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## Exploring the intersection of African religion and the scientific method: A geographical perspective

Richard Ochieng'\* · Martin K. Tanui

Department of Humanities, University of Eldoret, Kenya

\*Correspondence: [snrochieng@uoeld.ac.ke](mailto:snrochieng@uoeld.ac.ke)

 <https://orcid.org/0000-0002-5739-0789>

#### Abstract

In this paper, the authors delve into the intricate relationship between African religion and the scientific method, within the broader context of the African worldview. Religion, characterized by beliefs and practices concerning the supernatural, and the scientific method, a systematic approach to empirical inquiry, are often perceived as distinct paradigms. However, through examples from African cultures and traditions, the paper demonstrates how these seemingly disparate domains intersect and inform one another. By examining the geographical dimensions of African religious practices and scientific inquiry, the paper elucidates the inseparability of religion and science within the African context.

**Keywords:** African Religion, scientific method, Geographical perspective, supernatural, empirical inquiry

1.1. The Scientific Method and African Religion

The scientific method is a method of designing a research with a logical and rational order of steps by which scientists come to conclusions about the world around them. According to Jacques Monod, “The cornerstone of the scientific method is the postulate that nature is objective...In other words, the *systematic* denial that ‘true’ knowledge can be got by interpreting nature in terms of final causes ...” (Monod, 1974; Turchetto, 2009). This understanding is in agreement with what Chukwu (2002) in his book, *Introduction to Philosophy in an African Perspective*, presents as to the nature of scientific inquiry as presented in the scientific method. He further underscores the fact that science is based on evidence. He writes:

*Scientific method involves some analysis that is supported with evidence to buttress its claims. Science ensures that its propositions are based on logically adequate grounds....*  
(Chukwu, 2002).

Chukwu (2002) explains that scientific method helps us to organize thoughts and procedures so that scientists can be confident in the answers they find. Scientists applying the method use observations, hypothesis and deductions to make conclusions. It involves the following steps:

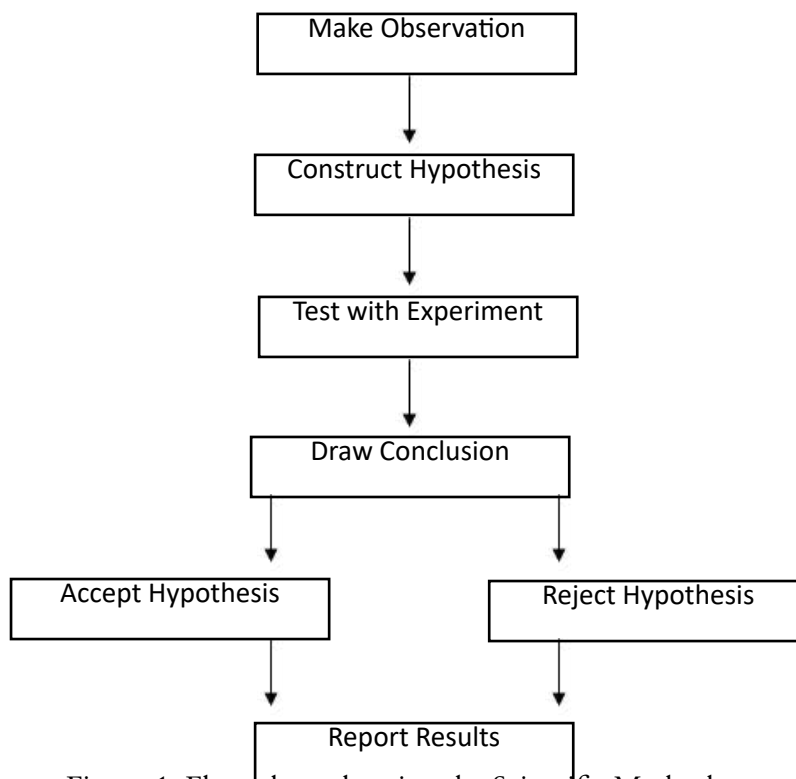


Figure 1. Flow chart showing the Scientific Method  
Source: Helmenstine, 2017.

The scientific method seeks evidential knowledge, which is based on the collected facts, which have been classified and then carefully studied. In the first stage, observation is made. This is where one has to understand the problem chosen. One uses his five human senses to identify a situation that needs to be addressed then develops research questions which need to be answered. For instance, one realizes that tomatoes are produced in different sizes through observation. This raises curiosity to find out why tomatoes are produced in different sizes.

The second stage of the scientific method is hypothesis. A hypothesis is a simple statement that predicts the outcome of a desired experiment. It means ‘a possible solution to a problem based on knowledge and research’(Jin-Su & Yong-Ju, 2006). An experiment is done in order to test the hypothesis. For example, if one intends to do research on why tomatoes are produced in different sizes he may hypothesize that, the

size of tomatoes is influenced by the amount of sunlight the tomatoes are exposed to.

The third stage of the scientific method is experiment. It is the part of the scientific method which tests the hypothesis. An experiment is a tool designed to find out if the ideas about a given topic are right or wrong. It is the most important part of the scientific method. It is the logical process that enhances a scientist's understanding of the world.

The fourth stage of the scientific method is conclusion which is a summary of experiments, results and how these results match up to the stated hypothesis. The final step is reporting of the results where the scientific knowledge is presented to an audience.

Basing on the foregoing information on the scientific method, a question is raised; does African religion meet the scientific method? An argument can be developed in support of the question. African religion meets the scientific method as it was a way of life which intended to solve problems facing indigenous Africans. Take a case from healing and medicine; once herbalists realized that people were suffering from a certain disease through observation, they raised questions which needed answers. A person who had skin rashes would be observed by the herbalist, who concludes that the person's skin was not normal as it had rashes, the herbalist then develops a hypothesis on the causes of the rashes. Later, s/he thinks of possible medicine (herb) to curb the rashes which s/he applies on the patient. After a period of time, s/he observes the patient further on the response to the herb. If the patient heals, s/he concludes that a given herb is a cure to that skin condition. Basing on the foregoing argument it can be concluded that African religious knowledge meets the scientific method.

Kwok (1965) has summarized the method of science as follows:

*The scientific method operates on fundamental principles. First, the need for observation; **empirical principle**. Second, to achieve exactitude in measurement..... he must employ quantitative means; **quantitative principle**. Third, he deals with causa relations and often uses abstractions to represent them. For this end, he must locate meaningful recurrences of behavior and then formulate general laws or equations, which describe and explain such behavior, **Mechanical principle**. Lastly, the principle of progress through scientific co-operation for non-personal ends; **cooperative principle**, a co-operation in which all scientists of the past, present and the future have a part.*

Kwok (1965) holds that a scientist operates on four fundamental principles: empirical, quantitative, mechanical, and cooperative. The empirical principle holds that scientific knowledge must be verified by the five human senses which include sense of sight, hearing, taste, touch and smell. Anything which does not meet these principles is not a science. For instance, the case of a flower, is true since it can be detected by the five senses. It may be argued that this is just an assumption because of course a flower can be seen, it can be smelled, and can be touched. But this principle cannot be absolutely applicable as one wonders how a flower tastes and the sound of a flower. Basing on Kwok's empirical principle, some scholars argue that religion does not meet this principle, as some of the religious phenomena cannot be measured such as gods, spirits, divinities and ancestors. Therefore, they conclude that all religious knowledge is not scientific. This principle however can be challenged by arguing that not all scientific knowledge can be verified empirically. For example, science argues that a British Chemist, Joseph Priestly (1733-1804) discovered oxygen in 1786. The discovery of Oxygen is a science, but how can you prove oxygen empirically without experiments? It cannot be seen, heard, tasted, touched and smelled! Therefore, this principle cannot be used to disqualify other sources of knowledge.

Kwok further argues that for knowledge to qualify as a science, it must meet the quantitative principle. This principle holds that for anything to qualify as a science, it should be measured. The magnitude of its variables should be determined. The quantitative principles employs measurement through which a scientist arrives at quantitative estimates of the variable and magnitude considered in their hypotheses. Measurement is crucial as it reduces vagueness and aims at exactitude in measurement. For instance, if one

was carrying out an experiment on particular trees, the number and size of the trees can be determined. Most scholars take this principle to dispute that religion is not a science because it deals with metaphysical issues. Issues such as spirits, divinities, gods among others cannot be measured. To what extent can we rely on this principle to disqualify other sources of knowledge? Is everything measurable in science? For instance, Sigmund Freud (1856-1939) made an assumption that 'unconscious mind governs behaviour' (Bargh & Morsella, 2008). Let us take the unconscious mind as a scientific phenomenon discovered by the psychoanalyst. What parameters can be used to measure the unconscious mind and the degree to which it influences behaviour? This principle cannot be applied absolutely to all scientific knowledge.

The third principle according to Kwok (1965) is the mechanical principle; he contends that, for something to be a science, it should be able to repeat itself. This principle seems to be more interested in the laws of nature in science which should be uniform. The mechanical principle can be summed up as the search for laws of nature which governs uniformities in the universe. For instance, the law of gravity is constant in all places at all times on earth. It implies that, scientific laws of nature should apply to all places at all times. For this end, scientists locate meaningful recurrences of behaviour and then formulate general laws or equations, which describe and explain such behaviour. Can this principle be applied to all scientific knowledge? Some scientists argue that Christ's miracles are false as they argue that if they were true they could have repeated themselves. But it can be argued that if miracles repeat themselves they will be ordinary. We also expect Big Bang to repeat itself so that we believe in it!

Lastly, Kwok (1965) identifies the co-operative principle. He argues that colleagues of a scientist must be able to approve new knowledge and be able to repeat proposed experiments under various conditions. Scientists report their findings to scientific publications and to a union of Scientists (Merton, 1968). The co-operative principle is where in the attempt to overcome prejudice and to gain objectivity, members of the scientific community set fourth varied and competing hypotheses and then wait for the confirmations or rejection of these hypotheses by others. The principle of progress through scientific co-operation for non-personal ends, a co-operation in which all scientists of the past, present and the future have a part. The main argument here is that science is a discipline just like religion, it may seem wrong to use science to judge the worthiness of religion. In this regard Barbour (2000) underscores the limitations of science. He states;

... religious beliefs are not amenable to strict empirical testing, but they can be approached with some of the same spirit of inquiry found in science. But religious knowledge cannot conform to such rules and methods that are known in scientific research. Modern social science emphasizes the functional importance of some religious systems of society. Human needs are more basic than the type of problems science can solve. We need ethical guidance for life which the increasingly accurate scientific descriptions do not contain i.e. No mature person with experience of life can seriously suppose that the issues of life and death, sex and abstinence, could possibly be solved by an *Encyclopedia of the Behavioral Sciences*. On such matters science clearly has got little to say. (Barbour, 2000:18)

It can be argued that, human affairs cannot always be subjected to the scientific method and its principles i.e. observation, classification, formulation of hypothesis and empirical verification. We cannot apply wholly science to interpret other disciplines. This is because both are expected to interrelate. It is wrong to make an assumption that, any subject that cannot be studied scientifically is not likely to enhance human condition. The foregoing leads into an inquiry on the worldview of science and African religion before identifying their areas of synergy.

### 1.2 Scientific Versus Religious Worldview

The term worldview is derived from the German word '*Weltanschauung*' which means an intellectual perspective on the world or universe. A worldview is a set of fundamental beliefs, acts and values determining or constituting a comprehensive outlook of life and the universe. It is a comprehensive conception of the image of the universe and the relationship of humanity towards it. It describes a sense of existence and a

framework for sustaining and applying knowledge to the universe. In a nutshell, worldviews tend to answer the following six questions; Where do we come from? Where are we? Where are we going? What is good and what is evil? How shall we act? What is true or false? (Heylighen, 2000). The paper explains the foregoing questions with cases from science and Christianity.

Scientists interpret their world view as follows: On the first question, 'where do we come from?' scientists claim that humans come from nowhere. Science formulates a number of theories of the origin of human beings and the world such as, Evolution of Species by Charles Darwin, Big Bang Theory which claims that the universe was a large mass which broke into elements and Passing Star Theory which claims that a star with greater force of gravity passed next to the sun and pulled gases from the sun. These gases cooled to form the nine planets, the earth included.

On the second question 'where are we?' scientists claim that we are on earth, the physical and material place in the solar system. According to them the earth has a beginning and an end. One day the earth will end. About the third question, 'where are we going?', scientists claim that we are going nowhere. Once a person dies, that is the end of life. On the fourth question, 'what is good and what is evil?', scientists argue that, what benefits an individual is good, while what destroys life is bad. To scientists, the end justifies the means, thus according to Charles Darwin's theory of survival for the fittest, it can be understood that human beings who find themselves in the world survive because they are for the fittest.

On the fifth question, 'how shall we act?', scientists claim that, 'we should react by following the rules of human rights and gain privileges one is supposed to get as a human being e.g. right to life, speech, expression'. We should struggle to attain what is good for an individual and not what benefits the society. What satisfies an individual is good and what does not is bad. Lastly, the sixth question 'what is true or false?' is answered thus; what is true is what can be verified by science through the four principles i.e. quantitative, empirical, qualitative and co-operative principle.

On its part, the Christian worldview answers the six questions as follows: 'where do we come from?' Christianity answers this question by explaining that humans were created by God. This world view is shaped by Genesis 1 and 2 where everything is believed to have come from God. The second question; 'where are we?' is given the answer that human beings are in the world which was created by God and everything in it. The third question, 'where are we going?' is answered with a claim that human beings are going to next world, heaven or hell where they belong. The fourth question on, 'what is good and what is evil?' is answered by Christians that good is obeying the God's commandments and doing God's will. According to Christianity, evil is breaking the God's commandments and acting against the will of God. On the fifth question, 'how shall we act?' Christians claim that they should act by obeying the commandments of God and doing the will of God. On the question, 'what is true and what is false?' Christians answer that what is true is what is accepted by the Bible and what is false is what is contrary to the Bible.

The African religious worldview answers the six questions as follows: 'where do we come from?' The African worldview answers this question by explaining that human beings were created by the Supreme Being. This world view is presented through various myths which point creation of the earth and humans to Supreme Being known by diverse names in different African communities. For example, the Agikuyu of Kenya have a myth explaining that God created the world and gave it to the 'first' man and woman named Gikuyu and Mumbi respectively. The two became the great grandparents of all the Agikuyu who were are the descendants of the nine daughters of Gikuyu and Mumbi (Gakuo,1992). The second question; 'where are we?' is answered by Africans by saying that, we are in the world which was created by the Supreme Being and everything in it. To the African, people live in the earth, not on the surface of the earth as explained by science. Most myths in Africa portray the earth as flat and the sky as hanging above and the sky as the abode of the Supernatural Being (Foster, Foster & Hutchinson, 2005). The Kalenjin of Rift valley in Kenya for instance believe that 'Assis' represented by the Sun (*Assista*) is the Supernatural Being (Chirchir, 2014).

The third question, 'where are we going?' is answered by Africans with a claim that they are going to the next world which is a stage of transition. But where is the next world? Some communities such as the Abagusii of Western Kenya believe that, after it has rained on earth, water moves down to the next world that

is found 'underground' where the dead reside in the afterlife. This can be proved by the 'smoke' which rises after rain from the ground because they are warming themselves near a fire. To them, moisture from the soil is smoke. Their main argument is that; death is a transition stage to the next world (LeVine & LeVine, 1985). The African worldview answers to the fourth question on, 'what is good and what is evil?' and the fifth question, 'how shall we act?', has to do with observing taboos, totems and rules set by ancestors and acting according to the will of the Supernatural Being and His agents (Kanu, 2013). On the question as to 'what is true and what is false? Africans believe that, what is true is what is taught by ancestors and elders who are also its custodians. Truth is stored in the minds of Africans through their cultural expression of life in form of customs. What is false is what is not found in the traditions of the African community. Anything that has not been taught by elders and ancestors is believed to be false (Mbiti, 2015).

This section gives the worldview of the scientist and Christian and African religionist. It can be noted that the main difference in these worldviews is about the existence of the Supernatural Being. Scientists are perceived to hold that such a being does not exist while the Christian and African belief systems admit the existence of a Being. Both worldviews have gaps in their attempt to explain the origin of the earth and human beings. The existence of these gaps mean that both science and religion have weaknesses as sources of knowledge.

### 1.3 Weaknesses of Science as the Sole Source of Knowledge

Physical science has observation and experimentation as its basis of knowledge. This knowledge is based on facts empirically proven through observations and data derived from experience using the five senses. Science knowledge has two components; the experimental, which produces observations and data, and the theoretical, which interprets this reality. Observation and data derived thereof presupposes materiality or physicality, while the theoretical component has concepts, theories and laws.

Inherent in this approach in science is a weakness; experimentation cannot explain immaterial or metaphysical reality as such are beyond empirical science. For example, science may explain causes of death but may not be able to restore life. Immaterial reality cannot be subjected to scientific inquiry and analysis. While scientific knowledge is limited to the material world, reality also encompasses immateriality. For instance, people are influenced by love and faith which are non-material. Some knowledge therefore cannot be put into experimentation. More so, as much as scientists insist that for anything to be a science, it must meet the mechanical principle, some information cannot repeat itself. An event such as the Virgin Conception and Birth of Jesus cannot repeat itself, yet it is the basis of Christian knowledge and at the heart of Christian belief.

It should also be noted that though science claims not to admit immateriality of reality, it still deals with immaterial realities; for instance, the 'law of gravity', 'concepts' and 'theories'. In fact, scientific knowledge assumes that humans are capable of understanding and knowing all reality. This notwithstanding, the weaknesses of science necessitate complementary sources of knowledge, a source which should relate with science harmoniously. This complementarity can be found in religious knowledge. This complementarity however should also admit limitations in religion as a source of knowledge.

### 1.4 Weaknesses of Religion as a Source of Knowledge

The term religion can be used interchangeably with the term faith. Faith means belief in (divine) inspiration, revelation, or authority. It is the strong belief in someone, something or even an idea. Faith as a source of knowledge like science has problems too. For one faith cannot be challenged. The nature of faith is such that it should not be challenged. Most statements are held as taught or presented. Most religions do not allow their members to challenge their beliefs. In Christianity for instance, the dogmas or articles of faith such as the Apostle's Creed are held as absolute truths that Christians believe in. Apart from dogmas or articles of faith, one should not also challenge religious leaders of a faith. The catholic understanding of papal infallibility often means that the pope cannot be challenged when he expresses himself, *ex cathedra*, in matters of faith and morals. Some religions have had people who have tried to challenge their religious leaders and religions excommunicated or put to punishment (Tanui, 2013).

Another difficulty associated with religious knowledge is that anybody can claim to have religious knowledge. There is no clear criterion for determining who has religious knowledge and who does not. Due to this feature of religious knowledge some people have misused religion. For example, in early 1990's the Movement for Restoration of the Ten Commandments of God founded by Joseph Kibwetere and Cereodina Mwerinde misled people in Kanugu in Southwest of Uganda. The two preached that the end of the world was to come on March 17, 2000. They claimed that the knowledge about the end of the world had been revealed to them by the Virgin Mary. The people who believed in them sold their property and joined the two leaders in a camp at Kanugu to await for the end of the world. When the end of the world failed to come, about 300 faithfuls of this religious group were led to commit mass suicide (Mayer, 2001). If the faithful in this situation had critically interrogated the two leaders and their end of the world message, probably the scenario would not have been tragic. Such religious faith is often based on fallacious reasoning. More so it is often difficult to agree on specific parameters to measure what can be considered as true faith. Every religion claims that its faith statements are true and should be held as such. Members of these faiths are often willing to die in defending their faiths as martyrs.

Lack of clear parameter(s) in determining which faith is true has also led to confusion. This confusion has brought discord between different religions which sometimes has resulted in religious wars. Furthermore, claims about faith can be used to justify and defend actions which otherwise would have been dismissed. For instance, in 2006 a religious organisation, 'The House of Yahweh' based in Kinangop, Kenya instructed its members to construct underground bunkers in readiness for the end of the world. The prophesied doomsday never came to be (<https://www.religionnewsblog.com/15302/house-of-yahweh-kenya-sect-bunkers-down-for-doomsday>). The above illustrations indicate that religious knowledge has weaknesses. These weaknesses can be addressed by another source of knowledge. There needs to be a complimentary source of knowledge to fill the weaknesses in religious knowledge. Before discussing this complementarity in scientific and religious knowledge, it is useful to understand the perceived disharmony between religion and science.

### 1.5 The Approach that Creates Perceived Disharmony between Religion and Science

One locus that creates disharmony between science and religion is fundamentalism. Both religionists and scientists tend to subscribe to fundamentalism. Both claim that their areas are the only genuine sources of knowledge. Religionists tend to be loyal to their brand of religion, while scientist tend to be loyal to their brand of science. For instance, as religionists, some Christians have developed an exaggerated sense of what loyalty in the bible means. Such believers know the Bible alone. Science is not a fact to them. Anything which is not addressed by the Bible is not true. Ironically, while such believers attack science, they use practical achievements of science such as electronic equipment, cars, phones and medicine. It is not uncommon for them to condemn science as satanic while having teeth repaired by scientific technicians. Furthermore, science has made it possible to understand how nature functions. It has opened up nature for Christians to use as follows; astronomical knowledge has helped understand part of scripture associated with astrology, geological knowledge can be used to understand the order of the creation days, ethnological knowledge can be used to unravel mosaic genealogies in relation to pre-adamic and co-adamic races of mankind, and carbon dating in historical science can be used to determine the time when biblical events occurred.

Another approach that creates a perceived disharmony between religion and science are mistakes peculiar to some religionists and scientists. Such mistakes include religionists' unsympathetic attitude towards science and scientists' unsympathetic attitude towards religion. The religionists regard scientists and their work as atheists and atheistic. For instance, when scientists say that human beings originated through evolution, they are labelled satanic. Some religionists on the other hand practice what can be referred to as a pseudo- or a false science. This is where instead of remaining in the domain of religion, religious groups such as the First Church of the Scientist and the Church of the Science Salvation without using the scientific method none the less appeal to the authority of science and make scientific claims (Ramati, 1996). Such religionists attempt to prove minute points of physics, chemistry and biology using theology yet religious stories are a matter of faith and therefore there is nothing strictly scientific in them. Such stories should be

understood in a religions context and not in the context of a scientific inquiry. This therefore means that science has got its own niche. This at times can breed disharmony from science.

The perceived disharmony can also be due to mistakes peculiar to scientists whereby scientists maintain that science is the only genuine knowledge. Such scientists have an antireligious attitude. They maintain that religion is not relevant and that science is the only source of knowledge. And as noted above such knowledge should only be proven through experiments and observational procedures. Emphasis is on that which is material in contrast to the immaterial and non-material. Scientists maintain that everything must be empirically verified, that is that every concept must have a corresponding material object for it be considered genuine knowledge. Such scientists call themselves custodians of knowledge. Such are arguments presented by Darwkins (2006) and Weinburg (1999), scientists who assert that key religions of the world claim to have knowledge which cannot be verified in society.

The perceive disharmony point to the fact that both science and religion have different methods of inquiry. What has not gone through their respective methodologies may not be considered as knowledge. This has posed hostility towards each other. Consequently, generating negative competition between science and religion leading to intolerance towards each other's ideas. Religion and science however need each other. There is need for a harmonious approach in their relationship. For instance, matter which is the object of science came to be through God's creative activity as held by many religious traditions; while on the other hand science needs moral safeguards as they handle matter, and this is done by religion. With immense powers of destruction of the material world through science, human beings need spiritual guidance. Religion supplies rules and regulations to scientists. It helps to protect human life against dangerous experiments. For instance, the code of ethics for doctors can be said to have a religious dimension where there is the demand for doctors to preserve human life at all costs to save life. It can also be noted that religion explains what science cannot explain such as the destiny of humans after death, while science explains what religion cannot such as the functioning of the human body through anatomy and physiology.

Religion and science therefore play an important role in peoples' lives. They cannot be separated from one's life; for example, Christians need religion to guide intra and interpersonal relationships and science aids in the geographical spread of Christianity through communication technologies. As sources of knowledge, both religion and science need to integrate for productive human life; for instance, traditional African herbalists combine their knowledge in science and religion in providing health services to people. Thus it can be said that African herbalist are religious scientists. With this understanding it can be concluded that neither science nor religion individually is the sole custodian of knowledge. Both religion and science rather complement each other in the search for knowledge. While scientific methods cannot be used to evaluate religious knowledge; religious methods cannot be used to acquire scientific knowledge. This notwithstanding scientific knowledge is as valid as religious knowledge as each handles different dimensions of human existence.

### **1.6 Expected Relationship between Science and Religion**

It should be noted that both religion and science are legitimate sources of knowledge. The following table presents dimensions of knowledge in relation to religion and science.



Knowledge in Science	Knowledge in Religion
1. Science deals with pragmatic knowledge	1. Religion relies on revealed knowledge
2. It must meet the four principles i.e. quantitative, empirical, co-operative and mechanical	2. It does not the four principles i.e. quantitative, empirical, co-operative and mechanical
3. Science relies on experiments	3. Religion relies on beliefs
4. Knowledge in science is uniform	4. Knowledge in religion is not uniform it has a variety of beliefs
5. Science does not believe in existence of a Supernatural Being	5. The belief in Supreme Beings is the basis of knowledge in religion
6. Scientific knowledge deals with natural phenomena	6. Religious knowledge deals with metaphysical issues
7. Scientific knowledge explains how things happens in nature	7. Religious knowledge explains why things happen the way they do
8. Scientific knowledge needs tangible evidence	8. Religious knowledge does not need tangible evidence
9. Scientific knowledge deals with soluble problems	9. Religious knowledge deals with unsolved mysteries
Scientific knowledge requires evidence	Religious knowledge does not require evidence

(Source: Barbour, I. G. 1997))

As indicated in the table above while science and religion each handle different dimensions of knowledge, they complement each other. The two disciplines depend on each other to certify human need for knowledge. Religionists require science to interpret their teachings and there are cases where science needs religion. The two need to consult each other. Francis Bacon (1561-1626) in the 17<sup>th</sup> Century spoke of two books; the Book of Nature and the Book of the Scripture. He stated that each must be read and understood. Both come from the same author and therefore could not conflict each other (Klein, 2003). While religion tries to explain ‘why’ it happens i.e. the purpose of something, science attempts to explain ‘how’ it happens, i.e. the functioning of something. The biblical and scientific accounts of natural phenomena have purposes that complement each other rather than contradict each other. The Bible’s concern is spiritual and eternal, while scientific texts concern is material and temporal.

Historically, scientific and theological thinking have owed much to one another and that their growth has been mutually promoted. It conforms to a widespread acknowledgement that much human knowledge is culture-dependent but it does not prejudice the independence of data either in the bible or in the natural world. It recognizes that in the interpretation of such data, theological and scientific ideas are often intermingled in one brain. Therefore, one will expect some degree of mutual influence (Russell, 2008). African religion also does not separate religion and science.

### 1.7 African Worldview, the Inseparable

Religion and science in pre-historic and traditional societies in all human societies seem to have enjoyed a harmonious approach as complementary sources of knowledge. Where science could not explain fully, religion explained and vice versa. The two were fully integrated as intimate and an inseparable discipline in a way that it was difficult to distinguish between what was scientific and what was religious. In the same way that religion was integrated into the people’s way of life that it was difficult to distinguish between what is holy/sacred from what is profane/secular, it was difficult to distinguish between what was religious and what was scientific. Both sources of knowledge were integrated for productive life. Whitehead (1978) states that academically, science was born in Europe but its home is the whole world. Scientific discoveries are transferable from country to country and from race to race, whenever there is a rational society. Certain races have evolved their own type of science based on their technological discoveries as Whitehead (1978) notes. Traditional Africans too integrated scientific knowledge to religious knowledge. Mbiti (1969) in his *African Philosophy and Religions* underscores the fact that African indigenous scientific knowledge cannot be separated from African religious knowledge.

The World Bank acknowledges that in the emerging global knowledge economy, a country's ability to build and mobilise *knowledge capital*, is equally essential for sustainable development as the availability of physical and financial capital (Huggins & Izushi, 2008). It points out that the basic component of any country's knowledge system is its indigenous knowledge base, which encompasses the skills, experiences, and insights of a people that they apply to maintain or improve their livelihood. It further notes that significant contributions to global knowledge have originated from indigenous people, in a number of areas such as human and veterinary medicine and this is because of their intimate understanding of their environments. It further argues that indigenous knowledge is developed and adapted continuously to gradually changing environments and passed down from generation to generation and is closely interwoven with people's cultural values. Indigenous knowledge is also the *social capital* of the poor, their main asset is to invest in the struggle for survival, to produce food, to provide for shelter or to achieve control of their own lives. It is further noted that indigenous knowledge is of particular relevance to the *development process* in the following sectors and strategies: Agriculture, Animal Husbandry and Ethnic Veterinary Medicine. It is also relevant in the use and management of natural resources, primary health care, preventive medicine and psychosocial care. It has also been noted for playing a role in saving and lending practices of the poor, community development and poverty alleviation at grassroots levels (Agrawal, 1995).

In the same breath Africans have developed their own discoveries which may not be noticeable by the outsider. They can be considered by scientists through examples from the following knowledge from indigenous African societies: Aboriginal Africans made fire by rubbing sticks. This is scientific knowledge in Physics. Indigenous Africans had knowledge of weather forecasting. They knew when to plant, weed and harvest. Further, they had knowledge of influencing weather patterns. For instance, the Abagusii ethnic community of Kenya had rain makers who had knowledge on making rain in a rain making ceremony known as *ribina* (Ombati, 2019). Native Africans had knowledge of counting, hence mathematicians. The Nandi of Kenya counted animals by dropping sticks as they left for grazing and after grazing (Seidenberg, 1962).). Many traditional Africans knew the science of manufacturing metals. They had knowledge in blacksmithing. They made arrows, hoes and knives from metals. They had knowledge in soil science as they knew which soil could manufacture metals and they knew fertile grounds, medicinal soils and had names for different rocks. They were well versed with knowledge in animal science and crop science production. They were knowledgeable in nutrition science. As they knew foods which were nutritious to patients, and those which could prevent malnutrition. For instance, among the Luhya of Western Kenya, women who had given birth could be given vegetables rich in iron such as spider flower (*isaga*), black night shade (*isucha*) and vine spinach (*nderema*) (Abukutsa-Onyango, 2005).

In traditional Africa, scientific and religious activities are integrated for maximum benefits for the community. For example, to ensure a successful crop, the importance of choosing the best seeds, weeding, and scaring birds away was never underestimated. But the people knew that however well one did these things they did not guarantee them a good harvest. So they had to apply religion to control that which science could not control such as bad weather and locust invasion. So they made sacrifices to God to protect their crops from harm and at the end of the harvest, they thanked God for a good harvest knowing that on their own they would not have ensured good crop. In medicine traditional Africa has herbal medicine, psychological counselling as well as religious procedures in treating a sick member of the community. Family planning (spacing and limiting as in post-partum sex taboo) was known and practiced with the help of both religion and science.

African communities even from ancient times had herbalists who were knowledgeable in medicinal plants and rocks. Significant advances in ancient Egypt for instance included astronomy, mathematics and medicine (Woods, 1998). Their geometry was a necessary outgrowth of surveying to preserve the layout and ownership of farmland, which was flooded annually by the Nile River. The 3-4-5 right triangle and other rules of thumb served to represent rectilinear structures including their post and lintel architecture. Egypt was also a centre of alchemical research for much of the western world. Egyptian hieroglyphs, a phonetic writing system, have served as the basis for the Phoenician alphabet from which the later Hebrew, Greek, Latin, Arabic, and Cyrillic alphabets were derived. The city of Alexandria retained pre-eminence with its

library, which was damaged by fire when it fell under Roman rule, being completely destroyed by 642. With it a huge amount of antique literature and knowledge was lost. The Edwin Smith papyrus is one of the first medical documents still extant, and perhaps the earliest document that attempts to describe and analyze the brain: it might be seen as the very beginnings of modern neuroscience (McClellan & Dorn, 2015). Sewage pharmacology first began in ancient Egypt and was continued through the Middle Ages. The use of animal dung as medicine started from Egypt. They involved themselves in practices such as applying cow dung to wounds; in this regard elephant excretes could be taken as medicine. They used fly specks, lizard blood, swine teeth, and other such remedies. Simply put, the ancient Egyptians had knowledge in medicine (Snoek, 2001). However, while Egyptian medicine had some effective practices, it was not without its ineffective and sometimes harmful practices. Medical historians believe that ancient Egyptian pharmacology was largely ineffective. According Parkins & Szekrenyey (2001), 72% of 260 medical prescriptions in the Hearst Papyrus had no curative elements.

The African archaeological record demonstrates Africa's vast achievements in the field of science and technology, which has been lost to the modern society, but which nevertheless can be recovered through a constructive hermeneutic engagement between the modern and ancient African scientific achievements. Sertima (1999) tells the story of how the lost sciences of Africa had marvelled the early European travellers in Africa, despite the later imperialistic era in which the African achievements were disregarded and sometimes accredited to the Asians, Europeans or even Arabs invaders. The best example of this was the marvels of the Monomotapa Empire of Zimbabwe, which were attributed to the other races and denied to Africans themselves. Examples can be provided of African scientific and technological achievements from the science of metallurgy in Tanzania, astronomy in Kenya and the Dogon of Mali, mathematics in Egypt South of the Sahara, architecture and engineering including the Monomotapa massive stone complex as well as the Egyptian pyramids and tomb architecture, where the Europeans not only begun to steal the treasures but even to deny the right of the Africans to lay claim to their civilisation. African discovery of agricultural plants, seeds and soils going as far back at 18,000 years whereas the European scholars in their limited knowledge had credited the Middle East and Asia for having been the earliest civilisations and inventors of agriculture for a bare 2,000 years. The Banyore of western Uganda had knowledge of medicine and capacity to perform complex operations on the human body including caesarean operations. This knowledge of surgery can be seen also among Abagusii of western Kenya who knew how to do brain surgery and circumcision. Apart from the foregoing knowledge they knew drugs relevant to control pain and bleeding during the surgery procedures. Far from Africans having been without written records, reference can be made of many scripts ranging from the hieroglyphs to Meroitic scripts and several manuscripts found in Alexandria, Timbuktu and Moorish documents some of which were in Arabic but written by Africans (Sertima, 1999).

There are also marvels that mystified many European travellers in the way Africans were able to communicate for several kilometres before the discovery of the telephone by the Europeans. Charles Breasted, son of James Henry Breasted, the celebrated American Egyptologist, is quoted as having witnessed ordinary Africans communicating over water for long distances. He refers to a person who stood at the very edge of the river Nile, "perhaps ten feet above the surface, and cupping his hands some four inches in front of his lips, would talk into the water at an angle of about 45 degrees, in a loud voice but without shouting. At intervals he would stop and listen while the distant man evidently replied in kind. But we who stood by heard no sound. Presently the exchange would end, and he would tell us in a matter-of-fact way what he had learned" (Sertima, 1999). It can therefore be concluded thus:

What emerges from the above that the discovery of steel-making, astronomical observations, mathematical systems, architectural constructions of great ingenuity and durability, agriculture and cattle-rearing of astonishing antiquity, navigation on inland waters and open seas, medicine, and communication and writing systems-is that we know Africa only in vague outline. The lineaments of a lot of science are now emerging and we can glimpse some of the once-buried reefs of this remarkable civilisation. A lot more remains to be revealed. But enough has been found in the past few years to make it quite clear that the finest heart of

the African world receded into the shadow while its broken bones were put on spectacular display. The image of the African, therefore, has been built up so far upon his lowest common denominator. In the new vision of the ancestors, Africans need to turn their eyes away from the periphery of the primitive to the more dynamic source of genius in the heartland of the African world” (Sertima, 1999)

The ‘heartland’ is the recognition of Africa’s being the original site of human achievement in both science and religion. Africa’s achievements, which are part of human achievement, still lie in the hearts of the ordinary people of Africa who still keep the memory of the ancient knowledge in a continuous manner through customs and traditions. Through a dialogue of the modern knowledge and the ancient wisdom of Africa, a new science can emerge, which draws from the memory of the old sciences and the new ones. Indigenous knowledge systems are part of this recorded knowledge, which still continue to exist in the archives of the peoples’ memories and cultural practices (Bicker, Ellen, & Parkes, 2003).

### 1.9 Conclusion

This paper proposes complementarity between science and religion propagated by Francis Bacon (1561-1626) in the 17<sup>th</sup> Century who spoke of two books; the book of nature and the book of the scripture Each must be read and understood. Both come from the same author and therefore could not be in conflict (Matthews, 2007). However, problems arise where there seems to be contradiction between them. It can be argued that the individual concern of each in disregard of the other is what brings about discord between science and religion. While science deals with the question of ‘how’ it happens; religion tries to explain ‘why’ it happens. It should be noted that each of them cannot alone adequately express truth. They need each other. Historically, scientific and religious thinking have owed much to one another and that their growth has been mutually promoted. It conforms to a widespread acknowledgement that much of human knowledge is culture-dependent but it does not prejudice the independence of data either in the religious or in the natural world. The African experience and approach provides a good example of such mutuality for the good of the community. This paper used the African traditional religion as an illustration of how science is not separable from religion and that it has existed with indigenous religion.

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