attempt to compare religion and science is like comparing apple and pie.

But the scriptures need not be taken literally. Rudolf Bultmann (1884-1976), for example, says that the Bible must be 'demythologised' if its import is to be appreciated.⁴ Scriptural language, being the vehicle to convey spiritual truths in material terms to physical beings, can only be symbolic. It may be in a metaphor, parables and fables or it may be figurative, mystical or mythical, but it could also be literal.⁵ Scriptures are revealed using the daily concepts of the culture of the place where the Prophet was born and lived. They are meant for the understanding of the people to whom they were revealed, and since these people have a cultural and linguistic appreciation at a point in time, it may require great discernment on the part of other people to fully appreciate the meaning, and reason must be used in this discernment. See Savi (2005: 26) for more notes on understanding scriptural language. Fortunately, these days Bible scholars and theologians recognise this, but this knowledge and understanding must seep through to all (see Hick (1994: 3)). It is also because of this understanding that we now have hermeneutics as a special study dealing with the theories of interpretation of the scriptures.⁶

Another misconception of religion contributed by religionists themselves is religious absolutism and exclusivism by which religionists insist that their revelation is the last and ultimate, beyond which there is no more revelation and outside of which there is no truth. Again this arises from literal interpretation of verses of the scriptures. They claim their religion consists of absolute truths which have what Hatcher (1977: 1-14) describes

² http://en.wikipedia.org/wiki/Opiate_of_the_masses (23/07/2009)

³ <http://www.socyberty.com/Religion/College-Collections-Religion-and-Sigmund-Freuds-perspective.85719> (23/07/2009)

⁴ Rudolf Bultmann on demythologisation of the scriptures, cited: http://en.wikipedia.org/wiki/Rudolf_Bultmann, (14/11/2009)

⁵ Jesus spoke in parables, Matt. 13:3,11; the Quran calls metaphors as *similitude* and *comparisons*, See Surah 2: 24; 29:42 (Rodwell translation)

⁶ See <http://en.wikipedia.org/wiki/Hermeneutics>, (01/06/2008)

as inherent exhaustive explanatory comprehensiveness. That is to say, within their religion are answers to all questions, and anything outside what they say is not the truth. Invariably what have been presented as absolute truths have only been dogmas which expose religion to the ridicule of science, for science never claims absolute. Truths of science today are ignorance of tomorrow. At school we learnt of nine planets in our solar system, Pluto being the last. A few years ago we learnt that a tenth planet, Sedna, had been discovered. Only in August 2006 we were told that both Pluto and Sedna are no longer considered planets but as dwarf planets or special types of heavenly bodies, so we now have eight planets. Truth is not absolute, and religious absolutism is a dangerous stand.

Bertrand Russell (1872-1970), apparently frustrated by these misconceptions, denounced religion. In his famous 1948 BBC Radio debate with Father F. C. Copleston (1907-1994), he said since all the religions claim exclusive truth then only one may, at best, be right. Then if there are seven religions and he chooses any one, his chances of being wrong are six in seven, a statistically huge probability of being wrong. He therefore found it more prudent to reject them all (Russell 1957). And he was an honourable man.

2. Myths of science: The second reason for the conflict between science and religion is the fact that men of science have been too rigid even with their own definition. Traditionally science has been defined as a body of knowledge obtained through observation and experimentation. With this scientists have asked: 'Where is God? Show him in the laboratory to us and let us test him in the test tube'. And as this is not possible they have concluded that religion cannot be compatible with science. Science has, this way, scorned religion. This is the philosophical position of *logical positivism*, lately called *logical empiricism*.⁷ But this posturing is invalid. To insist that science only deals with what is sensually perceptible is a myth of science, and we shall revisit this.

There is another myth of science. A one-off research finding is published and the uninitiated takes it as a truth of science. That is no science. Science is science only when it has been debated and debated and finally accepted. And when scientists have overlooked the fact that within objectivity is some amount of subjectivity, they are being disingenuous. For how else could scientists vote on truth as in the case of deciding on the status of Pluto and Sedna?⁸ Science must purge itself of these myths and superstitions for harmony with religion.

⁷ Logical positivism is a philosophy that combines empiricism, the idea that observational evidence is indispensable for knowledge of the world, with a version of rationalism, the idea that our knowledge includes a component that is not derived from observation. For some further details, see http://en.wikipedia.org/wiki/logical_empiricism (01/11/2008)

3. Religionists' plea of existentialism: The third reason stems from the two earlier reasons. When scientists have scorned religionists, the latter have capitulated and said 'well, religion is different from science and you cannot use the methods of science to investigate religion.' They have made the analogy that since you cannot use a microscope to view the stars, you can similarly not use the methods of science to investigate religion for religion and science are two different entities, and that science is not competent to sit in judgement on religion. Religionists have thus created a certain barrier preventing any intellectual discourse. This view of religion belongs to the branch of philosophy called *theological existentialism* (the branch of philosophy that looks for meaning in existence through subjective experience) whose chief proponents include Paul Tillich (1886-1965). This argument is not new. Even a scientist, Galileo (1564-1642), used a similar argument when he said the purpose of science is to show how the heavens go and the purpose of the Bible is to show how to go to heaven (Hummel 1986). Again this posturing is also not helpful.

When men of religion are pushed to the wall to defend their understanding of some scriptures, they have answered 'with God everything is possible', 'in religion we do not reason', 'faith begins where reason ends'. This is *sacrificium intellectus*, i.e. sacrifice of the intellect or surrender of reason. This has led scientists to believe that religion is for those who cannot reason well. Men of religion have made God a God of gaps, an antidote to our ignorance to explain that which is otherwise inexplicable. But God is beyond gaps.

The True Nature of Science - The Five Attributes

Let us look at the true nature of science. A science philosopher, William S. Hatcher, in Hatcher (1977: 32), says that there are five attributes that make science. He continues that any discipline that claims to be scientific must demonstrate those five attributes, and wherever those attributes are found we are dealing with science. These are methodology, verifiability, repeatability, predictability and pragmatism. The scientific methodology is a rigid uncompromising approach. As said earlier, the scientific method used to be thought of as observation and experimentation. Philosophers of science W. V. Quine (1908-2000), Karl Popper (1902 -1994) and William

⁸ On Thursday 24 August 2006, 424 astronomers and astrophysicists, forming less than 5% of over 10,000 professional astronomers all over the world, voted to decide on the fate of Pluto that had been discovered in 1930 as a ninth planet. The vote demoted Pluto from a planet to a dwarf planet, and by that Sedan was also downgraded to dwarf planet. Some however felt the last word had not been said yet. See <http://www.msnbc.msn.com/id/14489259/> (for further details (1 June 2008)). This is the same as the Scriptures of the Bible being voted upon to decide which should make it to the list of authorized versions.

Hatcher have indicated that this view is no longer valid. The scientific method today should be seen as a rigid application of various methods of acquiring knowledge and validating this knowledge through known standards of measuring truth.

Barney (1984: 296) notes that Abdu'l-Baha, in contributing his divine wisdom to epistemology, the branch of philosophy that deals with the theory of knowledge, shows that the process of acquiring knowledge is four-fold. The first one is adoption – where one acquires knowledge by inheriting, adopting, absorbing through faith, etc., as when one learns at school, from books, on the internet, accepts a tradition or custom, learns from the experience of another, etc. The second is by experiencing or experimenting. This relies on sense-perception and is hence empirical. The third is by reasoning, through mathematics and logic, meditation and reflection, by theorising through deductions and inferences. And, the fourth is by intuition, through flashes of thoughts or when one trains and organises his intuition for deliberate use. Intuition itself comprises various modes of knowledge acquisition including revelation, vision, dream and trances. The knowledge that spontaneously springs into our mind during serious meditation is intuition. Archimedes' Eureka was an act of intuition and not sense experience or experimentation, yet that was knowledge. Knowledge acquisition is often by a combination of these various modes through the exercise of the intellect.

When the modes of acquisition (as noted by Barney (1984: 296)) are consciously and explicitly organised to derive knowledge, we get science. This conforms to what Quine (1960: 3) said, that science is common sense which has become self-conscious and Hatcher (1990: 99) says “scientific method is the systematic, organised, directed and conscious use of our various mental faculties in an effort to arrive at a coherent model of whatever phenomenon is being investigated.” These philosophers are thus saying that science is not simply a body of knowledge but the process or method of acquiring this knowledge. And this process is not only sense perception. The process can be applied to any discipline and that discipline then becomes scientific. Thus if the process is applied to the study of the relationship between numbers we get mathematics which has nothing to do with sense perception. If applied to the building blocks of nature we get physics, and to the study of the stars we get astronomy, to the study of human behaviour we have the behavioural sciences and similarly if applied to the study of the relationship between man and his creator we get religion. This conforms to how Baha'u'llah (1817-1892) describes religion, i.e. the science of the love of God (Baha'u'llah 1991).

Verifiability is the second attribute. A claim will be considered scientific if it is publicly verifiable, that is, if other people can independently establish the claim for themselves. This principle makes science objective. Karl Popper goes further to say, if it should be publicly verifiable then it should also be publicly falsifiable.⁹ He means it should be possible to prove it false if indeed it is false. Karl Popper would therefore ask: If God does not exist how can we prove that the existence of God is false? This has also been a potential source of conflict. This principle of verifiability/falsifiability is probably the singular most important barrier between science and religion. Gurus of science have asked: you say prayer works, how can you prove it, can anyone pray and get the same results? Again, this is an area men of science are wont to be unfair to religion. Albert Einstein's famous Special Theory of Relativity, $e=mc^2$, passes the test of public verifiability, meaning anybody can publicly and independently verify it for himself. But how far is this statement true that anybody can verify it for himself? If you went to Kejetia (a market place in Kumasi, Ghana), or even at a university (a place of higher learning), I bet that you cannot get more than 2% of the population who can claim to know of the theory of relativity, understand its implications and have the competences to be able to prove the equation. So, is it publicly verifiable? Another example, the statement 'man can go to the moon', is a scientifically verifiable statement. But, of the 41-110 billion people who have ever lived since Adam (depending on what your starting point is and who you think our grandfather was),¹⁰ there are only 12 people who have ever stepped on the moon and only a few more will ever go there. So, is it publicly verifiable?

Hatcher (1977: 38) suggests that, by 'publicly verifiable', all we mean is that those who belong to a certain community of understanding, and who have the willingness, keenness and resources to so do, can verify it on behalf of the rest. So for $e=mc^2$ one needs to have studied physics and mathematics far enough to be able to prove it for the rest of us. And that is how we all live – people with the specialised knowledge and disposition prove things for us.

In the same way one must belong to a community of understanding to be able to prove the efficacy of prayer for himself. One must make himself a receptacle for receiving the bounties of God; e.g., by assuming a humble posture of belief, probably fasting, keeping one's mind, body and heart chaste, acknowledging one's weakness as against the strength of the Almighty, etc. With such an attitude, prayer works and people who have so benefited can testify. Obviously, not everybody can maintain this posture

⁹ http://en.wikipedia.org/wiki/Karl_Popper (1 June 2008)

¹⁰ http://www.straightdope.com/classics/a2_085.ntml (01/06/2008)

and so those who can do that will then be able to prove for the rest of us. Then prayer is publicly verifiable, in the same order as $e=mc^2$.

Again scientists have overstretched this principle of verifiability and objectivity too far. If scientific truth were wholly objective why should scientists not agree on every scientific fact but sometimes they have had to vote on truth? The case of Sedan and Pluto, which we have earlier mentioned, readily comes to mind. How different is this from the case of the Synod of Laodicea in 365 AD where Roman Catholic Bishops met to vote on the books to be included in the collection of sixty-six books constituting the Holy Bible?

The third attribute of science is its repeatability. By this, science philosophers mean that a claim must be capable of being repeated by even the same person. This means a finding cannot be called science if it is only a one-off phenomenon and cannot be repeated under the same conditions. E.g., if yesterday I boiled water to 45°C, added chocolate and it turned to petrol but I cannot repeat it today, then it is not a scientific finding. It was only a chance phenomenon.

The fourth attribute is predictability. Can a claim predict future events and can it explain past events? If a claim is scientific then we should be able to use it to predict what will happen tomorrow. It should similarly be able to explain past events.

The last attribute is pragmatism. This attribute says something is no science if it cannot do what it claims it will do. If I propose a theory that I can change a stone to diamond and we apply it and the stone does not change, then that is no science. These are the attributes that define science. They are the attributes by which any discipline should be judged. While scientists apply these to various disciplines and get social, mathematical and behavioural sciences without looking for test tube evidence, when it comes to religion scientists ask: where is your test tube evidence? This is double standards. We shall now look at religion in its true form and see whether we cannot apply these attributes to it.

The True Nature of Religion

The position I am espousing is based on my background as a Baha'i and, therefore, a brief review of this background will put the discussion in perspective. The Baha'i Faith is the world's youngest major religion founded in Persia (now called Iran) in 1844. Baha'is believe that throughout history, God has revealed Himself to humanity through a series of divine Messengers who have founded the various religions. These Messengers have included Abraham, Krishna, Zoroaster, Moses, Buddha, Jesus and Muhammad. The latest of these Messengers, we believe, is Bahá'u'lláh (1817-1892), who brings new spiritual and social teachings for our modern age. He taught that there

is only one God, all of the world's religions are from God and that now is the time for humanity to recognize its oneness and unite. He says the world is but one country and mankind its citizens. Among its specific teachings are the harmony of science and religion and the equality of man and woman.

Baha'is see religion as divine method of teaching mankind, much in the same way as we go to school and have different teachers teaching us at different times. The class one teacher teaches only what the child can understand at that level while the form four teacher teaches what is commensurate with the growing understanding of the child. Just as we do not continue to take the breast milk of childhood, we grow to be given higher level of truth of God. Thus the Baha'i Faith teaches that religion is dynamic and progressive and that religious truth is relative and not absolute, and requires to be renewed with time. The renewal comes when the spirit of religion has gone down, superstition creeps in and it seems incapable of holding morality together, a phenomenon we see today. Mankind at that time sees nowhere to turn to and vain imagination is taken for religion. That is when religion is renewed. This is the Principle of Progressive Revelation as the underlying theory of religion.

Religion has the following aspects: A Prophet who claims to come from God and reveals specific message or teachings. The teachings are of two types – a spiritual or essential part which is unchanging, and a social part which is suited to the age and therefore necessarily changes from religion to religion. The Prophet comes with a Book of Scriptures, there are specific beliefs and practices and there is a body of followers who constitute the community of understanding. With time the religion becomes a fulcrum of civilisation and later the impact of the religion and the resultant civilisation die down and a new religion is revealed. These are all observable facts about religion subject to public verification in the same way as scientific truths are verifiable.

Basis of Reconciliation

1. Absolute truth or relative truth: So how do Baha'is see science and religion as reconciling? Hatcher says in everyday discourse we are interested in uncovering "truths" as opposed to "falsehood". We do this by making propositions or "statements" and a statement is said to be true when it affirms the given situation that it asserts, and is false when the assertion is not the case. Hatcher continues that we say a statement is a "fact" when it has a high empirical component and a rather low theoretical content ie. capable of being established to be true empirically, and as such is almost readily "provable" or verifiable by common sense. But the scientifically important facts are those with low empirical content and high theoretical

component, for these have a high relational impact, meaning they have a lot of impact on many other theories such that their negation will mean the negation of many other theories. We say a statement is "axiomatic" when we conventionally assume its truth for the purpose of serving as the basis for further reasoning in other things.

Truth, itself, is the reality as it is, and when this reality or truth comes to our awareness we call it 'knowledge'. Since we are limited as humans, the 'knowledge' we can attain in any discipline, be it science or religion, can only be limited, a relative truth and not the absolute truth. Thus the kind of truth that we can be interested in at any given time is the relative truth, and not the absolute truth. This is important, for a false belief in our ability to have access to absolute truth is at the bottom of the science-religion dichotomy. Bertrand Russell says truth is like perceiving the outline of a mountain. From afar it looks hazy but as one approaches it, it becomes sharper till it is sharpest at some point. Even there what one sees is not the outline to certainty but the outcome of the instability of the electrons composing the atoms of the mountain (Russell 1957). Again truth is like the sea and we, the object of knowing, are the receptacles. No matter how big the receptacle, the sea cannot be contained. The Bible says the heaven and the heaven of heavens cannot contain God (1 King 8:27; 2 Chronicle 2:6; 6:18). So, God or truth is too big to be contained in any one person or book. God can also be found outside any book of scriptures or science. This understanding is crucial for any reconciliation between science and religion.

2. Theory, Faith and Reason: Hatcher again says that in everyday life we hold some statements to be true and others false; we see some things as facts, all spontaneously and uncritically. A time, however, comes when we ask why things are what they are and we realise we need more than just that uncritical attitude of everyday common sense knowledge. We then begin to, through the exercise of our intellect, look for "a set of hypothesis with the cogency and coherence to explain and harness the known facts." This set of hypothesis we call a *theory*. If, to this same *theory*, we add a high degree of personal commitment and emotional investment, we get *faith*. A theory is said to be weighty if it relates to many theories and can explain many facts and these related theories and facts would be thrown into disarray if the theory were rejected. Hatcher notes that Faith occurs commonly in religion and Theory in science though there is still some element of emotional investment in scientific theories. When the emotional component of faith is extreme and out of proportion to reason we get fanaticism where the individual regards everything else as being secondary to that faith. Faith seen this way, therefore, is rational and not blind, and should be amenable

to rational analysis without any hesitation or trepidation. When reason is seen as legitimately applicable in religion, we have taken a giant step towards reconciling science and religion.

Religious truth according to Baha'i belief, therefore, is not absolute but relative requiring to be superseded with time, for God in his divine wisdom sends a revelation as and when necessary. Religion, we propose, is a completely scientific phenomenon and this can be judged by applying the five attributes to it. The scientific method of investigation can be applied to religion. The exhaustive application of our mental faculties in order to acquire religious truth can be applied to make religion a scientific phenomenon. Religious claims are publicly verifiable in the same way as one can publicly verify $e=mc^2$. One can put himself in the situation to experience the beauty and efficacy of prayer. Religious claims are repeatable and predictable, eg. religion can give the adherent tranquillity, peace and harmony.

The Baha'i Faith presents itself as an example of religious phenomenon assessable for instance, for scientific scrutiny as a proof that religious truth is amenable to scientific investigation. It is saying that every 1000 years or so a holy personage arises who comes with a revelation and a book, gets a following which eventually uses the teachings to form a civilisation and after some time the truth is perverted and a new revelation is given. This is a phenomenon open to public verifiability by looking at the various religious groups, looking at their holy books and the community of understanding that formed after them. This can be established as true by any objective observer. The great historian Arnold Joseph Toynbee (1889-1975) attests to this in Toynbee (1961: 99-100) when he relates civilisation to cyclical periods corresponding to the advent of religion.

Zoroastrianism was the basis of Babylonian civilisation those days. Hinduism and Buddhism brought a lot of civilisation to the Asian region and beyond. The advent of Moses brought the Jewish civilization which has largely formed the basis of western jurisprudence. The advent of Christ gave rise to the western civilization as we see it today. The Prophet Muhammad's advent brought civilisation from which we are all benefiting in one way or the other. Averroes (Ibn Rushd, 1126-1198) and Avicenna (Ibn Sina, 980-1037) sprang up from Islam and their contributions to medicine and philosophy are well known. Algebra and Trigonometry were discovered by Islamic scholars. Anytime you write the numerals 1, 2, 3, you are benefiting from Islamic civilisation.

The Baha'i Faith has a set of teachings which, we believe, have the inherent capacity of uplifting mankind and bringing world unity. These teachings perfectly conduce to reason, exhaustive and critical use of the mental faculties, so the scientific methodology is also fulfilled. The books,

writings and practices are all there for all to observe and assess, and that makes it publicly verifiable. The fact that there have been other Prophets in the past who have raised civilisations as a result of their teachings makes religion fulfil the attribute of predictability as it explains the past. It fulfils the element of pragmatism, for it has always raised the status of mankind at the time of the revelation and brought spiritual upliftment to their sincere adherents.

Scientific phenomenon may have a periodicity (a long period of recurrence), and the periodicity of religion takes on that of cosmological interval (i.e., an interval as long as the time it takes for a heavenly body to be formed or seen again). One may argue that he will not live to see two religious revelations to prove how effective they are in uplifting mankind. Science itself answers that perplexity. Periodic comets are celestial or astronomical objects that appear once in a very long time, some even two hundred years interval. Halley's Comet is one such case which appears every 75-76 years, the last appearance being 1986 and the next one expected in 2061.¹¹ Religious periodicity is even longer but most important is that the records are there for analysis, even from the ancient days.

We asked a question earlier on: was our grandfather the ape or the clay? Baha'is believe in a divinely guided evolution. God created using the mechanism of evolution. Abdu'l-Baha says man has always been a man but he has not always maintained this form of man (Barney 1984). Therefore there may have been a time he looked like an ape yet he was inherently a man. If you take an eight week old human embryo and that of a dog, they look the same, tadpole, yet one is destined to develop into man the other a dog. The scriptures are not intended to be interpreted literally. God created using Darwin's evolution. The six days of creation need not be twenty-four hour days but periods of undefined length. The theory of relativity shows that time need not be constant in length, and if the Bible says the sun was created on the fourth day (Gen. 1: 14-19), how were the first three days measured in the absence of the sun? Obviously the day talked about here is not the twenty-four hour day, and remember in the eyes of God one day could be a thousand years (2 Pet. 3:8).

If one says a particular person built a house and I say this house was built by adding cement to sand and stone and water, are we necessarily saying different things? So God created using the mechanism of evolution.

Baha'i Scriptures on the Harmony of Science and Religion

'Religion and science are the two wings upon which man's intelligence can soar into the heights, with which the human soul can progress. It is not

¹¹ http://en.wikipedia.org/wiki/Halley%27s_Comet (01/06/2008)

possible to fly with one wing alone! Should a man try to fly with the wing of religion alone he would quickly fall into the quagmire of superstition, whilst on the other hand, with the wing of science alone he would also make no progress, but fall into the despairing slough of materialism' (Abdu'l-Baha, 1969: 143).

'When religion, shorn of its superstitions, traditions, and unintelligent dogmas, shows its conformity with science, then will there be a great unifying, cleansing force in the world which will sweep before it all wars, disagreements, discords and struggles—and then will mankind be united in the power of the Love of God' (Abdu'l-Baha, 1969: 146).

The Nature of Cooperation

Baha'is believe that science and religion are two potent forces in nature that are propelling mankind to its eventual destiny, the establishment of an ever-advancing civilisation in the world. Religion may provide insights for science to pursue and make discoveries. Religion should also provide the moral leadership to guide scientific advancement. The question of stem cell research is an area that religion can provide moral leadership for science. The question of when does life start for purposes of abortion has also come up again and again at various times and now it is topical in the international media. Religion should provide the answer and give the cut-off time. For instance I wonder how many of us here will not agree that life begins at the very split-second of conception when the sperm and the egg meet.

Cloning is another area that religion should guide; should science clone human beings or not? And supposing somebody stands up and wants to fertilise the egg of an animal with the sperm of a man just to satisfy his scientific curiosity, should that be allowed? Should euthanasia and assisted suicide be allowed? Can we arrogate to ourselves the right to determine when to cut off life? Discussion on such topics should necessarily be guided by religion. But, religion cannot provide this moral leadership if it does not position itself to be able to engage in rational discourse at a very high intellectual and scientific level. No scientist of any respect and repute will agree to dogmatic effusions that only appeal to emotions. Yes, there are ethical committees and every research should have an ethical clearance. Ethical clearance should benefit from moral leadership provided by religion. Thus Baha'is say science without religion leads to the quagmire of materialism, self-centredness and eventually self-destruction.

Science will not elbow God out if God is not seen as a God of Gaps only existing to explain the currently inexplicable. Science will rather help to redefine God and religion. Science will not make religion irrelevant but will make superstition, vain imaginings and pseudo-religion irrelevant.

Conclusion

If religion can be engaged in any respectable discourse then it must purge itself of superstition, myths and unnecessarily rituals. Science also has the role to regulate religion. Again Baha'is say religion without science leads to superstition. If religion presents something which does not seem to conform to reason then we are probably dealing with one's figment of imagination rather than religion.

In conclusion, we have tried to show that true science and true religion actually go hand in hand but religion must be purged of all superstitious trappings and then we will be able to investigate it scientifically. Religion must regulate science if we are to avoid materialism and science should regulate religion if we are to avoid superstition. Religion and science are not foes but allies.

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CHAPTER 8

RELIGION AND SCIENCE FROM THE PERSPECTIVE OF ISLAM

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Abstract: *The Arabs were not primarily science-oriented; they were poets. Scientific discoveries or theorems were not possible without literary works. And considering the fact that literary works among the Arabs was a late comer compared to the older civilizations of Greek, Persia and Byzantium, it is only natural that Arabic, the language of Islam, borrowed and extended scientific elements from the older civilisations much later in its life. Although Muslims would be quick to declare the genesis of their scientific discoveries and advances to be Qur'anic in origin, the fact also still remains that the religion's astronomy was based upon Greek knowledge and Ptolemaic astronomy, the sciences of the Harranians and of the Nestorians of Jundishapur. Since the 15th century to date however, Islam has taken a deep dip in the sciences. Muslim endeavours in the field of science went dead at the beginning of the 14th/15th centuries when European scientists began to come to the forefront. This paper contends that Islam is not against science. In fact, Islam and science are "twin sisters". Our emphasis, however, is that this is not what happened in the 9th to the 12th centuries. And so, the issue is what is the contribution of Islam in scientific discoveries today and what will it be tomorrow.*

Introduction

Various quotations from the Qur'an point out what the Qur'an has to say about science and books "pre-" pronouncements on several issues before scientists invented them. One could argue that if the Qur'an like other sacred books before it was revealed by God, then one should expect that Muslims do not always refer to its over 1400 years timeline as beating any human endeavour. If indeed the revealer is timeless and omniscient, did he not know the present at the time of the revelation and did he not know the future from the time of the revelation of the Qur'an?

The Making of Islamic Scientific Advances

The Arabs were not primarily science-oriented. Instead, they were poets. Scientific discoveries or theorems were not possible without literary works. And considering the fact that literary works among the Arabs was a late comer compared to the older civilizations of Greek, Persia and Byzantium, it is only normal that Arabic (the language of Islam) borrowed and extended scientific elements from the older civilisations much later in its life.

Although Muslims would be quick to declare the genesis of their scientific discoveries and advances to be Qur'anic in origin, the fact also still remains that the religion's "astronomy was based upon Greek knowledge and Ptolemaic astronomy, the sciences of the Harranians and of the Nestorians of *Jundishapur*".¹ Later, through Persia, Islam drew upon Indian science, notably the works of Brahmaputra II and Aryabhata and the Mahasiddhanta.²

Muslim Observatories

There were a number of observatories that were built by Muslims in the Middle Ages following their interaction with the Ptolemaic astronomy (i.e., the sciences of the Harranians and of the Nestorians of *Jundishapur*), named scientific centres and personalities. The observatory of *bayt al-Hikma* (House of Wisdom) founded by Caliph al-Ma'mun who died in 833 AD for example, was an imitation of the philosophical and scientific works from the Greek originals, which were brought from Rum (Rome) by the caliph's delegation. His astronomer was the mathematician Habash al-Hasib, as were the Banu Musa, (the sons of Musa Shakir). The Fatimids of Cairo had observatories, the observatory of *Maragha* in Persia founded by Hulagu Khan for Nasir ad-Din at-Tusi and the observatory of Samarkand founded by Ulug Beg and the observatory of Istanbul under the Ottomans established in 1575 by Taqi ad-Din and so many others in Delhi. A Chinese astronomer called Fao-Mun Ji was associated with the observatory of *Maragha*. In addition to these observatories, there were many lookout towers to study the motions of the stars. Often times, minarets were used for this purpose.

Early Muslim scientists created accurate tables (Zij) of planetary motion; for instance, the *Zij as-Sabi* of Abu Abd Allah al-Battani (known as Albategius in Europe), the *Zij* of al-Khwarizmi, the *Zij al-Hakimi* of the Fatimids (which was made by the Astronomer Ibn Yunus from his observatory on the Muqattam Hills outside Cairo) and the *Zij il-Khanid* of Maragha. These *Zij* often served for the creation of special calendars such as the Jalali. Muslim scientists such as al-Biruni, Qutb ad-Din ash-Shirazi,

¹ *Concise Encyclopaedia of Islam*, art. "Astronomy".

² Aryabhata II was a renowned mathematician and astronomer of ancient India and he wrote *Mahasiddhanta* as a treatise of mathematical astronomy. He used zero for the first time to define decimal systems while Brahmaputra defined the rules of zero

Abu Ma'shar al-Balkhi al-Farghani wrote great books on science and astronomy.

The influence of Islamic astronomy upon Europe was great. Arab scientists and astronomers such as az-Zarqa (known in Europe as Ajarqui) in Spain were the agents of such influence. Muslim astronomers perfected astro-tables, which made vital contributions to the voyages of early European explorers. The early prominence of Muslim astronomy made them leaders in navigation. Arab navigators guided the Portuguese in many of their voyages. Ahmed ibn Majid an-Najdji, a writer of treatises on navigation in verse and prose, is believed to have been pilot in the voyage of Vasco da Gama to India.

Astrological Science and Religion

As a means of divination, astrology is usually condemned in Islam, as in most religions, as a science that potentially misleads the soul. Astrology as a science may be said to offer great insights as a cosmological and symbolical science. Astrological science is seen to be incompatible to religion because it is considered to have the capacity to trap the soul in some existential illusion or error. In other words, divination can throw up some illusion which is actually the projection of a subjective flow. In the event that the foreseen is confirmed by events, the soul is trapped in an unreality of its own making.

All Muslims approved of astrology. There were many who held that, as all events happen by the will of God, they could not be controlled by the stars. The disapproval by many Muslims brought about a modification of astrological theory in orthodox Islam that the stars were no longer "rulers" as in pagan astrology but simply as "indicators" of beforehand of what God has decreed.³ A *hadith* of the Prophet says "Even when the soothsayers tell the truth they lie", and let no one malign fate for Allah says "I am destiny".

A practicing Jew is considered to have no astrological sign in Judaism because as a bonds-man of God that sacred identity replaces individual identity. The Talmud says Israel has no constellation.

In a world of advanced modernization, a post-modern world, is God still relevant? Is religion still relevant in a scientific and technologically advanced world such as ours? And what is the place of religion when DNA facilitates the detection of identity of blood relations? In Muslim understanding, if we come to accept that "man is not the Supreme Being of this universe, but is responsible and accountable to the Supreme Being God" (Hathout 2002: 95), then we can say that man still has to depend on

³ For details on this, see O'Leary (2001: 4).

the Supreme Being for his own life in spite of all his achievements. Without God, everything becomes impossible. When man dethrones God, he slips into self-worship and destruction. This self-destruction is highlighted by Gyekye's paper (in this volume) when he write of scientists' misuse of Galileo's inventions.

The true role of man in this universe, it must be said, is to be "God's vicegerent and trustee" according to Islamic theology. By that "he is so equipped as to be capable of having full mandate over nature in order to manage the planet in accordance with the creator's instructions, and not upon his own impulses" (Hathout 2002: 95). It can be deduced from the above that, for Islam, man's capabilities to do any exploits depends completely on his consciousness of his role as God's vicegerent on earth. A slip in that consciousness makes man to become a worshipper of himself or other matter. Hathout (2002) thinks science, which he considers to be a tool yet in its infancy, should not delude man into playing God.

Islam and Science

The coming to power of an Arab dynasty did not cause an abrupt break in the intellectual life of Egypt or Syria, Iraq or Iran. The school of Alexandria continued to exist for a time. The medical school at Jundishapur in Southern Iran, established by Nestorian Christians under the patronage of the Sassanians, also continued to exist. In these and other places, there was an endearing tradition of Hellenistic thought and science. There was also a high tradition of learning in Iraq and an Iranian tradition expressed in Pahlavi and incorporating some important elements coming from India and China. According to Hourani (1991: 76) and O'Leary (2001: 3-4), "from the later part of the second to the fourth Islamic century (8th to 10th Century AD), however, the work of translation was carried on intensely and – a rare phenomenon with the direct encouragement of the 'Abbasid Caliphs. For the most part, the work was done by Christians whose first language (of culture) was Syriac, and who translated from Syriac into Arabic but some work was translated from Greek directly into Arabic". Hunayn ibn Ishaq played the greatest role in the exercise of the translation.

At the beginning of the Arab power rhetoric, poetry and drama were no longer taught and studied much. Studies that gained grounds included philosophy, medicine, the exact sciences, mathematics, astronomy, astrology, occult sciences, alchemy and magic. Philosophy, science and the occult sciences were not as clearly distinguished as they are now. Further, the frontiers of what is regarded as "scientific" have moved from time to time, and it was quite consistent with what was known of the nature of the universe to believe that nature happened in the world lying beneath the moon, and to try to understand these forces and use them.

The motives of the Caliphs and their translator subjects were clear and practically oriented; medical skill, control over natural forces, which could be used to bring power and success. Intermingled with the sciences of Greek origin, however, were elements coming from the Iranian and Indian traditions. As early as the 9th century AD, the Arab mathematician al-Khwarazmi (800-847) was writing about the use of Indian- the so-called Arabic - numerals in mathematical calculations.

The Contribution of Muslim Scholars to Scientific Development

It is true that early Muslim scientists benefitted from the Greek, Iranian, Iraqi and Indian writings. But, that is normal because everyone gets knowledge on a subject from another. Several Muslim scholars adopted the translated works; they studied the works thoroughly but, above all, they carried the foundation works - whether as theorems or further inventions. Between the 9th century and the 13th century, Muslim scholars such as Thabit ibn Qurra (836-901 AD), Jalal al-Din Mohammad; Ibn Mohammad ibn Husain al-Rumi (1203-1273 AD) and Abd al-Rahman ibn Mohammad also known as Ibn Khaldun (1332-1395 AD), carried the field of science extensively to a higher level. They left behind them loads of books and articles in science.

Thabit Ibn Qurra for example became one of the early reformers of Ptolemaic views. He answered several problems related to the movements of the Sun and the Moon. Thabit's major contribution lies in mathematics and astronomy. He extended the concept of traditional geometry to geometrical algebra and proposed several theories that led to the development of non-Euclidean calculus and real numbers.

For his part, Jalal al-Din al-Rumi contributed greatly to Islam's philosophical and *tasawwuf* (Mystical Sciences) development. This was embodied in poetry, which he elucidated through his famous *mathnawi*. This book, regarded as the largest mystical exposition in verses is believed to offer solutions to many complicated problems in metaphysics, religion ethics, mysticism and other fields of science.⁴ Fundamentally, *mathnawi* highlights the various hidden aspects of Sufism and their relationship with the worldly life. Al-Rumi drew on a variety of subjects and derives numerous examples from everyday life. His main subject is the relationship between man and God on the one hand, and between man and man on the other. He further portrayed the various stages of man's evolution in his journey towards "the ultimate".⁵

Abu al-Husayn ibn Abdullah ibn Sina (known in Europe as Avicenna) was perhaps the icon of Muslim philosophers in the middle ages. Ibn Sina

⁴ www.islamandscience/muslimscientists/ 6/13/2008

⁵ *Ibid.*

led a school of philosophical scientists who, in his day, conceived of the universe as being formed by a series of emanations from God and in this way it was able to reconcile the unity of God with multiplicity. In Ibn Sina's formulation, "God was the First Cause or Creator, the necessary being in whom essence and existence were one" (Hourani 1991: 173). From Him there emanated a series of ten intelligences, ranging from the First Intelligence down to the Active Intelligence, which governed the world of embodied beings. It was from the Active Intelligence that ideas were communicated to the human body by a radiation of the divine light, and thus the human soul was created. The symbolism of light, which is common in *sufi* thought, it should be noted here, derives authority from the Qur'ān.⁶

Born in 1332, Ibn Khaldun would add History and Sociology to Philosophy. He sought to write a world history with a preamble aimed at analyzing historical events. His major book, the *muqaddimah* or Prolegomena was based on Ibn Khaldun's unique approach and original contribution. *Muqaddimah* became a masterpiece in literature on philosophy of history and sociology. The main concern of this great work was to identify psychological, economic, environmental and social facts that contribute to the advancement of human civilisation and the currents of history. In this context, he analysed the dynamics of group relationships and showed how group-feelings (*al-asabiyya*) give rise to the ascent of a new civilisation and political power. He identified an almost rhythmic repetition of rise and fall in human civilisation and analysed factors contributing to it. A major distinction between Ibn Khaldun's works and those of earlier approaches on the subject lie in his emphasis on environmental, sociological and economic factors governing the apparent historical events. This revolutionised the science of history and also laid the foundation of *umraniyat* (sociology). Ibn Khaldun also wrote a book on mathematics, which is not extant. Ibn Khaldun's influence on the subject of history, philosophy of history, sociology, political science and education has remained paramount ever since his life.

Perhaps, the most prominent Muslim scientist many know of today is Abu Yousuf Ibn Ishaq al-Kindi, born in 800 AD. Al-Kindi was a philosopher, mathematician, physicist, astronomer, physician, geographer and even an expert in music. Remarkably, al-Kindi made original contributions to all of these fields. On account of his work, he became known as the philosopher of the Arabs.

In mathematics, al-Kindi wrote four books in the number systems and laid the foundation for a large part of modern arithmetic. It is worth clarifying

⁶ See Sura 24.35-39

that al-Khwarazmi developed the Arabic system of numerals, but al-Kindi contributed to spherical geometry to assist him in astronomical studies.

In chemistry, al-Kindi opposed the idea that base metals can be converted to precious metals. In contrast to prevailing alchemical views, al-Kindi was emphatic that chemical reactions cannot bring about the transformation of elements. Al-Kindi further made rich contributions to physics geometrical optics and wrote a book (i.e., *kitab al-shu'a'at*, The Book of Rays) on it. Roger Bacon would later be inspired and guided by this book. Al-Kindi did not end on mathematics and physics, but he was the first in his days to systematically determine the doses to be administered of all medical drugs at the time. Very little was known on the scientific aspects of music in his time. He pointed out that the various notes that combine to produce harmony, have a specific pitch each.

Al-Kindi was a prolific writer. He left a total of 241 books in his name, the most prominent among them were in the science related fields. Some of his books in the various fields were⁷:

• Astronomy	-	16
• Arithmetic	-	11
• Geometry	-	32
• Medicine	-	22
• Physics	-	12
• Philosophy	-	22
• Logic	-	9
• Psychology	-	5
• Music	-	7

Generally Arab physicians were careful observers in the field of medicine. Their clinical records added much to what they learned from the Greeks. They invented some new instruments and in all branches except surgery, they advanced medical knowledge. Surgery was hindered because it was considered unclean due to contacts with touching dead bodies. Yet, for several centuries, the Arab physicians were in the forefront of medical work. And, as scientific progress has been continuous, their work made its contribution not only by passing on what others had done, but by a very real development which enabled them to give to succeeding generations more than they had themselves received.

In the context of the title for this book, that is "Interrelationship between Religion and Science in the 21st Century and Beyond", it has to be stated that the most remarkable thing of these Arab scholars is that they remained

⁷ www.islamandscience/muslimscientists/ 6/13/2008

deeply Muslim. In fact, almost all of them were Sufis^a to begin with before they became scientists. They eventually used knowledge of astronomy or physics or chemistry or mathematics to enhance their mystical lives. On the other hand, their religious commitment informed their convictions that from Allah emanated all intelligence.

Unfortunately, since the 15th century to date, Islam has taken a deep dip in the sciences. Muslims of the modern and post-modern eras have woefully failed to produce the type of world class scientists as did their forefathers discussed in this paper. Muslim endeavours in the field of science went dead at the beginning of the 14th/15th centuries when European scientists began to come to the forefront. Was it as a result of the devolution of the central caliphate, which was the sole supporter of Muslim scientific advances, or was it due to the inability of Muslim scientists to compete?

Two main factors may have accounted for this slip and these can be categorized as internal and external factors. It has to be noted that Muslim scientists flourished during the reign of the Abbasid dynasty. So they were only tolerated because they were under state protection. The devolution or disintegration of the Muslim caliphate after the fall of the 'Abassid dynasty in 1259 AD can be considered as the major internal factor. When economic and political life checked the cultural life of Baghdad, the leadership of Muslims passed from Baghdad to Aleppo, to Damascus, to Cairo, to Cordova and to Samarkand. Since the centre of authority could not be sustained, the beneficiary body of scientific endeavours could not be sustained.

The attack of the Mongolians in the 1250s, the autocratic rule of the Turks and the interference of European powers from the late 1700s together accounted for the external factors. In the past 100 years it would seem that Muslim scientists' output to the world of scientific research is almost negligible. From the 9th century AD to about 17th century AD, Muslim scientists dominated the world of science. Yet, today the number of original research papers published by Muslim scientists is 0.1% of the number published by scientists in Europe and the USA (Hassan 2000: 55-56). It can only be hoped that the trend would change before long.

However, Muslim scholars in this post modern period appear to be content with a blame game. It is typical of a Muslim to spent more time listing what ought be the correct account of history rather than telling what Muslim scientists are doing today to compliment the religion. Another general example of Muslim scholars being pleased to be reacting to situations is when western scientists came out in the 20th century with ethically questionable practices such as abortion, euthanasia, blood transfusion, organ

^a A *sufi* is an Islamic mystic

transplant, cloning, genetically modified (GM) foods and more recently the use of foodstuffs for biofuel and Muslim scientists only go back to the Qur'an to look for passages to say the Qur'an is aware of all that and God permits or does not permit it. It is important to state here that the readership of and the believers in the Qur'an are limited.

Conclusion

We have thus far discussed the origins of Islamic Science. Our discussion did clearly show that the Arabs learned their sciences from the translations of earlier Greeks, Iranians, Indians and Chinese works. Most remarkably, as we showed in this paper, was the fact that the Muslim scientists did not just adopt and hold onto what they inherited from their non-Muslim predecessors. Instead each Muslim scholar strove to go beyond the positions held at his time. They added new dimensions to what they came to meet. They contributed new knowledge to the already existing one.

Secondly, we noticed that Arab scientists became scientists from within Islam as a religion and they deepened their faith by their scientific discoveries.

The third obvious issue we showed clearly was that even though Muslim scientists dominated the world of science in the 9th through the 14th century, the religion slumped since the 17th century to date in scientific advances as compared to Europe and America contributing 0.1% in recent times, a trend that has to be reversed.

The fourth noticeable factor from the discussion was that the classical Muslim scientists, unlike their 21st century counterparts, did not consider science to give man "all the answers of life". Rather religion directs the knowledge of man to science and helps to answer more intriguing questions of the origins of life and matter whose beginnings scientific findings sometimes over exaggerate.

Based on the foregoing, we may conclude that Islam and science do not contradict each other. They express the same truth in different forms, which we may say correspond to the different levels at which human beings can apprehend it. The trained and explorative Muslim scientist can live by science. He who has also grasped meaning and proof through symbols but has reached a certain level of understanding can be guided by religion. Islam as religion encourages its followers to seek knowledge from the length and breath of the world, even if it is to China. The Qur'an says in 2:164,

"Behold! In the creation of the heavens and the earth;

In the alternation of the Night and the Day;

In the sailing of the ships through the oceans for the profit of mankind;

In the rain which Allah sends down from the skies;

*And the life which He gives therewith to and earth that is dead;
In the beasts of all kinds that He scatters through the earth;
In the change of the winds, and the clouds which Trail
like their slaves Between the sky and the earth;
Here indeed are signs for a people that are wise”.*

Note the literary construction of this verse. God is one and among His signs, tokens are the unity of design in the diversity of nature. The signs are taken from features that lead up to man's intelligence and wisdom.

The main point of our contention in this paper has been that Islam is not against science. In fact we have been told in this conference that Islam and science are “twin sisters”. We have also shown in this paper that Muslim scientists made early inventions in that field. But what is the situation today? It has to be emphasised perhaps that in this 21st century and beyond the issue is not what happened in the 9th to the 12th centuries but the issue is what is the contribution of Islam in scientific discoveries today and what will it be tomorrow. Islam as a religion sees science as the creation of God and so man must speak the truth in science. Islam and science like Christianity and science are best friends.

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CHAPTER 9

THE LAW OF DECAY OR THE LAW OF ETERNITY

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Abstract: *The influence of the Theory of Evolution has been enormous and has succinctly captured the minds of even intellectuals and scholars in the last two centuries and thus made them utterly believe that this theory has always been true to the core. Then came its downfall suddenly and all of the supposedly-scientific hypotheses began to crumble as modern science made tremendous strides in unveiling fabulous facts. The Bible, which made certain categorical statements centuries ago, is found to be utterly true in line with the modern scientific findings, which have absolutely refuted the Theory of Evolution. This paper attempts to highlight the inerrancy of the Scriptures in the light of the modern scientific findings, as against the back drop of the Theory of Evolution.*

The Second Law of Thermodynamics

When God created our own World and established the Garden of Eden as the dwelling place for man, God saw that it was good¹. Everything was in perfect order and the man was to live in perpetual harmony with God. He was to obey God and to take care of His wonderful creation. Man was created in God's own image².

God loved the company of man and wanted to have eternal fellowship with man. The *Law of Eternity* was built in him. Everywhere and in every nook and corner of the created world, there was perfection and man was to live forever in this blissful environment. The Law of Eternity was to continue. There was perfect ecstasy and permanence of creation and there was no other Law in operation. Suddenly, everything changed. The man disobeyed God and brought upon himself a curse. The curse became the Law of Decay. This exhibited itself in an universal law, known as the Second Law of Thermodynamics. This Law states that, "*The natural tendency of all Physical systems is towards increasing disorder*". This came upon man because of his disobedience in the Garden of Eden. Hence the basic cause of the decay was disobedience. It was not the plan of God that man should

¹ Genesis 1:31

² Genesis 1:27

be separated from Him. Man set in motion the *Law of Decay* and God allowed it to happen in the form of deterioration³, finally ending in 'death', a sign of total decay. This is expressed in science as 'entropy'. Originally, there was no sign of death or decay in the perfect world at the Garden of Eden. The present disorder is man's own invitation. The sin of man is multiplying day by day, resulting in lawlessness, drunkenness, disobedience and violence, as one could witness and experience today. The Law of Decay has found its perfect fulfillment.

Law of Decay in Operation

It is a common knowledge that, when a car is manufactured (created), it deteriorates in performance and depreciates in value after several years of use. Even, when repaired and refurbished, it only lasts for a further few more years. When Skyscrapers are built, they deteriorate and are finally rendered useless, only to be removed by demolition engineers, after a lapse of several decades. This seems to be the rule of the Law of Decay which is experienced everywhere in and around us. The Holy Bible tells about this vigorous Law of Decay in Romans 8:20: "*For we know that the whole creation groans and travails in pain together until now*" (the present time). As this Scripture indicates, this Law of Decay finds its expression even in the realm of biological systems. Hence this Law is universal in its application.

Aging and the law of decay: The present world is eagerly searching for a solution to counter the Law of Decay. The process of aging is believed to be influenced by a gland in the body called "Thymus" (South, 1998). Some people attribute longevity to vegetarianism and others to diet. Although sensible diet and exercise may improve one's health and lower the risk of dying prematurely from disease, nothing has been proved to retard aging. A contributor to a discussion on the Voice of America said, "Genetic engineering can come to the help of man, in combating the decay" (VOA, 1993). Man wants to defeat the Law of Decay. But God has set in motion this universal law, which no man can alter or reverse.

Frank (2009) wrote, "Locked within the code of genetic material are instructions that specify the age beyond which the species cannot live". Maximum life span is written in the genes. But as the end of that life span approaches, that which causes all the body function to start closing down is *still a mystery* to the scientists. Molecular biologist, Medina (1996) writes: "There seem to be mysterious signals that simply show up at certain times and tell cells to quit doing their normal adult functions". He said, "After declaring war on cancer decades ago, we still have not found a cure. And

³ Psalm 90:3

the process of aging is infinitely more complicated than the mechanisms underlying cancer". To date, no human intervention has been found to stop or reverse human aging. This confirms the words of Jesus in Matthew 6:27: "Which of you by being anxious can add one cubit to his life span?"

Theory of evolution: The Theory of Evolution, on the other hand, declares that man is evolving into a superman. This is quite contrary to the Law of Decay. It is a theory which promotes orderliness out of disorderliness. The Law of Decay opposes this theory dogmatically. The law of Decay points to disorderliness out of orderliness. Gish (2009), talking about life starting on its own, said "Amino acids would have to be arranged in an exact sequence to form a protein ... just like the letters in a sentence." Mere laws of chemistry and physics cannot do that. "The probability of protein forming by chance would be one-over-ten (1/10) to the sixty-fifth (65th) power, or in a layman's language, 000,000,000,000,000,000,000,000,000,000 to one". Tewari declares that "The probability of life arising by chance is billions of times more remote than the probability of a copy of *Oxford Dictionary* resulting from an explosion in a printing shop".⁴ The Theory of Evolution is still a "theory", because it has not been proven neither logically or nor scientifically.

Modern Scientific Evidences against the Evolution Theory

1. The Missing Link: One of the major tenets of the Theory of Evolution is fully and unswervingly based on the Missing Links. In order to prove this theory, it is mandatory to show in a tangible form, some sort of a missing link between the apes and the man, in order to justify, that man evolved from the monkeys. In fact, "*Darwin admitted that millions of 'missing links', transitional life forms, would have to be discovered in the fossil record, to prove the accuracy of his theory, that all species had gradually evolved by chance mutation into new species*" (Jeffery, 1998). Examples of the 'missing links' are as follows:

During the last century, biologists, geologists and paleontologists had been trying to locate the 'missing link' for humin (man). In 1612, Charles Dawson discovered pieces of *human skull and an ape like jaw bone* in a gravel pit, near the town of Piltdown, England. Since then, it was called the 'Piltdown man' and was regarded as the greatest discovery in support of Darwin's theory. For nearly half-a-century, renowned scientists and supporters, all over the world, regarded the 'Piltdown man' discovery as having unequivocally settled the issue of the missing link for man. In 1953, scientists began to suspect *misattribution* and found to their horror that it was a hoax. Radiocarbon tests showed, impeccably, that the human skull

⁴ http://home.iitk.ac.in/~ashtew/index_files/life.pdf (14/12/09).

was 600 years old and the jawbone 500 years old (Gordon and Gordon, 1995) Another discovery was the "Nebraska man" which was built from *one tooth*, and was finally disowned as the tooth of an 'extinct pig'(Pearce., 1998.). "Java Man", found in the early 20th century, was proved to be nothing more than *a piece of skull, a fragment of a thigh bone and three molar teeth*. The rest came from the deeply fertile imagination of the Plaster of Paris workers (Geraci, 2007).

The "Heidelberg man" came from *a jaw bone, a large chin section and a few teeth*. Most scientists reject the jawbone, because it is similar to the modern man. The "Neanderthal man" discovery by the German archeologists, who *found a skull* while digging, proved to be exactly that of a modern man and not that of an ape.

Then came the "Peking man", "Tanzanian man" and "Nariokotome boy" of the Lake of Turkana, Kenya. The Nariokotome boy decidedly established that the languages that the humid (man) would have began to speak was as early as 50,000 years and not 2.4 million years as was previously suggested (Pearce., 1998.).

2. The fossil Record: Today, many scientists are having a re-think on the Darwinian model. It has become plain from the fossil records that new and higher orders appear in groups comparatively suddenly. The old conception of evolutionary trees arranging fossils to develop smoothly from one branch into another is being vigorously questioned. The overall picture is that of a series of jumps to major new types of animal. It is not now sufficient to excuse ourselves by saying that, we merely need to look for more fossils. This has been done, yet the picture remains the same.

Fossil Records as agreed by Palaeontologists (Pearce 1998)

ERA	ORDER	MISSING LINKS
Cambrian to Eocene to Ploistocene	Invertebrates	12 major links
Silurian to Miocene to Ploistocene	Fishes	5 major links
Levonian to Eocene	Amphibians	5 major links
Permian to Cretacious	Reptiles	6 major links
Eocene to Ploistocene	Marsupials	5 major links
Eocene to Ploistocene	Mammals	7 major links

This is really a death blow to Darwinism, so evolutionary scientists have come up with a succession of alternatives. There have been five new theories all succeeding each other, because none of them is satisfactory even to evolutionists.

3. The DNA Code: A simple cell (plant / animal / human) is a very *complex factory*. A single cell algae is an automated, computerized system. Each cell consists of several sub-divisions. The nucleus contains amazing amino acids called DNA and RNA. Outside the nucleus are the Ribosome and Mitochondria. The DNA contains a very long tape, in which is stored all the *Instructions*. Each instruction is taken out and decoded and carried out in the genes, at the time of the reproduction. From that time till the biological specimen dies, the *instructions* are carried out with meticulous care, at every split second of life.

More and more books by scientists are questioning Darwin's evolution theory and what others deduced from it. Behe (1996) calls the molecular biology, "Darwin's Black Box", because it reveals why his theory has crashed like an ill-fated aeroplane. "Black Box" evidence of the creator from the cell (Pearce, 1998) is given as follows:

1. The DNA code requires one million pages of instruction. Dictates complicated technical instructions to make a plant or an animal or man. They are more technical than any man-made computerized code to make an airliner. Could a series of faults in instructions (mutations) make by accident, such a technical code?
2. The code needed someone who knew the translation and who then make a machine to translate it. This involves the Ribosomes. Someone was needed to know the "secret code", in order to break the code
3. The Ribosomes are on an "assembly line" to obey the decoded instructions and to produce the parts for the body. Requires technically complex and compatible machinery to read off instructions and to manufacture accordingly.
4. Edited copies of the instructions are sent out to every Ribosome. Sub-editors with word-processors, with the right sentences from the instructions are used to manufacture specialized parts. These editors are made by the cell factory.
5. Two hundred (200) different specialized workers or enzymes, attend the production machines (ribosomes). Francis Crick calls them 200 "frozen miracles".
6. The fuel and power department or Mitochondria, supplies fuel for every working machine (Organelle) in the cell. This power station is as complicated as any made by man
7. When a cell itself becomes specialized during gestation, it becomes part of (ex: heart, muscles, brain etc). The Centrosomes multiply it into those cells and is directed to become part of that organ in the right part of the body.

Following the DNA code, an example of man is as follows:

Cells in the human body: Man is made up of one hundred trillion cells (10 cells). (Contrast it with the space having trillion stars). Each cell is a *specialized unit of life*, working independently to carry out the specified function in the human body. A cell (as we all know) consists of a nucleus in the centre, surrounded by cytoplasm. What moves the cells to work together? What ushers in the higher specialized functions of movement, sight and consciousness through the co-ordination of a hundred trillion cells?

Body's instruction book: The secret to membership lies locked away inside each cell-nucleus chemically coiled in a strand of di-oxynucleic acid (i.e., DNA). To cite an example in the hereditary science – one egg and sperm share their inheritance, the DNA chemical ladder splits down the centre of every Gene, much as the teeth of a zipper pull apart. DNA re-forms itself each time the cell divides: 2, 4, 8, 16, 32 cells, each with identical DNA. Along the way, the cells specialize but each carries the entire 'Instruction Book' of hundred thousand genes. DNA is estimated to contain "instructions" that, if written out, would fill a 1000 volume of six-hundred pages in each volume. A nerve cell may operate according to "Instructions" from vol. 25, and a kidney cell from vol. 125 etc, but both carry the whole compendium. (*The DNA is so narrow and compacted that all the Genes in all the body's cells would fit into an ice-cube: yet if the DNA were unwound and joined together end to end, the strand could stretch from the earth to the sun and back more than four hundred times*). It provides each cell's sealed credential of membership in the body. Every cell possesses a genetic code, so complete, that the entire body could be reassembled from information in any one of the body's cells (Yancy and Brand 1997).

Body's language: Another way of looking at this amazing structure of DNA is to look at it as a special language. All life is determined by a "language", say the scientists and the name of that language is the 'DNA Code'. Science has discovered that every living thing on the earth is created and re-created by a 'language'. Any *language* basically contains *letters*. Each gene in our body contains four letters; they are T, A, G, C., and these letters form the *words*. Thousands of 'words' can be formed by using precise mathematical permutations and combinations. 'Words' form into meaningful '*sentences*'.

Millions of sentences can be formed by attaching sentences to sentences. Thus a language is born. The coded computer language of *windows 98* had 4 million sentences called the 'line-Instructions'. The language written in the human cells, are specific instructions to carry out specific tasks. Cells

may differ in functions, but all of them contain all the 'words' of the language. Each cell is a veritable dictionary (Comfort, 2006).

Thus it can be concluded that the progress that has been made in the 'Genetic Engineering', reveals the basic flaw in the Darwin's theory, which assumes a very primitive functioning of a cell, with uncomplicated elements. But the modern science dogmatically says that even the "so called" primitive cells are veritable gigantic factories, much more complex than the intricate man-made factories.

4. The Second Law of Thermodynamics: The basic statement that, when a biological system is created, it evolves into decay and deterioration over a period of time has already been touched on (Comfort 2006). The Theory of Evolution, if accepted, will be in awful contradiction to this basic law of nature. The theory of evolution portrays a Law of Progress (rather than a Law of Decay) and has failed to substantiate its theory in any tangible, scientifically verifiable form. After a careful and detailed study of the Biblical books of Daniel and Revelation, Sir Isaac Newton, one of the greatest scientists of all time concluded, "Therefore, any finding that contradicts scriptures is not science" (Newton 1733 [1991]).

Law of restoration: The Law of Restoration is a prerequisite to the Law of Eternity. Is there any hope for humanity then? Is not God going to do something about it? Will not God interfere and stop this decaying tendency? God, who intended to have an eternal relationship with man, will He not restore it, back to normalcy? Will not man and God experience the same intimacy that once man existed in the Garden of Eden? God says that He will restore the humanity and that is really the good news. "*I make all things new*" says the Lord⁵. "*Remember ye not the former things, neither consider the things of old. Behold, I will do a new thing*"⁶. God sent his only beloved Son, our Lord Jesus Christ to restore the World to the old and original order. He is going to restore the old order (Law of Eternity) by making the new Heaven (universe) and the new Earth (our world)⁷ and thereby, making everything permanent and eternal.

Law of eternity: In an International Symposium at the Massachusetts Institute of Technology (MIT), the scientific body predicted that the present world would come to an abrupt end in another 50 years time or so. The Bible categorically states that the present universe and the present world will collapse. The Law of Decay will perish with it (as expressed in 2 Peter 10: 30-13), paving the way for the old and original order-the Law of Eternity. The Lord Jesus Christ talks about eternity for both the wicked and the

⁵ Revelation 21:5

⁶ Isaiah 43:18-19

⁷ Revelation 21:1

righteous. The wicked belongs to the order of decay and the righteous to the order of eternal life. "*And these (wicked) will go away into everlasting punishment but the righteous (believers) into life eternal*". Thus the Law of Eternity will be established in the life of a believing Christians. The Law of Decay can never have dominion over the believer because, "*he has passed from death to eternal life*"⁸. The Bible says, "For God so loved the world that He gave his only begotten Son, that whosoever believeth in Him should not perish, but has everlasting life"⁹. This then is the good news by which the Law of Eternity will become operational in the life of a person, the moment the person trusts in the Lord Jesus Christ. When the sins, which separated man from God are forgiven, then the person will assuredly be promoted to the level of eternal bliss.(the Law of Eternal Existence)¹⁰. Therefore *the Ultimate Law* that will prevail is the Law of Eternity.

Conclusion

God intended to have eternal fellowship with man in a blissful environment. He therefore established the *Law of Eternity* within man. Unfortunately, through disobedience and disregard for the word of God, man brought upon himself a curse that resulted in the *Law of Decay*. This law eventually leads to the eternal destruction of man. However, it is never the desire of God that any should perish. He has therefore made a way of escape by sending His only begotten Son, Jesus Christ, to pay for that curse (the *Law of Decay*) with His life, and to restore man to the original order (the *Law of Eternity*). God says that whosoever believes in Jesus "would not perish, but has everlasting life". Which then would you choose; the *Law of Decay* or the *Law of Eternity*?

⁸ John 3:15

⁹ John 3:16

¹⁰ Mt 25:45; John 11:25

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CHAPTER 10

TRADITIONAL SCIENCE: A CASE STUDY OF AKAN MYTHS AND RELIGIOUS BELIEFS

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Abstract: *In this paper, we attempt to trace the scientific roots of Akan mythology exemplified by stories of creation and procreation. We compare these myths with similar myths from other cultures in Africa and elsewhere, especially Biblical versions of the myths. The study reveals that life and death, both created by *tdomankoma*, are two sides of the same coin, united in a cyclical manner by an inevitable eternal chain - DEATH-LIFE-DEATH - and that the various myths of creation and procreation have scientific roots.*

Introduction

There are some people who are irritated whenever they hear that science did not originate in Europe, and that there is something we can call African traditional science. If the Latin *scientia* means knowledge, and *tradere* means to pass on to, and *religion* means the sum total of a people's beliefs, world view and practices and, more particularly, their relationship with the beyond (represented by God or the gods), then we may be right in wanting to remove certain prejudices from our minds. The Senegalese intellectual, Cheikh Anta Cheikh Diop tells us in *Anteriorite des Civilisations Negres*:

As far as Greek and Latin writers, contemporaries of ancient Egyptians are concerned, the physical anthropology of the latter leaves us in no doubt: the Egyptians were black with thick lips, kinky hair and thick legs. (p.34)

These were the people who built the pyramids that have defied cyclones and hurricanes to date. As we speak today, dead bodies embalmed by the Ancient Egyptians several years before the coming of Christ are still practically intact. These achievements are surely not the work of a 'primitive mentality', if we may borrow the words of Lucien Levy-Bruhl (April 19, 1857 - March 13, 1939), or a chance happening.

I can hear dissenting voices murmuring, 'If the white man had not come to Africa, where would you people be today?' The Burkinabe historian, Joseph Ki-Zerbo, answers the question in his work, *History of Black Africa*.

According to him, in many corners of traditional Africa, the smelting of iron, the processing of gold-bearing rocks into gold dust and various royal regalia were no secrets. Traditional blacksmiths knew how to manufacture guns, gunpowder and bullets. The Bamenda people of Southern Cameroon invented, under King Njoya, an alphabet called *Aka-uku*. South Eastern Nigerians had an alphabet called *Nsibidi*, the Akans of Ghana and the Gyanans of Cote d'Ivoire called theirs, a system of socio-cultural knowledge, *Adinkra*.

So it is not true that Africa was a scientific vacuum when the white man came. Indeed, Leo Frobenius had no reason to exaggerate when he said this about Africa in the Middle Ages:

But these people were polished and civilized to the bone. Everywhere there were large, calm and peaceful streets where one could sniff the greatness of a people, and its human genius. It took the arrival of colonial imperialism for a people so civilized to be described as cannibalistic and primitive even though, on the contrary, the splendour of its art, the greatness of the empires of the Middle Ages constituted the real face of an Africa, wise, beautiful, rich, organized, non-violent and powerful as well as humanist – the very cradle of Egyptian civilization.

Ouologuem (1968: 111)

Creation Myths

Every society has its version of the creation myth. Below, we translate the traditional version of a traditional creation myth recorded by Ndoutoume (1986: 23).

Before Eyo'o there was nothing, a state of nothingness. Then appeared Eyo'o. Eyo'o, the formless. Eyo'o, the original entity who created time and space. Eyo'o was. Eyo'o multiplied. Eyo'o multiplied himself. Eyo'o gave names to everything. Eyo'o is above all. Eyo'o is in everything. Everything is in Eyo'o.

*Eyo'o gave birth to Si Eyo'o
Si Eyo'o begat Nkom Si
Nkom Si begat Mebegue Me Nkom
Mebegue Me Nkom produced Nkwa Mebegue
Nkwa Mebegue produced Ayobere Nkwa
Ayobere Nkwa begat Mensgome Ayobere
Mensgone Ayobere begat Nna Mengome
Nna Mengome gave birth to Ekang Nna,*

These are the words of the *mvét* collected and translated by the author Ndoutome Assamou D.¹ We may now compare and contrast this text with the Biblical story of creation in Genesis, both in content and style. We will not forget classical Greek, Roman and Norse myths of creation while at the same time keeping at the back of our minds, the scientific theory of the Big Bang. The comparison reveals interesting parallels.

First, Eyo'o seems to be the Gabonese version of the Jewish God/Jehovah. He is formless, beyond time and space. Jehovah is also timeless and is described as Spirit, corresponding to the formlessness of Eyo'o. Next, the state of void or nothingness that preceded creation runs through Jewish, Classical, Nordic, Gabonese and scientific versions of the creation story. Jewish myth describes the original form of the world as 'without form and void' – *tohu wa bohu* in the Hebrew. Hesiod uses the word 'chaos' which in the Greek means 'a yawning' or 'a void' to describe the original state of the universe. Ovid's chaos is not 'a gaping void but rather a crude and unformed mass of elements in strife' (Morford and Lenardon 1985: 32). According to Nordic creation myth, in the beginning there was chaos. Chaos had creative power for out of it came the gods. (Sutherland-Addy 1999: 96).

It is the same Eyo'o who created everything and gave names to his creation, just like God in the Bible who created all things but left the naming of his creation to Adam, the first man. Besides, Eyo'o is omnipresent, manifesting himself in every one of his creatures. And God too, we are informed by the Bible, manifests his eternal power in His creation. Then comes the genealogical tree marvelously tracing the line through generations upon generations. This reminds us of the Biblical accounts in Genesis 5 and Matthew 1. Equally fascinating is the narrative style of the creation myth. The repetitions in the generational tree and its consequent song-likeness are more natural to the *mvét* than to the narration of the Christian Scriptures.

In case someone suspects that the Gabonese/Equatorial Guinea mythology is influenced by the Biblical story in Genesis, we may point out that traditional society existed long before the advent of both Christianity and Islam in Africa. Literacy, which would have enabled people to read the Biblical account and copy the style, came much later.

We now have a fitting background for the examination of Akan creation mythology. A popular Akan myth has it that in the beginning, God lived with his people. One woman, however, kept hitting God with her pestle whenever she pounded her *fufu* (a traditional food) according to one version of the myth. Another version states that the women washed their dirty

¹ The word *mvét* refers to the musical instrument (similar to the xylophone) or to the player of that instrument. The collection in the book from which this myth is taken is from Gabon and Equatorial Guinea. The Cameroun is equally well known for its *mvét*.

things and poured filth on God's house, the sky. Yet, a third version states that women kept cutting part of God's sky and using it to prepare their soup. Whatever the disturbance was, it troubled God so much that he complained but to no avail and so he was left with no choice but to ascend higher into the sky, separating himself from the people. This story is actually not a creation myth but an etiological tale explaining how God separated himself from his people.

This myth is similar to the Biblical story of God's relationship with his people, the Jews. Just as the African women disturbed God to cause him to move away from his people, so did the Jews push God away from them by their sins and their disobedience. In both cases, the close relationship between man and God was destroyed. The human sense of guilt is evident in the two cases. In the case of the Akans, man now has to approach God through the mediation of the divinities and the ancestors. In the Christian view, the gulf between God and man needs to be bridged through mediation and reconciliation through Jesus and the various saints (as well as the Virgin Mary to some Christian sects).

In the Christian myth of creation, man is created in the image of God and man's true destiny is to aspire to be like God. The Akans also express the same idea differently. God, according to the Akans, is the Great Ancestor, our *Nana* who, even though is high up in the heavens, is still close to his people. The spirits of the dead are also ancestors and their death gives them strength, power and wisdom to guide the living. So, the Akans also believe in man taking on some of the attributes of God. This belief is widespread in Africa. In the minds of the Bantu, according to Temples (1969: 64):

The dead also live ... When they consider the inner reality of being, they admit that deceased ancestors have not lost their reinforcing influence; and that the dead in general have acquired a greater knowledge as they have in fact been able to learn concerning vital and natural forces they use to strengthen the life of man on earth.

Temples (1969: 96)

The Akan view of God is evident in the names and the praise names they give to him. The following poem entitled "Onyankopon Kwame" was written by E.M. Adu-Darkwa. It uses many of the traditional praise names given to God by the Akan in the oral tradition:

Onyankopon Kwame a wobɔɔ osoro, ɔɔ asase,
Onyankopon Kwame a wobɔɔ nkwa, ɔɔ owuo,
Wo din de Yehowa – Anyame mu Nyankopon,
Ototurobonsu, Obɔadeɔ – Wone Awurade;
Opumpuni, Tweaduampɔn – Woyɔɔ domankoma.

Onyankopon Kwame who created heaven, created the earth
Onyankopon Kwame who created life, created death,
 Your name is Jehovah – God of all gods,
 Creator and Giver of rain – You are Lord;
 Mighty One, Dependable One – You are the Original Creator.

Onyankopon Kwame, Asase wura,
Ogo-mee Nyame a yene wo goro a yensu kom.
Onya-mee Nyame a yanya wo a na yamee
Ama-osu Ama-owia Nyame a wobɔ owia, tɔ nsuo,
Okyesoe Nyame a onnim ayeampam.

Onyankopon Kwame, Owner of the Earth,
 When we walk with you, we are never hungry.
 When we have you, we are satisfied
 You are the creator of the sun and the giver of rain.
 Generous God who knows no partiality

Bɔrebɔre Nyame a ɔɔɔ adeɔ, ɔɔ ne ho,
Onwanwafoɔ Nyame a onim anwene,
Na ɔno ara anwenwene, anwene ne ho ne ne ɔɔɔɔ.
Abubummabaa – ɔ wobaeɛ ansa na worenwene o,
ɔ wonweneɛ ansa na woreba o, obi nnim.

God who created all things and created himself,
 Wonderful God, expert weaver,
 He who wove and wove and wove himself and his likeness
Abubummabaa – whether you came before you wove,
 Or wove before you came, no one knows.

Onyankopon in Fante means the Greatest Friend. If the Akans call him *Kwame*, it is because he was born on Saturday. This seems to agree with the Christian version which depicts Saturday as the Sabbath – the day the Creator took a rest. The poet and Akan oral tradition saturates us with the fact of God as Creator. He is Creator, Expert Weaver who made the heavens, the earth, life, death, the sun and he is the giver of rain. He is the creator of the variety we see; the one who created all the diversity, created himself and human beings in his own likeness. The image in the last two lines of the third stanza is interesting. *Abubummabaa* is a small insect which weaves broken sticks around itself. The eternal question about this insect and ultimately about God who created it is whether it wove the broken sticks before it entered or whether it entered before it wove the sticks.

God is credited with the creation of all things. In the poem as in Akan oral tradition, the list of God's creation is made of good things. In the second line of the first stanza, God is said to have created death, the only odd one out of a list of positives. Akan oral tradition does not stop there but goes further, in fact, close to a blasphemy; e.g. *ɔdomankoma a ɔbɔɔ owuo maa owuo kum no* 'The Almighty who created death, only to be killed by death'. The Christian parallel is the death of Christ on the cross. Once again, we must not be talking about possible foreign influences since traditional beliefs existed well before Christianity came to Africa. The Akans or the Akan traditionalists, like the Christians, believe that death is as inevitable and as necessary as life.

Akan creation mythology does not seem to have the equivalent of Darwin's evolution or of the Big Bang theories that have confused and continue to confuse scientists themselves. The following riddle comes as a climax to the Akan vision of God the Creator:

<i>ɔkwan twa asuo</i>	(The path has crossed the river.
<i>Asuo twa ɔkwano</i>	The river has crossed the path
<i>ɔpanin ne hwan?</i>	Which is the elder?
<i>Yɛbɔɔ ɔkwan no kɔtoo asuo</i>	We made the path and found the river.
<i>Asuo no firi tete</i>	The river is from long ago,
<i>Asuo no firi ɔdomankoma ɔbɔade.</i> The river is from the Creator of the universe.)	

Beier (1967: 30)

The poem answers the crucial question "Which is the elder?" The path is man-made while the river was created long ago by God. If the river is timeless, then how do we describe the one who created it?

Creation myths generally make God the Creator but he enlists his creation as partners in different ways. In the Christian story of creation, God created all things but tasked Adam with naming the things he has created. This, according to Sutherland-Addy (1999: 130) means that God invites human beings to become co-creators with him. In the Akan myth, after God has created all things, he allows himself to be hounded out and he ascends further up into the sky leaving his creation to be looked after on his behalf by divinities and ancestors.

In another Akan myth, *Onyankopɔn* has three children of the same age. They are the sun, the moon and the stars. The Almighty decides that he wants to promote one of them above the other sons and so he sets a riddle for them to answer. He sends his emissary to summon the sons. Two of them – the moon and the stars – are very rude to the messenger while the sun shows all the traditional hospitality of a host. The messenger then helps the sun to answer the riddle and God makes the sun preeminent among his brothers giving him the exclusive right to patrol the universe by

day. By the same token he curses the moon and the stars to shine only at night. In this story, God appoints his creation as copartners in the creation process. A Yoruba myth depicts the Supreme Being who delegates the power of creation to his sons. According to the myth, *Olorun (Olodunmare)*, the great sky god, sent his eldest son, *Orischala*, to create the earth but on his way, he drank his head off and fell asleep. The second son *Oduduwa* in turn left and created the earth in a place called Ilife (Ife).

Procreation

This section deserves a poem for illustration. The poem was written by a Senegalese scientist, to be precise, a veterinary surgeon called Birago Diop:

Listen more often to Things than to Humans.

The voice of fire is audible

Hear the voice of water

Those who are dead are not gone

They are in the woman's breasts

They are in the wailing baby

And in the flaming firebrand

The dead are not under the ground.

Diop (1969: 45)

This may sound naive to his fellow scientists. Indeed if the dead are not gone and not under the earth, where then are they? To this pertinent question, the poet provides a scientific answer by pointing to the 'woman's breasts' and the 'wailing baby'.

The relationship between the breasts, the baby and the dead is clearly demonstrated. You may call it reincarnation. You may not believe it. But then, how do you explain the close resemblance between a baby and a family member who died long ago? Our belief is that what scientists call genetics may not be too different from what traditional religion calls reincarnation. Besides the baby/breast relationship is a matter of topical scientific interest. Do they not say these days that breast milk is safer than the feeding bottle?

As Baym et al (1979). notes, S. Eliot, who was no African, seems to share the African traditional vision of the world as an unbreakable chain uniting birth (the entrance) and the exit through death. He writes in a poem, *Burnt Norton*:

Time present and time past

Are both perhaps present in time future

And time future contained in time past.

Baym et al (1979: 1295)

Eliot establishes a close relationship between the past, the present and the future. He continues:

... the end precedes the beginning
And the end and the beginning were always there
Before the beginning and after the end
And all is always now.

Baym et al (1979: 1299)

Birth the beginning of life and death, the end are brought together here. Death comes before birth and both, according to Eliot 'were always there'. He states the fact even more pointedly in "The Journey of the Magi"

... were we led all that way for
Birth or Death? There was a birth certainly,
We had evidence and no doubt. I had seen birth and death,
But had thought they were different ...

Baym et al (1979: 1295)

Eliot thus comes to the conclusion that birth and death are not different, the same African view Soyinka expresses in his poem "Abiku".

... Abiku moans, shaping
Mounds from the yolk.

The child moans, building burial mounds from the sap of life. Yams also sprout from mounds after decay and death in the ground. So, Soyinka builds a close connection between life and death.

Biologically, we are told that human life begins in the womb where a sperm fertilizes an egg. The African traditional religious version is that the baby is planted in the womb by benign ancestors to re-unite with the living. You may call it another childish myth. If you do, then answer the following questions:

- a) How come the same meeting between sperm and egg does not always produce babies?
- b) Why does the same process sometimes produce twins or triplets?
- c) Why does it sometimes produce abnormal babies with fully grown teeth ready for meat?
- d) Why are certain babies still-born?
- e) Why do others die shortly after birth?
- f) Why are some born black and others white?
- g) Why are some born to rich families while others are poor?

h) In any case, where do the egg and sperm originate from?

We take inspiration from Andre Gide's title *If the Grain does not Die*, which is an allusion to the Biblical verse, John 12:24:

Verily, verily, I say unto you, Except a corn of wheat fall into the ground and die, it abideth alone: but if it die, it bringeth forth much fruit.

Indeed, biologically, the hard grain must necessarily die and decay. Then from under the earth where it was buried, it will emerge so transformed from its original state that we hardly recognize the mother grain. This little plant will then grow and pass through several stages till one day it produces fruits whose seeds are destined to go back to the soil. So at the end of the day we realize that the transformation is only an illusion. The Akan belief in the life/death cycle fits almost exactly into this scientific pattern. The belief is that the baby does not emerge *ex nihilo* and that the baby is the replica of one ancestor or the other or, indeed the personification of a departed relative who has resurrected after burial and decay. This is why the baby must be named after a dead relative.

Genetically, this apparent mystery is highly plausible. What we may deduce from the foregoing is that traditional science existed before western science discovered the wonders of genetics; for the mother grain is bound to produce grains physically and characteristically similar to the parent. After all, the crab, our elders say, can never give birth to a bird ((*ɔkɔtɔ nwo anoma*). The English version, 'like father, like son', is too simple and colourless because it restricts heredity to only the living parents.

Science or Superstition

An area where the life and death cycle is visibly demonstrated is where infants die repeatedly in a family (*awommawuo*). Traditional societies cannot understand sickle cell anemia which might be at the root of this phenomenon, which they do not hesitate to attribute to a witch. But they desperately need an answer to their problem. Naïve and incredible as it may sound, the answer is found in brutalizing the departing infant by drawing horrible designs on the baby's face, or by insulting the returnee by giving it ugly name like – *Dɔnko*, *Sumina*, *Nantwi*, *Abrɔwɔfie*, *Kaya*, *Yɔmpɔwɔ*. The traditional belief is that the baby (*bagyina*), thus maltreated and insulted, can no longer play tricks. It has to stay once and for all. The "abiku" syndrome, as we may call it, has been made famous by two Nigerian poets, J. P. Clark and Wole Soyinka.

Traditional religion has answers to all these questions. The baby is an envoy sent where and when the ancestors want him or her to be; and it is they who decide how he should appear. This is why certain families, no matter how rich they are, cannot make babies or can sometimes produce morons.

On the other hand, little jobless girls and families with absolutely no financial support effortlessly produce twins and triplets. Twins are sacred envoys from the spiritual world. They bring with them blessings and good luck from the other world. As such, they must be treated with utmost respect and reverence. They should not be separated but they may not marry the same man or woman. Whether twins have spiritual powers or not, circumstances surrounding their birth and the need to avoid unnecessary jealousies justify the myths that surround them. As for the mother of twins (*Twonta*), she enjoys special privileges in traditional society since she is credited with spiritual powers.

Teenage Pregnancy (Kyiribra)

The biblical word for pre-marital relationship is fornication, which often results in teenage pregnancy. Medically, we know that it promotes ill-health. Today AIDS is the greatest scare that threatens such youth. Traditional society takes many steps to prevent it in elaborate puberty rites – *Dipo*, *Bragro*, etc. Culprits are banished from the society of decent men and women to go and live in a hovel located well outside the village or town.

On this particular issue, it might be observed that science and Christianity have opened the flood gates to pre-marital sex by frowning upon the rites and the punishment that traditional society prescribed. In Islam the fear of premarital sex seems to support early marriage.

Choice of Spouse

Today, many marriages land on the rocks shortly after the fanfare because one of the couple might have realized the partner is a drunkard, a flirt, a cheat, etc. Traditionally, there was no marriage that was not preceded by a secret, thorough search conducted mainly by the mothers into the background of the suitor. There are several folktales about the pretty obstinate girl who rejected every suitor sanctioned by her parents. She ended up marrying a python or *sasabonsam*.

Science does not bother itself with such things. But Christianity tries to capture it through counseling. But the role of the family search should be given supreme importance, if we are to save our young daughters and sons from the hands of wolves disguised in sheep skins. We start from the Bible, the story of Ammon, son of David, who ravished his ravishing sister Tamar. The boy ended up being killed by his brother Absalom (2 Samuel

13). Science too discourages incest on the grounds that it tends to perpetuate the weakness inherent in the family/clan. Tradition prescribes specific punishment for this social aberration and specific rites to appease angry gods. The fact is that since parents have been pushed to the background in matters concerning the marriage of their own children, young lovers sometimes marry for some time before realizing that they come from the same extended family. What then should they do? Divorce or go ahead?

Death, the Leveler

We often console ourselves by saying that death is a leveler and an incorruptible judge in the sense that the rich and the poor, the white and the black, the sinner and the virtuous, the learned and the ignorant will all die one day and return to nature.

But is this claim wholly true? Some are driven by sheer want and desperation to commit suicide. Some babies are still-born, others die very young through hunger and natural disasters. Some mothers die during child birth. Some youngsters die in their teens through accidents and other catastrophes, whereas some live to up to 100 years. So, it is not true to say that "all die be die". In other words, death does discriminate. Death is neither a leveler nor a fair judge. This is why many African communities draw a clear line between the death of a young man/woman as against that of an old man/woman; between death through suicide or accident and natural death. The latter forms of death are seen as abominations (*mmusuo/atofowuo*) that must be exorcised from the community. There is no need therefore to celebrate them. The same argument goes against the first person to die in the family (*sodo*). No fanfare and no ceremony is held for fear that the unfortunate incident might open the floodgates for more to follow. As for babies, they are buried in pots (*kukuba*) without ceremony and the parents are forced to put on white clothes and to eat their delicacies as though they were in a festive mood.

These rites correspond, of course, to no visible reality. But myths are invariably rooted in a kind of scientific truth. The fact is that the loss of a dear one is so traumatic that it could bring about infertility if steps are not taken to minimize the psychological pain, and psychology is a scientific discipline. Indeed, psychology is the meeting place between science and religion.

At the end of the nineteenth century, Europe gave birth to an intellectual movement called Surrealism. It was the brain child of intellectuals who had been awfully disappointed by science after witnessing the untold disasters unleashed onto humanity by the two world wars. Parting company with reason, they preferred another level of reality which they rated over and above what you and I can see, touch, hear, smell or feel. In his wisdom,

Leopold Senghor, a Senegalese intellectual, preferred to locate the new reality beneath the one scientists know because in traditional Africa metaphysics, true and superior reality resides in the under-world.

The point that is of particular interest to us is that nobody in Europe dared to see in the activities of Guillaume, Apollinaire, Picasso, Dada, etc. as a return to fetishism or primitive life. Yet the same people do not hesitate to condemn every aspect of African culture as primitive. Apollinaire, the French poet, for instance, surrounded his entire house with statuettes imported from Africa. The Cubist art, initiated by Pablo Picasso, is said to have been inspired by African masks.

Looking Ahead

Of all black peoples who proudly stick to African traditional religion, we may easily single out the Beninois (Dahomeans), the Haitians and the Yorubas for medals. Indeed the vast majority of the scientists you meet in these places practice the voodoo or 'juju' alongside Christianity. They are neither shy nor afraid to identify with their cultural roots. The interesting contrast is that the majority of the scientists in our higher institutions of learning are practicing Christians, even though reason and faith are in principle no compatible bed fellows. They practise traditional religion alongside Christianity without daring to say so in public. We are therefore just as syncretic as our Beninois or Yoruba counterparts.

The doubting Thomases may ask: Do you sincerely believe these cock-and-bull stories? Our answer is that science is yet to unveil every part of the universe. Who knows if one day we are going to discover a planet completely alien to ours? Just as Galileo and Copernicus were branded as heretics for daring to go contrary to the dogmas of the Catholic church, we may or may not discover, one day a new world where scientific logic does not work, and where $2 + 2$ would make 5 instead of 4, as Aimé Césaire mockingly claims in his "Notes of a Return to the Native Land". The future may therefore lie in syncretism both scientific and religious.

Conclusion

We may say that, in Akan mythology, original creation is the work of God. The role of man is to procreate; in other words, to create on behalf of God. Parents are therefore no more than mediums for transporting spiritual envoys from one world into another. They are put in trust; they are not owners of their children.

We have also established that more often than not, it is not necessary to strip scientific reality from the mythological wrappings that make the truth more palatable to swallow. Today medical doctors in many hospitals in Ghana seem to agree with this principle since they start the day with prayers,

praises and worship. The function of this activity is to prepare the patients psychologically to trust the efficacy of the diagnosis, prescribed medicine or surgery administered.

Finally, we try to answer the question: Which way forward? The options are three:

1. Reach out to the past in total disrespect for whatever is modern.
2. Forget completely about the past and accept whatever comes from the developed world without any discrimination.
3. Select whatever is positive from Western culture and add it to carefully selected aspects of African culture.

The third option, which is the most palatable, implies the rejection of negative aspects of African culture as well as decadent aspects of Western culture. This also means that the new culture which is fast gaining grounds is hybrid, whether we like it or not. What we must understand is that racial, cultural, religious or tribal purity is neither attainable nor desirable. For as Aime Cesaire says in "Discours sur le Colonialisme (1956: 9): Any culture that shuts its doors to the outside world is doomed to starve and die for want of oxygen.

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CHAPTER 10

AKAN TRADITIONAL BELIEFS AND ENVIRONMENTAL SCIENCE

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Abstract: *This paper sets out to explore the intricate relations between various facets of traditional beliefs and practices on one hand and modern science on the other. Traditional religion which has been conscious of environmental protection since time immemorial is examined in particular under the following headings: the atmosphere, water bodies, flora and fauna, and mother earth. In each of these cases, we look closely at the link between these beliefs and modern environmental science. From the study, it becomes clear that traditional man knew of the absolute need to preserve the environment for the survival of the human species. He took definite steps to achieve this aim but this knowledge was always shrouded in mystery and secrecy since its modus operandi is spiritual. Modern science needs to acquaint itself with the realities behind these mysteries and find ways of harnessing them for the use of man.*

Introduction

*And hark! How blithe the throstle sings!
He too, is no mean preacher: come forth onto the light of things
Let Nature be your Teacher
Enough of Science and of Art:
"Close up those barren leaves;
Come forth and bring with you a heart that watches and
receives".¹*

We cannot talk of environmental pollution without tracing the problem to its roots; the Industrial Revolution, which may be described as the greatest enemy Nature has ever had to face. The first to vent their anger against the unwholesome effect of the Revolution were European writers like Charles Dickens in *Oliver Twist*, where he exposes the health hazards posed by

¹ In *The Tables Turned* by William Wordsworth, pg. 92.

smoke and soot churned out of factories. The same problem inspires two poems by William Blake both titled the "Chimney sweeper"².

In France, as early as the eighteenth century, Jean-Jacques Rousseau idealized the lifestyle of primeval man whom others called the "noble savage". A great deal of Romantic literature was inspired by a desire to escape from the polluted towns and cities in order to seek refuge in the country side. Alphonse Lamartine (*Le Lac*, *L'Autômne*) John Keats, ("Ode to a Nightingale", "To Autumn") William Wordsworth, (*The Daffodils*, *To the Cuckoo*) are only a few of such critics.

Factories and machines do not run on empty stomach. They need raw materials and energy to function. The earliest locomotive engines were powered by coal. But the vast majority of modern machines are fed on oil. Industrialized Europe was not well endowed with the raw materials required by their factories. Hence the need to colonize so called primitive people who did not appear to have any use for diamond, gold, bauxite, timber etc. which they had in abundance. It is through the exploitation of these resources that Europe defiled Africa and left behind an ugly history of soil degradation water and atmospheric pollution.

In this paper we take a critical look at the role of traditional religion in the face of massive exploitation of Africa's natural resources and the resultant environmental degradation. We focus mainly on these areas: the Earth, Water Bodies, Flora and Fauna.

Mother Earth

In Akan mythology the earth is personified as a woman born on Thursday, hence the name *Yaa*. In most cultures the world over, she is depicted as a mother famed for her abundant generosity which she showers on all and sundry without any discrimination.

Asase Yaa is the indispensable supporter of the living as well as the dead of whom she is the safe custodian. Humans, plants and water bodies are all her children who depend on her for sustenance. But the earth is more than that. She is a goddess next in rank to the almighty, *Onyankopon Twereduampɔn*. This hierarchy is recognized by all. In libation pouring, the first name to be evoked is that of God, followed by *Asase Yaa*, then the Ancestors. The fetish priest is well aware since he first sprinkles powder to the sky god, then to Mother Earth. This is his way of asking for permission for a successful performance.

² There is no denying of the fact that the industrial revolution marked a major breakthrough in the history of mankind. But its positive impact was sometimes tainted by negative by-products. Nineteenth century European writers in particular preferred to criticize the negative aspects rather than hail the positive ones.

Like the Jewish Sabbath, when the creator is said to have taken his rest, a day is set aside by every local village when it is strictly forbidden to go to farm. Admittedly, one day is not enough for the earth to replenish lost energy but it is enough to revitalize the farmer who must have toiled for six days non-stop from sunrise to sunset.

Around this scientific reason, the ancients wove an interesting story: if you go to the bush on that particular day you are sure to encounter Mother Earth disguised in the form of a weird old woman or a dwarf (*Aboatia*) or a monster (*Sasabonsam*). This was to ensure that people obeyed rules, given the fact that this society had no law enforcement agents.

Land Ownership and Mining Activities: Generally speaking, land is nobody's property. It is communally owned. The chief or family head holds it in trust, that is, on behalf of the extended family. No one has the right to sell part of it because it is a legacy from ancestors who closely monitor how we use it. Any abuse of land is likely to be met with punishment in the form of diseases like blindness, impotence, paralysis, or death. In short land is inalienable. Let us hear L. S. Senghor on this issue:

"The clan ancestor is the link man who unites the divine and the mortal, being himself a spirit, a kind of demi-god. It is he who has received from the local deity of the Earth, right of use of part of the land on behalf of his descendants, as common property which is inalienable.

*The oldest of the living members is the chain that link.
The living and the dead"*

Senghor (1964: 29)

In this regard modern chiefs, more than any others, must bear the blame. For a pittance they sell ancestral lands to foreigners in the name of so-called African hospitality which is a nice euphemism for selfishness and lack of responsibility. Once the land is sold there is no way anybody can control how it is used and for what purpose.

In the olden days, gold and for that matter, other precious minerals, were not supposed to be kept in large quantities by individuals. Any sizeable discovery was to be reported immediately to the local chief who in turn reported it to his superior. Whoever defied this injunction was doomed to be haunted by the spirit of precious metals till he lost his senses and confessed his crime which was punishable by death. The ultimate reason behind this injunction was the need to check the proliferation of precious minerals, thereby ensuring economic and financial stability.

Today, in the name of civilization and development mining operators strip Mother Earth naked by removing the vegetation cover and the top soil containing nutrients much needed for plant growth. To make matters worse, mining operators leave behind an ugly legacy of gaping man-holes which they do not care to fill or level up.

Mining activities also expose the land to soil erosion which impoverishes the soil, rendering it barren and useless for agriculture. Additionally trees that must have taken decades to grow are mercilessly and disrespectfully hacked down or uprooted with the aid of chain saws and bulldozers without the slightest concern for reforestation.

Research conducted by Baafi (1981: 24) shows that Akwatia, a diamond mining town in the Eastern Region was originally a farming village but mining activities have destroyed most of the farm lands resulting in shortage of foodstuffs, high prices and general economic hardships.

Besides, chemical substances such as sulphur, arsenic, cyanide, mercury used for processing minerals are highly toxic. They end up entering the soil, lakes and rivers thereby endangering human, animal and aquatic life. The same is true of all mining towns like Bibiani, Tarkwa, Obuasi. The dreaded Buruli ulcer is suspected to be caused by this environmental pollution. All these activities carried out with the aid of science and technology and in the name of development amount to desecration of *Asase Yaa* who does not hesitate to punish us in the form of drought, famine, and diseases.

In her research carried out at Obuasi and her environs, Abrefa (2000: 29-32) comes to the conclusion that agriculture in Obuasi is on the verge of dying because of the pollution of the air, soil and water by mining activities. She further discovers that some of the diseases resulting from arsenic pollution are skin diseases like hyper pigmentation and eye inflammation. She cites inhabitants of Anyimadukro, Anyinabrem and Naintain among the most vulnerable to diarrhea and respiratory problems due respectively to the consumption of contaminated water and to dust in the atmosphere caused by surface mining. All these are responsible for the high mortality rate.

Like mining operators timber contractors often arrogate to themselves absolute authority over all trees and undergrowth within their concessions. For every tree they fell the entire plant neighbourhood has to be sacrificed to the whims and caprices of merciless tractors.

Desecration of Sacred Places

Mining operators are not the only ones who hide behind science and technology to pour scorn on traditional beliefs. Civil engineers who design roads across cemeteries and sacred groves, estate developers who merrily

build houses in cemeteries, chiefs who sell out plots of land in sacred places are all guilty of this unwholesome practice. All these cases involve the excavation of old and fresh skeletons which are transported elsewhere to be dumped dishonorably into mass graves.

In popular belief cemeteries are resting places of the dead, both old and new; whoever disturbs such places by day and more particularly by night is sure to encounter ghosts, except where such activities are really inevitable. Behind this myth is the fact that cemeteries are the repository of relics of ancient civilizations. Indeed archeological excavations in South America have uncovered wonderful artifacts of the Incas and Aztecs. Similar excavations in East Africa have enabled scientists to estimate the age of the first man on earth.

Whereas such excavations may be considered as useful and therefore acceptable building of roads across cemeteries cannot be defended especially as, with a little bit of imagination and effort, these sacred places could have been spared. Now, if sacred places can be defiled with impunity, what stops rogues from vandalizing tombs in search of precious metals that might have accompanied the dead to their grave? Awudome in particular has witnessed many such activities.

Cemeteries and sacred groves are of course no match for bulldozers but there is a remote price we pay for our effrontery. Realizing the silence and impotence of the dead, drug addicts have turned cemeteries into safe havens where they ply their trade and empty their bowels with impunity, only to pounce on us at night as armed robbers.

Sacred places include certain rocks, mountains, and other peculiar land formations specially designated and given names because of their peculiar nature or shape. They are worshipped as deities. A typical example is the rock Tekpete in Kloyom (the Krobo Mountains) on which the Krobo girls are made to sit for purification during the Dipo rituals. It is believed that the rock cleanses and insulates them against all sorts of venereal diseases. Another example is the Boti Falls near Koforidua. It is believed that the spirit incarnated by the falls is opposed to being photographed.

But deification of peculiar geographical phenomena is, as a matter of fact, no more than a strategy for preserving nature and for promoting tourism. This is an area where modern science and traditional science agree, except that engineers who have no respect for nature are only too glad to show the power of technology by targeting such rocks and mountains for demolition.

Water Bodies

In most West African traditional beliefs water is considered to be sacred. The sanctity, purity, as well as the immeasurable necessity, has led to sayings

such as *Kronkron*, *Kronkron Tano* 'Pure, Pure Tano'. God is called *Toturo Bonsu a tɔtɔ nsuo*, that is *God, the fount of water*. He is also called *Amosu* 'the giver of water', Water, therefore, is vital to life. The English saying 'Water is life' sums up all the traditional beliefs about water. It is an essential product of man's life on earth.

These same traditional beliefs about water bodies have guided man to institute a lot of taboos and a lot of practices regulating the use of water as well as its preservation. The myth of "*Maame Wata*" the goddess of the sea is prevalent in most West African communities. This goddess evokes respect traditionally. The rules governing its being must not be infringed upon. Names of water bodies (rivers, lakes, lagoons, and the sea) prove that, in the world view of the traditional man, water is given due reverence and importance. The Akans call the sea *Bosompo*. River Pra and the lake, called *Bosompɔ* and *Bosomtwe* respectively, are all regarded as deities whose rules must be respected. Indeed the lake is reported to have been given the name *Bosomtwe* after a hunter had chased a wounded antelope (i.e., *twe*) to a tiny shallow lake. The antelope is reported to have entered the lake and mysteriously disappeared. Unable to explain the mystery, the hunter came to the conclusion that the antelope must be the embodiment of the goddess of the lake. Whether we believe it or not, we need to protect the lake to attract tourists. A myth then is a very useful medium for preventing the destruction of the Eco-system.

According to Abayie-Boateng I (1993), the fetish priest always refers to God, the Omnipotent, before performing and, in his performance, a priest, Safo Taakora, sings this song:

"Brefia Tano ee, Kronkron Tano ee!

Merekɔ frɛ Nyame ansa na maba."

Sacred Tano, Holy Tano!

I am going to call god before coming to perform in public.

Here, the River Tano is called both sacred and holy. The god Tano is further addressed as follows.

Konkon Tano,

Birefia Tano,

River god of the King of Ashanti.

Noble river, noble and gracious one,

When we are about to go to war,

We break the news to you.

Slowly and patiently I get on my feet.

Slowly and patiently I get on my feet.

Ta Kofi, noble one,

Firampon condolences! Condolences! Condolences!

*Ta Kofi, noble one,
The drummer of the talking drums says
He is kneeling before you.
He prays you, he is about to drum on the talking drum.
When he drums, let his drumming be smooth and steady.
Do not let him falter.
I am learning let me succeed."*

This drum prelude and many such thoughts go a long way to stress the importance of water. It is for this reason that certain taboos have been constituted in connection with water bodies. Messrs Dokyi and Kwarteng (personal communication) of the Kwame Nkrumah University of Science and Technology explain that between Bepoase and Funfuni near Wiemoase in the Effigyia Sekyere District is found the Water-heads of the Afram River. No farming is allowed there and, to re-enforce the protection of the environment, the place has been made the abode of the river god. The god there is called Afram. It is forbidden to farm near the place.

The River Nyamaa is reputed to be a goddess whose major concern is to punish wrongdoers. It is generally believed that wherever and whenever she is invoked to impose justice, her judgment is swift; the culprit will die within the shortest possible time. The deity is located at Antoa, a small town that is close to Kumasi in the Ashanti Region of Ghana. The need for social justice might be the main reason behind the *Antoa Nyamaa* cult which should be situated within a social context where people have lost faith in the judicial system.

Taboos

One may not farm at points close to water heads or sources of streams or rivers. Though this is culturally explained as a taboo against the river god, we realize that it is indeed a measure to protect the river from exposure to the sun and eventual drying up. Today the wanton destruction of flora around river heads is one of the main causes of environmental degradation and ecological disorder. In the urban areas buildings are constructed without plan on rivers and streams and this adds even more to pollution. If we could all respect the free movement of water along river beds pollution in urban communities especially in the suburbs of these cities would be minimized.

A little river called Subiri at Adwumakase-kese in the Kwabre district of the Ashanti Region of Ghana is protected by a forest belt believed to be sacred. Since time immemorial both the forest and the river have been enjoying this protection. But times have changed. Presently, sand winners

are digging tons of sand from the forest thereby desecrating both the forest and the river. It is to be expected that the river will soon dry up while the forest vegetation and animals are seriously threatened.

Fishing communities along the West African coast usually have a day on which it is forbidden to go to sea. We believe that even though the mythical explanation behind this taboo is that the sea goddess would reveal itself in its entire monstrosity to such recalcitrant fishermen, the real reason is ecological or environmental. It helps to allow the fish population to get replenished. This also allows fishermen to have a day of rest, to regain their energies. Odoteye (2006: 115) stresses that there was and still remains a significant religious dimension and belief system with rules and dimensions for controlling and managing the fishery resources and migration of fishermen along the coast.

Defecation in the river bodies: Defecation in any of the river bodies is a taboo. Rivers, as already stated, are considered as pure and the water from the rivers like River Tano is used for the purification of the State and the Stool during religious festivals such as *Akwasidae* and *Odwira*. As a sacred entity, water should not be desecrated. Any infringement of this role, it is believed, would bring disaster on the offender and on the society. We observe, however, that the taboo is used to enforce the cleanliness and purity of the river against water pollution. Pollution would bring harm including diseases of all sorts on people who drink it. The taboo therefore serves the needs of man by protecting his health in a sound environment. A return to the traditional regulations would greatly enhance man's health.

Fishing: Fishing in certain parts of some rivers is prohibited. There are parts of the Tano river in which fishing is prohibited. In other parts of the river, such prohibitions do not apply. The reason for such regulations is religious and is shrouded in secrecy and myth. We realize, however, that this prohibition helps to protect the stock of fish from getting depleted and thus saving the fish population for the use of man. Most of these traditional beliefs and practices regarding fishing in various river bodies, we suggest, have been influential in keeping the rivers rich with fish.

Flora: Just as there are examples from the Earth/land to show that traditional beliefs and practices linked to them are actually meant to preserve the environment, so are there instances from flora and fauna in traditional African societies to which are associated beliefs and practices aimed primarily at environmental protection. With flora, one may cite the following instances:

- Medicinal herbs are collected secretly or in the night after certain rituals have been performed before they are processed and applied.

- In countries in the Sahel, the baobab tree, ostensibly because of its relative size and height, is held to be inhabited by a spirit or goddess and is therefore revered.
- In the forest areas where the Akans of Ghana are found, the *Onyina* (Silk cotton tree), which is also noted for its commanding height and size, is also revered. Before it is harvested for any purpose certain rituals have to be performed. It is believed that in traditional setting failure to do so may bring calamity upon harvester, his family or the community of which he is a member.
- Among the Akans of Ghana, the climbing plant called *Homakyem* in Asante and *Homatre* in Brong, commands awe and respect by its commanding presence, with the upper end entangled in the branches of some giant tree and the lower end rooted in the ground at an angle of about 45 degrees. Lack of records about how this plant manages to climb so high without ostensibly climbing the stem of the giant tree itself has led local communities to speculate that this plant is inhabited by a spirit (goddess) and is therefore revered. It is claimed that any slash of the cutlass on the stem by anyone who attempts to cut this plant down calls forth blood instead of the usual sap we expect from trees and that during the night that follows it wails.
- Again, among the Akans of Ghana, the plant called *Sese* from which the *Sesedwa*, stool for kings and queens, is made is revered and certain rituals have to be performed on the *Fema* tree whose branches provide material for the sticks used to beat the *Atumpan* drums (Akan talking drums used and owned only by Kings/Chiefs).
- We must not forget the wonderful tree called *Akonkodee* or *Akata*. At the right season, there is no distinction between leaves, fruits and flowers as they all fuse into marvelous reddish crowns adorning the top of the trees. Children love it but they are warned not to go there alone for fear that dwarfs might kidnap them. For what is good for children appears to be equally good for dwarfs. The scientific reason behind this beautiful story is that the marvelous tree needs to be mystified if it is to escape extinction.

Fauna: Now, when we focus attention on fauna, we notice equally fascinating convergences between Akan Traditional beliefs and practices and environmental science, in terms of objectives. A few examples are cited below to illustrate our point.

To the Akan people, the buffalo (trɔmo in Twi) is known to be a dangerous and fearful animal and, for that matter, anyone who is able to kill one has to undergo some purification rites if he wants to lead a normal life thereafter.

The Akan proverb: *Se wobekum Ɔtrɔmo na wadware sasaduro deɛ, gyae no na ɔmfa ne dwace nnante nko* 'If you'll kill a buffalo only to undergo cleansing then why not leave it alone and have your peace?' is another way of saying that it is not worth the trouble of hunting down the animal. Incidentally the buffalo population is not only small but also keeps dwindling, making them endangered species. From hindsight, therefore, it can be said that the "purification" clause was only a measure meant to preserve the species.

- The case of the buffalo calls to mind that of Akan beliefs associated with the deer (*ɔwansane*) This animal is said to possess witchcraft and this makes people wary of hunting or trapping it. Indeed few people eat its flesh. Other creatures considered as endangered species include the owl "believed to be the prophet of doom and death. For this reason it is protected from extinction. Vultures and crows which are useful as scavengers are inedible and rightly so because we need to protect these health inspectors who help us to get rid of carcasses of animals. We cannot forget the weaver bird (*Akyem*) which seems to enjoy the neighbourhood of man. These master craftsmen weave intricate nests whose entrance hangs loose in such a way that no snake can enter. They are a common sight in most villages, yet even the most mischievous boys do not shoot or trap them for food. This is because this creature makes wonderful designs sings melodiously and is beautiful to look at. So everybody feels the need to protect it. Monkeys which are scientifically very close to human beings enjoy the pride of place. At Fiema in the Brong Ahafo Region they are neither killed nor eaten. Indeed a dead monkey is given a befitting burial. At the other end of Brong Ahafo, near the Ivory Coast border, it is strictly forbidden to kill monkeys. But, as soon as they cross to the other side of the border, they may be killed for food. Once again, beyond the mysteries surrounding monkeys, we come back to the same root-cause, namely, environmental protection. By convention, hunters respect a period of the year when they do not hunt in order to allow the animals time to breed. Besides, animals that have freshly littered or are pregnant are not supposed to be killed. The proverb *ɔɔfoɔ a onnim aboa yarefoɔ* 'the hunter that know not a sick animal' seeks to ridicule the hunter who shoots a sick animal.
- Again, beliefs and practices associated with clans and totems among Akans can arguably be said to be a means of preserving nature. The clans, variously put between 6-9, and their totems may be classified as follows using information from Braffi (1972):

CLAN	TOTEM	ATTRIBUTE
1. Oyoko/Odako	falcon	Patience
2. Bretuo/ Agona	Leopard	Aggression (eloquence)
3. Asona	crow /raven	Wisdom
4. Asenee	bat	Diplomacy
5. Aduana	Dog	Skill
6. Ekosna/ Asokore	Buffalo	Uprightness

Braffi (1992:16-24) says of clanship:

Clanship, upon which rests the whole fabric of the society of the Akan peoples, is based upon the belief that between the members of a group of families and certain classes of natural objects such as animals, birds fishes and plants, certain intimate relationships exist. Such species of animals, birds or fish are regarded respectively as totems of the common origin of the tribe; for this reason the members do not eat, kill or trap such animals or birds or fishes. On the sale or death of a totem, any member of its representative tribe would buy or bury it with every show of respect, as could be expressed towards their human members; or if captured alive ransom of a large sum of money would be offered.

As there is no vandalistic destruction in nature, every totemic animal or bird is given a spiritual or symbolic quality....."

This is where we borrow an example from Camara Laye's "L'enfant Noir" (1954). We should understand why the mother of the little boy is frightened because the innocent boy is playing games with a snake. But the father arrives in time to explain that there is a pact between his clan and this particular snake, which enjoins them to respect and protect each other. After the encounter with the snake the child asks his father and the following discourse took place:

- "Father what is this little snake that visits you?
- Which snake are you talking about?
- The little black snake which my mother says I shouldn't kill.
- Ah, he said.
- He looked at me a long while. He seemed unwilling to answer me. He was no doubt thinking about my age, wondering if it

was not too early to disclose this secret to a twelve year old child. Then he suddenly made up his mind.

- *That snake is the spiritual guardian of our clan. Do you understand?*
- *Yes, I replied, even though I did not understand clearly.*
- *That snake, he continued, is always present; it always appears before one of us. In our generation, it is to me that it revealed itself"*

Camara Laye, 1954: 13-19

For similar reasons, Mrs. Laye whose totem is the crocodile cannot be touched by any crocodile, for such a breach of agreement would amount to cannibalism if not suicide and would threaten the survival of both parties.

It does appear from the foregoing, that totemism is not only in Ghana but all over Africa. The fundamental aim of totemism is to ensure the survival of certain species, nothing more, and nothing less. It will therefore be unfortunate and superficial to associate such beliefs with primitive mentality. Whatever reason is given for the choice of these animals as totems (myths, life experiences by some ancestor or perceived qualities from the viewpoint of a particular culture), the fact still remains that by revering these animals we contribute to environmental conservation.

Conclusion

The foregoing shows that traditional society had its own concept of environmental protection. As a matter of fact, it is modern society aided by technology (which is the applied form of science) which is to take the blame for environmental degradation in Africa. Christianity too has its share of the blame. By demystifying areas hitherto considered sacrosanct, the Christian religion has indirectly encouraged the youth to disrespect sacred groves, water bodies, plants and animals, and defiled mother Earth. The strange thing is that the very people who are responsible for large scale environmental destruction are the ones who come back by the back door disguised as friends of the environment.

Machines have, needless to say, no human face. But machines can do no more than what thinking human beings in flesh and blood, command them to do. Much as we need science and technology to develop, we need to give a human face to technological civilization. The Chinese, Japanese, Malaysians, etc. have made technological strides without abandoning their traditional way of life.

Animism (the traditional belief that there is life in rocks, mountains, the sea, rivers, lakes, flora and fauna) is not the religion of primitive people. Rather, it is a manifestation of the African's close attachment to nature.

It would be fair to point out though that the same traditional beliefs do not prevent Africans from setting fire to the bush, thereby causing severe damage to soil, atmosphere, plants and animals as well as water bodies and aquatic life. Besides in the mining areas some of the havoc is caused by local boys operating under the name of "Galamsay". All this is to show that we have our own share of the blame.

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CHAPTER 12

RELIGIOUSLY INCORRECT: AN OVERVIEW OF SOME RELIGION-CENTRED LANGUAGE

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Abstract: *The usage of a particular language or expression may be regarded as being politically incorrect. In this paper, we strive to determine as to whether it is also possible for one to be religiously incorrect or not. Drawing data from some languages, cultures and religious groups in Ghana in particular, we explain that specific languages, expressions and/or words are particularly associated with specific religions, denominations (of a religion) or occasions and that it is incumbent on one to know and use them appropriately. Again we explain that, depending on one's religion and environment one finds oneself, a particular register would be employed. We put emphasis on the fact that one's inability to recognize different religious environments and occasions may cause one to be religiously incorrect.*

Introduction

It has been claimed in several quarters that language could hardly be separated from culture and religion (see Wardhaugh (2005) for example). Brown (1958) notes, quoting from a speech made by Martin A. Nowak, a Harvard professor of mathematics and biology, that "Religion, like language, is a human universal ...". So, religion and language go hand-in-hand in the realization of individual goals they are intended for. Indeed, language and religion have often worked together in several and diverse endeavors and, as Safran (2008: 171) explains, language and religion are related in the sense that both have deep structures and both are regarded as parts of 'primordialism'; individuals are (normally) born into both. Thus, primordialism goes a long way to explain why language and religion continue to be the two most important ingredients in the definition of ethnonational identity. It is no accident that language and religion have provided and continues to provide some grounds for several national and international hostilities and agreements. One of such hostilities that continue to disturb world peace is the never-ending Arab/Palestinian-Israeli conflict. While land and various border disputes and related issues have often been seen as the causes that persistently fuel the Arab-Israeli conflict, one cannot undermine

the fact that there is a contribution of religious and/or ethno-cultural differences. And, since issues on religion and language are intertwined (for religion is expressed mainly through language), the contribution of language cannot be undermined. Accordingly, just like religious differences, language differences have fanned some conflicts. Besides the Arab-Israeli conflict, one could think about the Catholic-Protestant conflict in the Northern Ireland, an intra-national one.

Many works such as Brown (1958) and Orosz (2008) have concentrated on discussions on religion and its relationship with language and other factors that affect social integration; i.e., the concentration on religion-sociolinguistic connection. In this paper, we continue to delve into the religion-sociolinguistic connection, but in a different direction. We direct attention to language (specifically, words and pieces of expressions) and how it draws distinctions between different religions. We contend that, through language and different uses of aspects of it, many religions and even denominations (within a particular religion) make reference to similar or same entities, items, beliefs, representations, etc. differently and that the inappropriate use of specific reference term or expression in each religion and/or denomination would amount to religious incorrectness. That is to say, just as some language uses or expressions are regarded as politically incorrect, so is it with language use in religious circles such that one could be religiously incorrect. In some religions, such language-motivated religious incorrectness could be tantamount to having committed a heinous crime that is punishable by even death.

Specific language distinctions

What exactly is or constitutes religious incorrectness? In explaining, we draw inspiration from the definition of political incorrectness, which is generally explained as the use of expressions and/or actions (which may include gestures) that can be perceived as excluding, marginalizing or insulting groups of people who are socio-politically disadvantaged or discriminated against. Following this explanation, we explain religious incorrectness as the use of language (i.e., terms and expressions) that does not reflect the norms of a particular religion. In other words, while a particular use of a language could be fine in itself, it could be seen as inappropriate in relation to a particular religion. It is thus important that one guards against religious incorrectness. It is important to note that religious or sacred language is a moral discourse. In other words, language about God is really language about how people should behave towards each other and, so, it must be devoid of incorrectness if mutual respect is to be sustained. For people to guard against religious incorrectness and, for that matter, to behave well towards each other, they need to know that

different registers are associated with different religions and/or different denominations. Accordingly, it is important that one has some appreciable level of mastery over various religious registers. Otherwise, one should be cautious in talking about a religion or, better still, avoid engaging in unnecessary conversation about it.

It is known from history and recent happenings that the so-called inappropriate use of religious language and, for that matter, religious incorrectness has left some people in trouble in some purely religion-oriented societies, particularly in Islamic ones. A case in point is that of Gillian Gibbons, a British schoolteacher who got into trouble in the Sudan because she had allegedly named a teddy-bear Muhammad.¹ While this teacher may have done that in adoration of Muhammad as a religious figure (she holds in high-esteem), her act was considered as a blasphemy to the prophet Muhammad and Islam and offensive to believers of the religion. This therefore explains the need for one to be cautioned not to be caught in religious incorrectness. Indeed, it took the call of leniency from the British government and some world powers for her to be pardoned.

Religious Registers

The term register is widely used in Sociolinguistics, a branch of Linguistics, as a language variety that is associated with a particular topic, subject, discipline or activity (e.g., Wardhaugh (1986), Trudgill (1992)). This means that the topic or issue one is talking about should determine one's choice of words and expression. Hence, it is possible for the same person to use very different linguistic items to express more or less the same meaning on different occasions depending on the subject being talked about.

In a broader sense of religious correctness, we note that many religions are associated with specific languages and this could be explained as due to where a religion must have originated. Such religion-specific languages are often referred to as sacred languages. Also sometimes referred to as liturgical language, a sacred language is a language that is employed for religious purposes by people who speak languages other than it, in their daily life. A number of different languages have been used as sacred languages in different religions and denominations. Such languages include Ecclesiastical Latin, Hebrew, Sanskrit and Pali which are respectively used by the Roman Catholic Church, Judaism, Hinduism and Theravada Buddhism. Syriac is also generally used as a liturgical language by Syriac Christians. Last, but not the least, here is Classical Arabic which is also the sacred language for Islam.²

¹ http://www.metro.co.uk/news/article.html?in_article_id=77069&in_page_id=34 (17/06/08)

² Several works suggest that Classical Arabic is the only true language of Islam (the Qur'an) and that it differs markedly from the various contemporary spoken Arabic forms.

There are other sacred language uses that have overstepped religious affiliation. One of such cases is the differences in English language usage between the Protestants and Catholics (in the Northern Ireland in particular. For instance, of some books in the old testament of the Bible, while Catholics refer to them as *deutercanonical*, Protestants call it *apocryphal*.

We note that misguided attempts to bring sacred languages of the individual religions in line with current trends – i.e., modernization of sacred languages – could result in loss of religious faith, since some religious stipulations are embedded in the sacred language. But, it is important to note that the modernization of such languages could not be the sole cause of a loss of religious faith. For instance, today, many intensely loyal Roman Catholics lament over the abandonment of the Latin Mass in favour of various vernacular on the basis that such abandonments have contributed to the loss of some traditional Catholic stipulations in particular and the Catholic faith in general. In the Church of England, while the attraction of the young generation might have been the motivation for the disuse of the Book of Common Prayer was perhaps to, (Freeman 2001) notes that this attempt has not prompted an influx of young worshippers to the pews.³ So, perhaps, religious groups should keep using their traditional ways of worship. However, it is necessary to recognize that language is dynamic. In other words, languages evolve over time and, since religion and its beliefs are expressed with language, the same could be said for religion. Deacon (1997) puts it as follows:

‘... as a language passes from generation to generation, the vocabulary and syntactical rules tend to get modified by transmission errors, by the active creativity of its users, and by influences from other languages. Eventually words, phraseology and syntax will diverge so radically that people will find it impossible to mix element without confusion. By analogy to biological evolution, different lineages of common ancestral language will diverge so far from each other as to become reproductively incompatible.’

Deacon (1997:22)

Considering the number of languages that is/could be considered as sacred to individual religions, coupled with the issues of borrowing (of words) and the tendency for non-native speakers of the so-called sacred (and for that matter ‘superior’) languages to borrow from it into their individual native languages, one is set to be inundated with variety of referent terms of sacred purposes to items, processes, states, etc. which are often similar

³ The Book of Common Prayer, the first of which was published in 1549, encompasses a number of prayer books of the Church of England. It is used in the Anglican Churches. It is viewed as a ‘reformation’ product.

across different religions and/or cultures. As a result, to some extent, a keen acquisition of a particular religion would involve a conscious effort in the learning of a new set of vocabulary and, possibly, a new form of syntax. In other words, one would have to acquire new terms of reference and sentence structures when one is acquiring a new religion. A case in point is the use of 'thee', 'thy', etc. and certain phraseology such as 'believing on the Lord Jesus' instead of 'believing in the Lord Jesus' in some Christian circles. Because what is said may partially condition what can be thought, the use of such speech patterns and expressions has subtle psychological effects on its users. Also, to some extent, believers of a religion would express some of the words and phrases almost unconsciously. For instance, when a Muslim mentions the name Muhammad, he or she is sure to follow it up with *Salaahu Allaihi wasalaam* (which translates as 'the peace and mercy of Allah be upon him').

Christianity and Islam in Akan Speaking Communities

Having explained religious incorrectness and some related issues of it in the earlier section, in this section, we explore some of the specific terms and phrases between followers of two major religions in Ghana – i.e., Christianity and Islam. In particular, we explore these terms and phrases as used by the Akan people and/or in Akan speaking communities. Being one of the most widely spoken language in Ghana, if not the most widely spoken as the 2000 population census (which also identifies Akan people as constituting the largest ethnic group; i.e. 49.1%) suggests, we realized that getting such terms and phrases as used in Akan would not be much of a hustle.

Back to the two religions in Ghana under discussion, Christianity and Islam, we observe that the choice of religious terms and expressions by members of these religious groups in the Akan community differ, even though they often refer to the same item or idea as noted earlier. We could therefore say that each religion has developed and continue to develop a distinct register. We assume a development of a register because these religion are not traditionally Akan and for them to employ a unique set of words could only be explained as a development of words. The following are a few examples register distinction.

The examples in (1) underscore the differences in language use between religious groups. So, people who share a common native or local language, but who also belong to different religious groups, will use terms in the individual (sacred) languages associated with the individual religions they belong to refer to objects and ideas that have to do with religion. For instance, as could be observed in (1), in referring to the place of worship in an Akan community of Islamic religion orientation, people will prefer to use the

1. Christian	Islam	English Translation
Asɔredan	masalakyi	church building/mosque
Onyankopɔn	Allah	God
Yesu	(Anabi) Isa	Jesus
Sɔfo	imam	overseer/pastor
Kɔ asɔre	Kɔfrɛ Nyame	Go and worship
Som Nyame	Yɔ asɔre	To worship God
Bɔ mpaɛɛ (mpaɛbɔ)	Frɔ Nyame (Nyamefrɛ)	To pray (praying)
Akɔmkyene	kyiriwia	Fasting
wie akɔmkyene	gu kyiriwia	To end fasting
Nsahohorɔ	nsukita	Ablution

term *masalakyi* instead of the term *asɔredan* in the Akan language. *Asɔredan* is rather used by an Akan who is a Christian (and living in a Christian community).⁴

Another term from (1) that is of interesting difference between Christians and Moslems in Akan communities is the use of the word *God*. Basically, the Akan Christians prefer to use the item *Onyame* or *Onyankopɔn*, while Akans belonging to the Islamic faith prefer the term *Allah*. From our interview with followers of the two religions, we realized that the two linguistic items of *Onyame* and *Allah* give some kind of deeper meaning (of the entity each refers to) to their respective users. They partially condition their minds and give them a deeper understanding of the being they are worshipping. Even though it is generally believed that *Allah* and *Onyankopɔn* or *Onyame* are used to refer to the same being of supreme importance, the use of these words have more than reference importance in the respective religions; the use of them have some kind of psychological effect on the minds of their users. We could therefore say that *Allah* and *Onyame* communicate more effectively to the members of the respective religious groups.

We observed from our inquisition that Christians do not feel comfortable using the term *Allah* to refer to God. On further enquiries, we came to understand that Christians are not comfortable using the term *Allah* because they believe that *Allah* is a different being and not the Supreme Being they believe to be God. Hence, the kind of understanding they get when the term *Onyankopɔn* and related ones in the Akan language are used is different from when *Allah*, a sacred language internal term, is used. Basically, this explains and emphasizes the fact that the Arabic language, from which the term *Allah* comes from, is recognized by Christians and followers of other religious groups as purely a sacred language for Islam despite the fact that

⁴ We realize that *masalakyi* is not an Arabic term but, rather, *masjid*. Considering borrowing and its associated deviations, that is how *masjid* has come to be pronounced in Dagomba and Hausa, *masalakyi*. Indeed, also observed in our interactions with a scholar that another deviation of *masjid*, *missiri*, is also used among the Moslem population in the Upper-West region of Ghana.

the Bible has even been translated into Arabic. Accordingly, for a Christian to be religiously correct, the use of appropriate Christian terms is paramount.

We realized that Moslems also avoid using the term *Onyame* or *Onyankopon*, as used by Christians, on the basis that the term could be used for any other deity. Most Moslem respondents however admitted that, in ordinary conversations and with non-believers of the Islamic faith in particular, they would not mind using *Onyame* in place of *Allah* but definitely not in prayers. And so, while an Akan Moslem may consider using the term *Onyankopon*, an Akan Christian will not entertain the idea of using the term *Allah* at all. But this is understandable in the sense that while the term *Allah* remains in the sacred language of Islam, Arabic, *Onyankopon* is what has been developed in the receptor language of Akan. It is issues of deep-seated religious inclination like this that have contributed to the explosion of different linguistic items being used by different religious group and denominations even though, often, people belonging to the different religious orientations share the same ethnic background or common nationality. And, although unconsciously, this is all in the name of being religiously correct.

Despite the desire of different religious groups, here Christians and Moslems, to adhere to terms and expressions in their individual registers, it is interesting to note that in cases where a Christian is talking to a group of Moslems or a Moslem is doing so to a Christian group, in order to achieve a certain level of psychological influence, the speaker will resort to the use of linguistic items that are associated with the religion of his hearers. Thus, for the sake of solidarity, it is not uncommon to hear a Christian making use of some Islamic expression, for instance saying *As Salaa mu Alaikum* (meaning 'peace be unto you') when he or she is greeting. Thus, we could also suggest that being religiously correct enables effective dissemination and reception of whatever information one desires to put across.

Besides the inter-religion differences we have discussed, one would also wonder about what pertains within the same religion. That is, are there intra-religion differences; are there differences in language usage between denominations in a particular religion? In the following section, we explore what pertains in Christianity in Ghana and among the Akans in particular and how different denominations trigger different language uses.

Differences in Christian Denominations

Differences in reference of same or similar religious ideas and items are not only inter-religion, but also intra-religion and that is the case in Christianity. That is to say, there are some denominations in the Christian faith that have different linguistic items when it comes to referring to ideas, beliefs, etc in the religion. The emergence of these denominations could be explained

by advancement of knowledge. But, we observe that, to some extent, it has to do with the desire of a group of people to be religiously correct with regards to some pertinent beliefs which, indeed, should not have been divisive. Consider the case of Catholics and Protestants in the Northern Ireland. Although both belong to the Christian faith, differences in ideas have driven them apart to the extent that, even, the style or the architecture of their places of worship is characteristically different and, with language use, so much terms and expressions are available.

Coming back to Akan Christians, we observe that people of the Roman Catholic faith in particular assiduously hold on to sacred language of the faith, which we have noted as Latin. From our inquisition from Akan Catholic believers, we realized that most non-native speakers of Latin, in this case native speakers of Aka, do not understand the Latin terms used during church service and only mimic responses to various saying in the language. However, they find the use of the language and its association with the religion as strength of the Catholic faith. The other Christians who more or less adopt English in their activities see no special use of Latin by the Catholics. But they do not see English as a sacred language. Many of such Christians hold the view that tongues should be regarded as a sacred language,⁵ if we are to consider any language as such. To them, the fact that even the speaker of tongues may not understand what he or she is saying, makes tongues a mystery and for that matter sacred to the Christian faith of particular Christian denominations.

With regards to terms of reference, the Roman Catholics have several. A common one among Akan Catholics which is of interest here is *mass* and it is used to refer to *church service* (particularly of a particular nature and leading). As religious correctness demands, an Akan Catholic will prefer to say *merəkɔ mass* meaning 'I am going to church' instead of *merəkɔ asɔre*, most of the other Christian groups would rather say. However, an Akan of the Jehovah Witness faith in particular will use the term *adesua*, meaning 'study' to refer to *church* and, thus, will prefer to say *merəkɔ adesua* (which actually mean 'I am going to study').

It is important to observe that the diversity in the use of terms between the different major denominations places emphasis on the core meaning of what they individually see as being at the center of their worship. From the respective use of the terms *Mass*,⁶ *adesua* 'learning' and *asɔre* 'worshipping', we are with the assumption that, perhaps, the Catholics take the communion

⁵ Among Christians, tongues are generally believed to be the most intelligent, perfect language in the universe. Indeed, it is referred to as God's language without hesitation and speaking in tongues is generally defined as speaking in a language that is unknown to the one speaking it.

⁶ The term *Mass* is said to have been derived from the Latin word *missa* meaning 'dismissal' (and also later came to mean 'mission' (Pope Benedict XVI, *Sacramentum caritatis*, 51).

(i.e. a symbolic eating of the body of Christ and drinking the blood of Christ) any time they go to church, the Jehovah Witness people go to church to learn the scriptures in particular, and the other Christian denominations go to church purposely to worship. Some other different linguistic items (that refer to common items) that exist between the different denominations are as listed below:

2. Roman Catholic	Jehovah Witness	Some others	
Mass	adesua	Asore	'church(service)'
adidi kronkron	nkae adidi	awurade adidi	'communion'
—	ahennie asa	Asoredan	'church building'
katekise	Dawurubofo	ɔsɛmpakafoɔ	'evangelist
vatikan	Bethel (Betel)	dwumatire	headquarters
Atoresom	Babilon kosee	Atorɔsom	false religion

6. Conclusion

This paper has explored the differences in the use of terms and expressions between different religions and denomination (of a common religion) and the essence of it; religious correctness. It has been observed through explications that, indeed, religions are set apart by defined sets of terms and expressions and that when one acquires a religion, since language and the use of it goes hand-in-hand with religion, one has to be aware of the set of linguistic items that are preferred and used in that religion in order not to be religiously incorrect or to be seen as such. Indeed, besides the fact that the use of these sacred terms and expressions has to do with religious correctness, they also serve as markers of group identity. We have noted that there is a dynamic relationship between language and ethnic or cultural identity in which one influences the other. This relationship extends beyond the ethnic and cultural aspects to the dimension of religious identity. Having observed this language-cultural-religion relationship and its impact on a group of people, we assume here that the connections within groups and between groups are of critical importance to everyday events. But, we leave this option of argument for future discussions and research.

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