A COMPARATIVE ANALYSIS OF FORCE IN AFRICAN AND WESTERN WORLDVIEWS

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DEPARTMENT OF PHILOSOPHY
FACULTY OF ARTS
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I, Archibong, Emmanuel Iniobong, with Reg. Number: 2016087001F hereby certify that I am responsible for the work submitted in this Dissertation and that this is an original work which has not been submitted to this university or any other institution for the award of a degree.

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To the Supreme Force, Eternal King, Immortal and Invisible God Almighty. A very present help, loving, compassionate, merciful, faithful, longsuffering, patient and kind Father. He is the restorer, preserver, protector, helper, wisdom of man and the hope of all ages. Lord be glorified now and forever more, amen.

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ABSTRACT

The concept of force is a reality with a flip side representing African explanation, particularly (Bantu ontology) as adumbrated by Placide Tempels on one hand, and Newtonian/Einsteinian explanations in western science on the other. Force, the study contends has a material (scientific) and an immaterial (African) explanation but operates by the same principles leading to the motion and change of state or shape of an object. While Isaac Newton systematized the concept of force using mathematical postulates or axioms in his three laws of motion through the scientific method of observation and experimentation, it didn't jettison the metaphysical substratum of the concept analytically. Newton's first, second and third laws of motion provided an ontological truth of force in the guise of it being factually descriptive without stating what force is in itself. But in Einstein, force or energy became clearly a metaphysical concept in relativistic and quantum mechanics. In Bantu-Afrcan ontology, force is held metaphysically in hierarchical order with God at the apex and minerals (materials) at the lower wrung of the ladder. Force in Africa is generally reduced to a metaphysical reality while force in western science is to physical quantities. The study interrogated the material and factual claims of force in western science from its ontological derivatives such as: motion, velocity, acceleration, mass, distance, change, gravitation, relativity, and space-time arguing that force as a material concept does not adhere strictly to the highly prized scientific method of observation and experimentation. The study employed the method of comparative analysis which exposes the convergence and divergence of force from an African and western systems and the implications arising from each. Force the study held has an ambivalent nature of the material and immaterial with one serving as a missing link of the other. Also, except perhaps for linguistic convenience, the study found that the scientific concept of force doesn't really tell what force is in itself unlike the African worldview where it is clearly defined. The study revealed further that the categories of the mind can delineate the immaterial from the material components of force in a complementary manner revealing convergences and divergences in the western and African system. Since force is an attribute of being, the study deduced that the belief in force can determine human behavior and action. The study found also that confusion arises when humans hold one explanation of force as absolute to the exclusion of the other. The study faulted the compelling unity of the method of science as advocated by the logical positivists as unnecessary to the discovery of the truth of reality as there are indigenous systematic approaches (alternative theoretical frameworks) to tackling such complexities as force which needs to be explained within a cultural context just as we have in the African system. The study also examined some ontological questions generated by the concept of force and applied them to human social relations showing the negative and positive implications of adhering strictly to either the material or immaterial aspect of force. The study concludes that no belief or thought system about any concept of reality is primitive or unsophisticated even voodoo, witchcraft, magic or sorcery.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The concept of force is examined in the study because it is at the heart of 'reality' or 'being'. Also, the shared similarity and dissimilarity of force is the basis for comparing the traditional Africa and modern scientific thought systems which both have interesting perspectives to the concept. The major ontological characteristic of traditional Africa is dynamic while that of science is static. Force as a concept generally possesses power or energy that propels an object into motion and is capable of changing its state and shape. Everything in the material universe is held to be energized by force and its fields whether chemical, mechanical, electromagnetic or mental. Little wonder, all the fundamental conceptions of force in modern science are categorized comprehensively under: gravitational, electromagnetic, strong and weak nuclear force and that explains every interaction and behaviour of particles of matter following Newton and Einstein's theories. Force in traditional Africa worldview is hierarchically understood and explained from God to minerals in the material world. Interestingly, the study holds the default position that force whether from a traditional Africa or scientific perspective is fundamentally metaphysical.

Efforts have been made by humans over the ages to understand the basic constituents of the material universe and the laws governing it. In Western philosophical system as traceable to Thales, there is the preoccupation of the Ionians within the purview of finding that one primordial substance from which every other phenomenon in nature can be explained. This search was seen as systematic and empirical which is why the Ionians are reckoned as cosmologists and held as forerunners to modern science. Russell writing along this line avers that: "there is ample reason to feel respect for Thales, though perhaps rather as a man of science

than a philosopher in the modern sense of the word. The statement that everything is made of water is to be regarded as a scientific hypothesis and by no means a foolish one. Twenty years ago, the received view was that everything is made of hydrogen, which is two thirds of water".[1]

Thales, just like other right thinking humans in other regions of the world have been reflecting about the vastness and wonders of the universe and what its constitutive elements might be. Force then can be understood and better appreciated from its human cultural or traditional explanation. Modern science thus developed with a complex range of philosophy, scholasticism, mysticism, Christian and secular humanism. Its rational thinking also developed through a long range of change and formation with the experiments of the enlightenments and breakthroughs in the sciences. According to Geisler and Bocchino, "…a worldview is a philosophical system that attempts to explain how the facts of reality relate and fit together. In other words, a worldview shapes or colours the way we think and furnishes the interpretative condition for understanding and explaining the facts of our experience.[2]

Africa and western science have material and immaterial aspects which this study seeks to explore. These material and immaterial aspects of reality can be rightly called science from the Latin word *scientia* translated as "knowledge". If a person for instance, wants to have knowledge of the secrets of manipulating the material forces in nature in African thought system, such a person must enroll to be trained by the diviners or medicine men and must first be initiated, with some rites performed. This position is similar to what is obtainable in modern science as well. The training is on the one hand, for some persons (professional scientists and medicine men) while the non-initiates believe and accepts what they are told as the outcome of such training by these authorities without having had a firsthand experience. When Placide Tempels' in his Bantu ontology talked about "vital-force", he was iterating what traditional Africa holds as the fundamental constituents of reality. Life-force as understood in African

thought system has to do with the very essence of 'being' whether material or abstract so that "Force is the nature of being; force is being and being is force and that which all beings are; the central point from where creation flows".[3]

Factual or material knowledge of reality among the people of Africa is mainly restricted to matters of everyday living and is mostly the fundamental concerns of the artisans. Without any doubt, the work of the artisans have played a decisive role in establishing man's knowledge of and mastery over nature of which precede science. Africans are very conscious materially in the sense that they used the material forces in the universe to increase their life-force through healing and magical powers. This is why sacred plants, places, hills, rivers, valleys, mountains and animals are used by Africans to manipulate nature.

Accordingly, one very familiar but philosophically related issue with regards to force in modern science is that it is metaphysically descriptive yet held as a factual physical quantity. Force and by extension energy is held as neither created nor can be destroyed but can be transformed from one state into another following the law of the conservation of energy. What this implies is centered on how force propels objects or bodies into motion or how bodies interact through the processes of force. Interestingly, when force itself is questioned, it leads the questionnaire straightaway into the realm of metaphysics. For instance, how can the nature of the 'entity" that sets an object in motion be ontologically ascertained? How can it be grasped empirically following the scientific method of observation and experimentation? Is force of its own creation or it is from something outside of itself? Do all forces have cause and effect? How does the concept of force align with scientific hypotheses and theories? Is force outside of being or being outside of force?

Life or vital force in African worldview is analogous to vibration in science. The whole material universe is believed to be made of vibrations and this is metaphysical. Subtle vibrations called quantum wave function is present in the 'possibility' waves of subatomic and atomic matter. From this "vibrations of possibility" scientists are able to determine the sometimes mysterious behavior of matter and energy. In quantum mechanics, everything in the universe has this inherent probability-vibration pattern. This pattern enables scientists to calculate the very structure of atoms and molecules and how these particles emit and absorb electromagnetic energy.[4] Yet 'African science' (which has to do with how traditional Africans understand and harness the forces of nature for their wellbeing) is more profound and unique in comparison to western science as this study will expose.

The study shall highlight the concept of force as it is understood in African and western science arguing that the two systems are different flip side of the same coin of reality. The study will show that both African and western tradition holds either implicitly or explicitly, the material and immaterial dimensions of reality as exemplified in the concept of force with the basic differences being methodology. While the method of modern science is fundamentally empirical, that of African is metaphysical and religious but they investigate the same object or concept. However, there is an entailment of the metaphysical from the physical so that the concept of force and all that appertains to it cannot strictly follow the scientific method as exemplified in what scientists' calls dark matter, black holes and string theory. This is the basic idea in the study that will be comparatively analyzed in the two systems under review showing the areas of convergence and divergence, strength and weaknesses with regards to force.

1.2 Statement of Problem

Western scientific system adopts the inductive method of cause and effect via observation and experimentation through hypotheses and theory formulation. But upon a critical reflection, the scientific method is metaphysically underpinned. Through this hypothetical method however, science has systematized and explained the concept of force from Newton through Einstein. In the process, it has generated a lot of corollary concepts which are inherently metaphysical such as motion, mass, gravitation, change and space-time.

From these, what then is the nature of force outside just description in scientific terms? Is force material or wave-like? How can mystical force be justified apart from just mere belief? Is force the same thing as power, strength, energy or it is just attributes? What is the origin of force? Is force a being or an attribute of being? Is force known by its effect or by its existent reality? Is it the case that theories in modern science explain force as factual and empirical in the strict sense of the word? Can atoms, electrons, bosons, mesons, leptons, quarks, hadrons, fermions and other micro-particles be given the same status of materially real entities? If the reality of force in western science has gone metaphysical such as it is with dark matter and string theory, why is African science which is metaphysical, disparaged by such group as the logical positivists? If what is real is measurable and testable following the scientific method, can force be justified empirically? Since there are several methods of arriving at truth about reality of the external world, why is the scientific method for whatever reason revered so highly as the most reliable path with respect to gaining knowledge of reality despite its perceived shortcomings?

Consequently, following the scientific method can force be called factual or material since it is outside the boundaries of direct empirical observation? Furthermore, since humans engage nature from a cultural presupposition and assumptions why do we have needless hostility and acrimony over different thought systems? Against method and cultural superiority, there is the need to explore systems that work such that it brings about increase knowledge, understanding, progress and development to man just like western science is doing. However,

since science is not the only pathway to rationality about the reality of force, ought African thought system to be integrated into western science and *vice versa* in other to become a partner in progress?

1.3 Purpose of Study

The fact that humans have the rational ability to make sense of their immediate environment and social relation using the power of the mind and common sense observation necessitated the need to examine the concept of force from an African and western scientific worldviews. Hence, the purpose of this study is to:

- Inquire into the nature of force in African and in western scientific systems.
- Establish that the material and immaterial aspects of reality informs the arguments underlying the meaningfulness of force as a concept.
- Examine the material and immaterial dimension of force in African and western scientific systems and their implications for reality.
- Establish the truth that a people's worldview of Force influences their philosophies, beliefs, science and perception of being or reality in general.
- Examine the inadequacies of African and western scientific systems of "apprehending reality" and the imperative of a cross-pollination of ideas.
- Analyze the ontological nexus between the material and immaterial mode of reality and their explanations in African and western scientific systems.
- Examine how methodology is perhaps the only difference in the understanding of what is ontologically real in African and western scientific systems.
- Examine the possibility of integrating science into African worldview and African belief into science for mutual benefits

1.4 Scope of Study

The study relies both spatially and in content on research primarily in the area of African philosophy with Tempels *Bantu Philosophy* as a foundation and modern physics, especially Newtonian, relativistic and quantum mechanics which provided useful information on the concept of force in science. Philosophy of science is another area where the study draws on in scope as well as traditional branches of metaphysics (ontology) and epistemology (theories of knowledge). As a philosophical research that centers on man and the universe of force, the study also touches other areas of philosophy where some connections are established such as ethics, philosophy of religion, philosophical anthropology and socio-political philosophy.

1.5 Significance of Study

As a study that centers on understanding force and the fundamental constituents of mind and matter, it will benefit researchers in the area of African studies as it will provide great insight into the concept of force from a scientific perspective thereby exposing convergence and divergence. In the science of physics, the study will highlight the metaphysical cum ontological dimension of force as well as the issues that revolve around force as a supposedly factual and material reality making scientists to appreciate other systems of rationality of thought like that of traditional Africa. The study will also contribute to the area of philosophy of science in that it will extend the discussion on the basis of the analysis of concepts and problems in science of which force is one. In the area of law and legal procedures, religion, ethical considerations and psychology, the study will provide useful insights into why humans act in a certain way and why they do the things they do sometimes even against established laws and moral codes. The interdisciplinary nature of the study will benefit lovers of nature, professional physicists, professional philosophers of science, religious and ethical enthusiasts, legal luminaries, research students, and every lay person who have interests in the complex nature of force in our universe and the fascination it holds as well as the logic of explanation accruing from its contemplation

from the two systems under consideration. The study will also serve as a veritable resource material to relevant government institutions and agencies, policy makers and traditional institutions because of the challenging issues treated and historical richness. This is so because the area of study has a strong inclination towards reality of a material or immaterial sort. All these can be made possible when the content of the study is made available to the general public through publication as a text or articles in journals that have online visibility.

1.6 Methodology

As a qualitative research, the method employed in the study is comparative analysis. The method of comparative analysis adopted is the individualizing, universalizing, variation-finding and encompassing types. Applying the method, the study looks at the object of investigation (force) analytically from an African and western scientific systems focusing on the convergence or divergence before inferring implications for social reality in general.

1.7 Definition of Terms

There are some terms that need explication with regards to understanding the *locus* of the study. They are comparative analysis, force, Africa, science, culture, worldview and thought system. The meaning assigned to each below shall be held at face value throughout the study.

(i) Comparative Analysis: Simply put, is the act of comparing two or more things with a view to discovering similarities and differences about the things being compared. A more elaborate classification or types of comparative analysis is set out by Tilly who distinguishes four types which are: individualizing, universalizing, variation-finding and encompassing. For the purpose of this study, the universalizing and the encompassing approach shall suffice. The universalizing approach aims to "establish that every instance of a phenomenon follows essentially the same rule" while the encompassing approach "places different instances at various locations within the

same system, on the way to explaining their characteristics as a function of their varying relationships to the system as a whole ".[5]

(ii) Vital Force: In African thought system, vital or life force is a metaphysical concept that is inseparably bound to 'being' as force is one with being. Being is conceived as the concept of force and is all inclusive and exclusive, material and immaterial. Force is the totality of everything in reality whether corporeal or incorporeal. Thus, "nothing moves in this universe of force without influencing other forces by its movement. The world of forces is held like a spider's web of which no single thread can be caused to vibrate without shaking the whole network".[6] Force or being is found in all reality whether in chemical, mechanical, mental, psychical and spiritual interaction.

(iii) Force: Force in modern science is a push, a pull or a turn and is held to be a material and factual reality. Thus, a force acting on an object may: (i) balance an equal but opposite force or a combination of forces to maintain the object in equilibrium (ii) change the state of motion of the object (in magnitude and direction) or (iii) change the shape or state of the object.[7] The four interaction of force in modern science are gravitational, electromagnetic, strong and weak nuclear force.

(iv) Africa: This is a geographical and socio-cultural entity *englobed* by the continent of Africa also known as the Sub-Saharan black Africa. Africa here represents a people bonded by almost similar cultural heritage and beliefs system with colonial experiences too. The issue however of where ancient Egypt belongs, and whether black Africans can lay claim to the Egyptian heritage, is far from being settled.[8]

(iv) Science: Science is a field of knowledge held as following the method of physics with Newtonian, Einstenian and Quantum physics forming modern science, which consists of

collection of "facts" by means of careful observation and experiment and the subsequent derivation of laws and theories from those facts by some kind of logical procedure. The aim of science is the improvement of man's lot on earth and that aim was to be achieved by collecting facts through organized observation and deriving theories from them. According to the theory of falsificationism by Karl Popper, some theories can be shown to be false by an appeal to the results of observation and experimentation.[9]

(v) Culture: This is the way of life of a people, including their attitudes, values, beliefs, arts, sciences, modes of perception, and habits of thought and activity. Cultural features or forms of life are learned but are often too pervasive to be readily noticed from within.[10]

(vi) Worldview: The most profound questions of existence are those questions and not their answers that are surprisingly enduring throughout the history of philosophy. Hence how these questions are answered by a people defines their worldview system components as a coherent collection of concepts "allowing us to construct a global image of the world, and this way to understand as many elements of our experience as possible".[11]

(vii) Thought System: This represents the thinking pattern of a people which invariably defines their perception or views about reality. Thought system involves the culturally structured set of assumptions touching on values, reason, faith, experience and commitments underlying how a people perceive and responds to reality in an all embracing manner. A thought system is a philosophical system which attempts to explain the interrelatedness of facts of reality as well as shapes and colour the way people think, behave and furnishes the interpretative condition for understanding and explaining the facts of human experience implicitly and explicitly. Kant pointed out that human beings do not perceive the world as it actually is, but rather that our knowledge of reality and relation to social phenomena are conditioned by certain *apriori*

elements-categories and forms of intuition such as time and space.[12] In describing the world including the boundaries of knowledge and the relationship between world, mind and language, it should be borne in mind that the entire discussion is within a system and sometimes about a thought system.[13]

ENDNOTES

1. Bertrand Rusell, *A History of Western Philosophy*, (Newyork: Simon and Schuster, 1945), p. 41

2 N. Geisler and P. Brocchino, *Unshakable Foundations*, (Minneapolis: Bethany House, 2001), p:43.

3 Placide Tempels, *Bantu Philosophy*, (Paris: Presence Africaine, 1959), p.27

4 Fred Alan Wolf, *The Eagle's Quest: A Physicists search for Truth in the Heart of the Shamanic World*, (Newyork: Summit Books, 1991), p.24

5 C. Tilly, *Big Structures, Large Processes, Huge Comparisons, Russell Sage Foundation*, (Newyork, Vogel, D, 1984), pp: 82-83.

6 Placide Tempels, *Bantu Philosophy*, p. 27.

7 Luck Steve (ed), *The International Encyclopedia of Science and Technology*, (Newyork: Oxford University Press, 1999), p. 148

8 Ada Agada, Existence and Consolation: Reinventing Ontology, Gnosis and Values in African Philosophy. Calabar: 3rd Logic Option Publishers, 2015. p.6

9 A. F. Chalmers, *What is this thing called Science?*, (Burkingham: Open University Press, 1990), pp: xvi-xvii, 38

10 Simon Blackburn, *Oxford Dictionary of Philosophy*, (Oxford: University Press, 2005), p.86

11 C. Vidal, "Metaphilosophical Criteria for Worldview Comparison" Metaphilosophy 43(3). (2012), pp.306-347

12 Immanuel Kant, *Critique of Pure Reason*, Trans. Norman Kemp Smith, (London: The Macmillan Press, 1982), p.40

13 Benjamin Brown, *Thoughts and ways of Thinking: Source Theory and its Application*, (London: Ubuiquity Press Ltd, 2017), p. viii

CHAPTER TWO

LITERATURE REVIEW

2.1 Literature on Force in African Worldview.

The style of this review shall be thematic. It will try to delineate the idea of force from a wide array of literatures focusing primarily on extracting the meaning of force in traditional Africa worldview and the accompanying logic of explanation.

In the work *Bantu Philosophy*, Placide Tempels[1] attempted articulating and at the same time, informs that the people of Sub-Saharan Africa (just as other Africans) have a distinctive philosophy. Tempels argues that the African philosophical categories are identifiable in language, thus the basic metaphysical category in the thought of Bantu-speaking societies is Force. Tempels avers that:

> We can conceive the transcendental notion of "being" by separating it from its attribute, "force", but the Bantu cannot. "Force" in his thought is a necessary element in "being", and the concept "force" is inseparable from the definition of "being". There is no idea among Bantu of "being" divorced from the idea of "force". Without the element "force", being cannot be conceived. We hold a *static* conception of "being", they a dynamic. What has been said above should be accepted as the basis of Bantu Ontology: in particular, the concept "force: is bound to the concept "being" even in the most abstract thinking upon the notion of being.[2]

For the Bantu as well as other Africans, being is animated by force. This force has a supreme value which is life, force, to live strong or vital force. This Bantu Ontology is contingent upon the cultural beliefs held by the people. Tempels emphasized this point lucidly when he asserts that, "anyone who wishes to study primitive people or *Evolues* must give up all idea of attaining valid scientific conclusion so long as he has not been able to understand their metaphysics. To declare on *apriori* grounds that primitive peoples have no ideas on the nature of

beings, that they have no ontology and that they are completely lacking in logic, is simply to turn one's back to reality.

Force in Bantu philosophy can be understood from a firm logic of belief. This belief is centered on the Supreme Being or God. Thus, the Bantu speak of God himself as "the strong One", he who possesses Force in himself. He is also the source of the force of every creature. In the minds of Bantu, all beings in the universe possess vital force of their own: human, animal, vegetable, or inanimate. Each being has been endowed by God with a certain force, capable of strengthening the vital energy of the strongest being of all creation: Man.

The unique thing about this force as subscribed to by the Bantu's is that, they are metaphysical but with evidence in the physical or natural realm. This suggests that "life force" or "vital force" has been enshrined in everything in creation by the supreme creator, God. To this end, there is force in everything in creation whether animate and inanimate. The understanding of the workings of this force is essential to the survival of the Bantu's as well as their manipulation of mind over matter. Tempels avers that the Bantu say, in respect of a number of strange practices in which we see neither rime nor reason that their purpose is to acquire life, strength or vital force, to live strongly, that they are to make life stronger, or to assure that force shall remain perpetually in one's posterity.

The concept of force to the traditional African has a dimension to which it is correlated to "energy". Energy in modern science is uncreated and indestructible. Similarly, force has the same connotation as it can only diminish one's being but it cannot be destroyed. Tempels explains this point lucidly thus: "those who think that, according to the Bantu, one being can entirely annihilate another, to the point that he ceases to exist, conceive a false idea. Doubtless one force that is greater than another can paralyze it, diminish it, or even cause its operation

totally to cease, but for all that the force does not cease to exist. Existence which comes from God cannot be taken from a creature by any created force".[3]

The Bantu African has a rich and profound philosophy of reality which captures the very essence of the people's worldviews, culture and system of thought. Their idea of being has a lot of relationship in many ways with that of the West as can be implied, since being is a subject that has a lot of relevance to reality and force is at the centre of being, it becomes very germane to examine Bantu's understanding of force alongside Western science. One of the outcomes of such interrogation will be the nexus between force as a supernatural concept and its expression in the material world. Others are: how to manipulate the forces in the other modes of being like plant and animals in order to preserve man's vital force and or harm others. All of these and much more shall form the basis of the discussion in the study.

Accordingly, John S. Mbiti in the work, *African Religions and Philosophy* sets out to deal almost exclusively with traditional concepts and practices in those societies which have not been either Christian or Muslim in a deep way, before the colonial period in Africa. This point is instructive because it talks about the pure traditional and cultural beliefs of the people of Africa before Western or Eastern infiltration. But our concern amidst other deep philosophical issues raised and discussed in the work is on the extraction of the concept or idea of vital force.

It must be stressed upfront that the subject of 'being' from which force is a subject is not majorly different amongst traditional Africans. If there are variations, they will be so insignificant as to be noticed. Mbiti notes that the concept of force makes much sense in religion for the Africans. He asserts this truth thus: "because traditional religions permeate all the departments of life, there is no formal distinction between the sacred and the secular, between

religious and non-religious, between the spiritual and the material areas of life. Wherever the African is there is his religion".[4]

Africans conceive of man as a tripartite being. By that, he has a soul, spirit and body. This makes it easier for him to relate with God, the Supreme Being, other spirits and even his ancestors. There is no much bifurcation for the Africans between the spiritual plane and the natural. Mbiti avers that we have repeatedly emphasized that the spiritual universe is a unit with the physical, and that these two intermingle and dovetail into each other so much that it is not easy, or even necessary, at times to draw the distinction or separate them.

From the forgoing then, natural or supernatural phenomena have the same sources and ontological status. The natural intersects with the supernatural and vice versa. What is held to be natural and empirically verifiable is a product of supernatural forces. Created things are made from a different substance which is spiritual and emanates from the Supreme Being who is held as God. Mbiti avers further that:

> God is the explanation of man's origins and sustenance; it is as if God exists for the sake of man…Animals, plants, land, rain and other natural objects and phenomena describes man's environment, and African people incorporate this environment into their deeply religious perception of the universe. We have already seen how some of these objects and phenomena are attributed with life and personality, so that strictly speaking, nothing is essentially dead or devoid of life (being) in the sight of African People.[5]

It becomes easier to understand the notion of force from an African worldview because force is that which animates "being" and this vital force is in every created things whether living or non-living. It is this understanding of being that makes the African to see every object in the universe as being alive because it attracts life force from the creator who himself is life. This is the reason why the African can manipulate matter through words and other mystical means. Magic, witchcraft and sorcery are all realities that are undeniable in African cultural systems and

this is contingent upon the frame work of force, which is often seen as mysterious because it defies every known logic as well as scientific explanation. Mbiti avers that: "there is mystical power in words, especially those of a senior person to a junior one, in terms of age, social status or office position…The words of the medicine-man work through the medicine he gives, and it is this, perhaps more than the actual herb, which is thought to cause the cure or prevent misfortunes. Therefore, formal 'curses' and 'blessings' are extremely potent;…" [6]

The idea of force in African system of thought as captured by Mbiti is one of dynamism. Force is in every being and their attributes; force is in spoken words, thoughts and gestures. Force is the definition of being and its livewire. Thus everything created by the Supreme Being has life force or energy originally programmed into them. To this end, the interconnection of one causal event to another can be explained by this belief system which accounts for why traditional Africans can manipulate the forces in nature for good or evil, a trait absent in modern science. This dimension is what this current study is bringing to the round table of discussion.

D. A. Masolo continuing the discussion in the work *African Philosophy in search of Identity* begins by stating that the birth of the debate on African philosophy is historically associated with two related happenings: Western discourse on Africa, and the African response to it. At the centre of this debate is the concept of reason, a value which is believed to stand as the great divide between the civilized and the uncivilized, the logical and the mystical.

The author, going beyond the Western cultural attitude of bias as seen in the comments of such personalities as Kant, Hegel, Levy Bruhl on the Africans, set out to review the notion of mysticism, science, philosophy and rationality from the perspective of African system of thought. The author noted that with regard to the analysis and understanding of African System of thought, "In its present form, this debate begins in the mid-sixties with the publication in 1964

of Peter Winch's article "Understanding a Primitive Society" and in 1967 of Robin Horton's now famous paper "African Traditional Religion and Western Science". Masolo noted with concern that: "either as a result of the influence of anthropology or as a result of a crisis within the institution of philosophy itself, the discussion on rationality has turned philosophers into anthropologists and sociologists of alien cultures, and anthropologists and sociologists into philosophers" [7]

The point being made by Masolo here is that, the issue of scrutiny of African traditional thought with respect to mysticism or witchcraft is supposed to be the exclusive preserve of philosophers and not sociologists and anthropologists, whether as professionals in that discipline or as a method of inquiry. Thus with regards to the reality of witchcraft, oracles and magic, there is an agreement about its existence though with the problem of corroboration using the scientific method.

The author states that most Western philosophers strongly defend the connections that are based on a specified and super-realist notion of human kind, science, and rationality. The theme they defend is that man is a natural creature in a rational world of cause and effect; and that with the aid of reason we can master nature, manipulate society, change culture, and indeed, shape ourselves. This position holds a conception of rationality that identifies logical consistency and coherence in the explanation of reality as its minimal characteristic. The truth of this "reality" they believe, is established by science.

According to this school of thought, there can only be "one" rationality based on universally valid rules of logic and inference. These rules can be stated as follows:

i. The law of identity (if P, then P)
ii. The law of non contradiction (Not – (P and not-P)
iii. Modus Ponens (If (P, then Q) then Q).

The problem with holding on to this Western kind of logic is that, it does not create room for relativism of truth or knowledge and so cannot explain other aspect of cultural ontological logic. This is why the West holds that there is only one reality, whose relations are objectively discernible by science. It is such kind of thinking that has made the West to dismiss the notions of witchcraft, magic and sorcery as utter nonsense. But one thing is certain that one cannot draw a line and thereafter create a restriction for things outside the line.

The standard of rationality from modern science therefore destroys relativism of reason of which most cultural traditions are embedded emerging from evidence, provided by among others, social anthropologists, out of non-western beliefs and practices. With respect to words as just a simple conventional signs made into a system to impart information or as force, Masolo quoting Robin Horton asserts:

> That one of central characteristic difference between traditional African worldviews and scientific theories is that the former treats words as if they are able to produce the things for which they stand. In other words, "the words of men are granted a certain measure of control over the situations they refer to"….In this way,…Africans personalize the causal forces in nature in contrast to the impersonal forces operational in scientific explanations.[8]

Heidegger says a thing that has no word to represent it does not exist. In the explanation of reality, that is, in an attempt to give a theoretical grounding for why things happen the way they do, Africans revert to spirits as Westerners revert to science. Spirits are to African traditional thought what material particles are to Western scientific system. Horton as quoted by Masolo observes that because traditional thought, invariably makes recourse to personal spiritual explanations to account for practical or empirical events, such explanations becomes comparable for modern science which serves the same purpose.

One important point to note in the preceding discussion is that, there is the acknowledgement that witchcraft, sorcery and magic is a reality amongst Africans; but the

subject of debate or controversy, is in the logic of explanation as to its causal consistency or coherence. But this itself is coming from a cultural background thus it will be improper to use one paradigm of rationality from a culture such as science to judge another culture or system of say, the Africans. This is the reason why perhaps Horton as quoted by Masolo holds that "… traditional thought is not specialized knowledge. It cares neither for the theoretical plausibility nor for the logical consistency unlike Western science, of its many claims because its production does not take place under the awareness of or need for theoretical plausibility or logical consistency as guidelines for its internal structure. Often traditional thought is not consistent at all. Even the concept of causality which is ascribed to the power of the word is not consistently held. The "theory" of words only sometimes exhibits causal claims.

Continuing in the same line of discussion with regard to the logic of traditional African thought, Robin Horton in his "African Traditional Thought and Western Science" asserts that there is a link between the religious thinking of traditional African and the theoretical thinking of the modern West. To him, the troublesome red herrings which lie across the path towards understanding the crucial differences between the traditional and the scientific outlook are avoidable. Concerning the differences, he asserts: "it is that in traditional cultures there is no developed awareness of alternatives to the established body of theoretical tenets; whereas in scientifically oriented cultures, such awareness is highly developed. It is this difference we refer to when we say that traditional cultures are 'closed' and scientifically oriented cultures 'open'" [9]

The idea of "closed" and "open" societies is predicated on the absence of any awareness of alternatives which makes for an absolute acceptance of the established theoretical tenets, and removes any possibility of question. This is culturally patterned and acts like a stronghold to Western culture because of the faith in the system of science; though traditional African thought cannot divulge itself of this pattern too. But beyond the "closed" and "open" system by the lack

of awareness of alternatives, sacredness of beliefs, and anxiety about threats to them and vice versa, the author acknowledges that "a central characteristic of nearly all the traditional African world-views we know of is an assumption about the power of words, uttered under appropriate circumstances, to bring into being the events or states they stand for.

A word therefore has force or energy to the traditional African and he holds firmly to that belief. But the source of this power is from the Supreme Being who is said to form the world out of chaos by uttering the names of all things in it. In traditional African cultural system, to know the name of a being or thing is to have some degree of control over it. This is where invocations of spirits become effective in rituals. It is also believed that harm can be done to man by various operations performed on his name-for instance, by writing his name on a piece of paper and burning it.

In African magic, bodily movements, bites of plants, organs of animals, stones, earth, water, spittle, domestic utensils, statuettes and a whole host of actions, objects, and artifacts play a vital part in it. Magical objects are the preliterate equivalents of the written incantations which are so commonly found as charms and talisman in literate but pre-scientific cultural Milieu. However, the scientist's attitude to words is, of course, quite opposite as he dismisses contemptuously, any suggestion that words could have immediate, magical power over the things they stand for. The scientists grant an enormous power to words only in the indirect sense of bringing control over things through the functions of explanation and prediction. Arising from this position, Horton avers: "why does the scientist reject the magician's view of words? One easy answer is that he has come to know better: magical behaviour has been found not to produce the results it claims to, perhaps. But what scientists have ever bothered to put magic to the test? The answer is, none; because there are deeper grounds for rejection-grounds which make the idea of testing beside the point".[10]

To reject any phenomena as primitive because they do not conform to the scientific method is a serious error. The *status quo* has always been that belief or faith without factual evidence is utter nonsense. But when a person presses on and asks that the one denying the other reality presents himself for a test, the bias sets in. Some will argue that, how can one test what is already held to be ridiculous vis-a-vis empirical verification? When a stands or position is intolerable rather than hopeful, it becomes a case of undue feeling of superiority exhibited. The idea of explaining something supernaturally from a naturalistic point of view tantamounts to a categorical mistake. Even at that, the West once and still held on to such belief in the supernatural. Horton puts it thus:

> That the outlook behind magic still remains an intellectual possibility in the scientifically oriented cultures of the modern West can be seen from its survival as a nagging undercurrent in the last 300 years of Western Philosophy. This undercurrent generally goes under the labels of 'idealism' and 'solipsism', and under these labels it is not immediately recognizable. But a deeper scrutiny reveals that the old outlook is there all right-albeit in a strange guise.[11]

The underlying point from all these is that traditional African thought system has its own merit just as is Western Scientific system. However, their methodology differs greatly such that one is "closed" and the other 'open'. We also see that the acceptance of magic, sorcery or witchcraft as a reality is founded upon the beliefs in them. This makes it such that while in traditional thought system it is mostly experience that determines theory, in the world of the experimental scientist, there is a sense in which theory usually determines experience.

Udo Etuk further attempts to systematized "The Possibility of African Logic" to show how the Africans line of thought is different from the West. This differential in reason anchored on cultural system can be responsible for the pejorative outlook of African traditional thought system. Udo Etuk attempts to show that philosophy, just like logic can be regionalized. His convictions stems from the truth that "philosophy always grew out of a people's concern to

understand their world, their lives, so as to be guided hereby. Etuk makes the point lucidly clear that philosophy is invariably bound to the culture of a people because though philosophy is a universal quest, it has boundaries which is why we have Chinese, Indian, Islamic, British, European philosophies which is just the way these people make sense of their existence as influenced by their most cherished culture.

If philosophy, a universal discipline has boundaries or delineations, it follows that logic too which is a branch of philosophy must so be. This is the grounds on which Etuk tries to establish what can be called African logic as logic is concerned with the form or pattern that a proposition takes. Traditional Africans he avers, have rationality which is why they can have logic. But some occurrences in African cultural belief or system will not square up with the formal logic of the West. This does not in any way makes African thought illogical. Etuk puts this point in perspective thus: "what this means specifically in the area of logic is, again that there is a strong possibility of African logic, of African ways of cognizing reality, and of African ways of discovery. It is true that thought and reason are universal human characteristic; but thought itself is never about nothing; it is always about something…problems and challenges are bound to shape the way they think and reason".[12]

The African logic that Etuk proposes is founded upon how reality is perceived. This perception of reality invariably affects the logic behind it. Etuk using the concept of time as an example asserts "that even the West recognizes what is called "African time". Thus, "the difference lies rather in that, while the Westerner feels himself controlled by time and is literally enslaved by his chronometers, the African gives the impression that time was made for man". The other example is on what Etuk calls "Status Factor". Here the status of a person in African cultural thought system affects the outcome of certain actions as right or wrong. Etuk exemplifies this logic thus: "if anyone cut another person's palm fruits, then he will pay this fine.

S has cut another person's palm fruits. But given the two premises, it does not follow that: S must pay this fine; because the status of the person intervenes: But S is a grandchild of this community Therefore, S will not pay this fine".[13]

This kind of reasoning is predominant among the people of Ibibio in Nigeria and elsewhere in Africa and is related greatly to several other cultural belief systems like sorcery, magic, and witchcraft. A logic of thought will without doubt make sense if we understand fully the underlying meaning and factors that influences it. This is why we have cultural and by extension, thought differences between the West and Africans. For instance, the Western culture of queuing (merit system) will not work in Africa where several reasons can be attributed to given those with certain status the honour they carry and are recognized. Logic, or a people's way of organizing their forms of thought cannot be separated from their systems of thought; thus explanations must be based on the underlying culture that a people are most fundamentally committed to.

Continuing Udo Etuk's line of thought, Chris Ijiomah in his *Harmonious Monism: A Philosophical Logic of Explanation for Ontological Issues in Supernaturalism in African Thought* built his Idea around the following convictions:

> … Philosophy is culture bound. Second, Africa is a multi-cultural entity that has cross-borderline marks, that is, unconsciously rooted assumptions called root paradigms or touch-stone propositions which serve as criteria that determine which propositions that should be included into or excluded from African Epistemology. Third, every part of philosophy is colored by root-paradigms of the culture in which philosophy is domiciled; fourth, every explanation has a logical base. Fifth, every logic has a correlation with the configuration in its culture…[14]

Ijiomah stated the point explicitly that purely formalized logic lacks eidetic meaning and hence cannot represent a statement of ontology. This is very instructive as ontological claims may require a different kind of logic to understand its import. Validity can therefore be gained at

the expense of sound argument or even the discovery of truth. He notes that logic must go beyond just the form in which an argument is stated to the ontological truth of each premises and propositions. Hence Ijiomah declares that "…every logical system cannot be adequate for the explanation of all social experiences".[15]

The above point underscores the need for alternative logic that could serve as good explanatory tools for analyses of different phenomena and that is where the three-valued logic of duality or supernaturalism comes into play and the appropriation of these logics will depend on the ontological-configuration that is involved. Thus in the work, Ijiomah started out by examining certain acclaimed Western thinkers and their claims alongside the laws of thought showing the pitfalls in those systems as well as their history.

But of particular interest to us is what Ijiomah calls "the theory of reality "(ontology) and this is where African thought falls. Ontology therefore, is essentially the study of what is most real. Thus reality is a product of how people conceive or perceive things in the universe. The correlation therefore between logic and ontology according to Ijiomah, is seen if the ultimate reality is studied in relation to justification of reasons of events; it yields the correlation between logic and ontology; if the ultimate reality is studied in relation to the "how" of events, it yields the correlation between ontology and psychology.

To this end, we need to clarify that metaphysics is not ontology since ontology is a branch of metaphysics. While metaphysics study the general characteristics of being, ontology study the ultimate reality, that is, the basic reality on which every other reality stands according to the perception and conception of a people. The dualistic logic of the West is prevalent in Aristotle's logic. It is seen as a complete body of doctrine and it has thus closed the chapter of

logic and hence cannot be improved upon. With respect to ontology, Plato stands out and this is why it is held by some scholars that every philosophy after Plato is a mere footnote.

Ijiomah argues that every thought or philosophy of a people is culture bound and tongue tied. This shows the close connection between philosophy and culture. For this reason, the fundamental function or goal of philosophers is to construct world-views which will bind people of the same culture together. And this is the foundation upon which Western philosophy is built, as well as any philosophy at all. To understand African mode of thought is first to understand African ontology which heavily draws from the belief in hierarchical existence of "being" beginning from God and terminating in inanimate entities all containing vital force and these forces relate as contraries and hence yearn for each other.

Ijiomah establishes his theory of harmonious monism upon the basis that for the traditional Africans, each reality, whether spiritual or physical, depending on the role it plays, assumes physical or spiritual characteristics creating a harmonious relationship. Reality therefore is cyclical for the African incorporating the spiritual in the physical and a dualism of the spiritual and physical. Ijiomah states the theory of harmonious monism thus: "the difference between the logic of the West and Harmonious Monism can be gained from the logics of Hegel and Marx and it is that, the latter (Marx and Hegel) do not allow extremes (materialism and spiritualism) to meet. It is only in African logic that such is possible. In this African logic one of the extremes does not super-impose itself on the other. Since they are contraries they are always harmoniously in monism".[16]

The difference therefore is clearly predicated on the African system of thought. This worldview determines how reality is conceived which in turn informs the philosophy of a people. African logic is predicated upon her worldview so that, a knowledge of this ontology takes care

of the logic emanating from it. And if for any reason the logic doesn't seem plausible by say the Western criterion, the fault then will be from the viewer's lenses. This is how magic, rituals, sorcery and witchcraft can be explained as a phenomena which is why two contrary realities can unite without producing a contradiction in African worldview and it is this dimension of reality that the concept of force is grounded upon.

In the work *African Vitalogy: A Step Forward in African Thinking* Martin N. Nkemnkia did a seminal work on African philosophical thought. He began by searching for the identity of African thoughts and the contributions of various authors in the formulation of such. He went further to examine the anthropological and cosmological perspective of African thought, the knowledge of God, African vitalogy, gnoseological characteristics of African thinking as well as ontology and metaphysics in African thinking. The author focuses on force which he calls *Vitalogy* where he harps on the supernatural powers of the Supreme Being flowing through other contingent beings. He asserts that:

> By *vitalogy* we mean a conceptual vision of the whole of reality where there are no space for irreducible dichotomies between matter and spirit, religious commitment and daily life, soul and body, the world of the living and the world of the dead (world of the ancestors). Therefore, in *vitalogy*, each concept, scientific field, cultural aspect is a value, which is found within a *"whole*". This *"whole"* can still be considered as "Togetherness" or furthermore as "The One", that comprise all its parts.[17]

From the above quotation, there is a unified vision of the world which includes both the material, visible world (the cosmos) and the invisible, spiritual world (the dwelling place of the ancestors which is as real as the visible world). Thus, every appearance of reality in its different forms, always correspond to an invisible reality that constitutes at the same time, the source of the visible and its principles.

Within this fulcrum avers the author, life precedes "being" which is a determining factor to it. In this lies the reversal of values. For the African, "Being" is an attribute of the "vital force" of life itself, thus it is created. As the author puts it, our problem is not so much in trying to justify life, but rather in trying to find the founding principles, through which all existing things owe their existence. Consequently, a demonstration of the existence of God, man and the world is not possible. The reason for this as stated by the author is because one cannot demonstrate or prove a given fact. What we can do is to establish the hierarchical order of the existential values and give an answer to the questions such as "why does one exist ", "what does one know?", "what is the value of knowledge?" To attempt an understanding of spiritual forces from a naturalistic basis will amount to an exercise in futility. This is where the cultural ontology of a people forms a major facet of their logic. Nkemnkia opines accordingly that:

> … the civilization and the culture of a people are characterized by the category of "relation", which makes African civilization a civilization of relation: between man and nature, between man and the supernatural, that is, the vital force which is God, who communicates himself to man and to everything. It is necessary to emphasize here that culture in its highest definition is the effect towards a greater humanization, a greater order in the universe, and it is the process through which one can interpret the aspirations and orientations of man and mankind when trying to give meaning to existential problems, and clarify his position in the world and history.[18]

The phenomena of magic, rituals, incantations, witchcraft and sorcery in African worldview are from a perspective. It is not just a fable or myth but an operational reality with pragmatic truth. It defies mathematical, logical or experimental explanation except the explanation is done on the basis of understanding the underlying reality. If life force flow from the Supreme Being, the creator of everything, visible and invisible, then it is only logical to deduce that vital force will be in everything. This is the origin of the concept and idea of a supernatural and spiritual life as an integral of human beings.

Vital forces therefore bind the natural with the supernatural in a manner that is holistic. This is where Africa gets her idea of communalism and brotherhood. This is the relationship between the "I and the We", "the parts and the whole", between "the creator and his creation", between "the soul and body" between "the living and the dead". This is why the African co-exists with nature because they see nature as a mother having vital forces too and sacred. All of these as Nkemnkia argues are important in understanding why Africans think the way they do with respect to reality and what the current study seeks to advanced.

In the article "The Theory of Forces as conceived by Igbo-Africans" Obiajulu Mulumba Ibeabuchi examines the Igbo concept of force *ike* such as: (i) Force as given by ancestors (ii) Force from charms and magic (iii) Force obtainable from sacrifices (iv) force in prayer, sacred objects and places. The writer avers that there is a Supreme Being who gives life or force to other beings that are subordinate. He made the point that people elsewhere believes that the gods have power, force or energy (*ike*) over things that men cannot control or understand.

For the writer, man is a force itself who manipulates other forces whether good or bad through other forces in the form of charms in other to assert himself and secure his own existence from other malignant forces. Of course all these would not be possible if there isn't a belief in spirits whether good or evil ones. These deities and spirits as spiritual beings are evident in Igbo proverbs and are believed to be more powerful than man in terms of their power and abilities. The writer informs that:

> The *Arusi*…are spiritual forces in nature which until when they are discovered by man, remains inactive. They become active once man discovers and begins to worship them. It is an instrumentality through which evil forces are controlled, their forces enfeebled. The real meaning of *Arusi* is *Aru kwusi* (evil must stop)… Thus the deities essentially are activated to help man guard against evil in the society.[19]

The process of activating these spiritual forces will require some level of expertise from a *dibia* (medicine man) who has knowledge about the workings of such phenomena. Such a secret is not opened to all. The utility derived from such spiritual forces is also social and beneficial to all. Forces in the universe also interacts in a harmonious relationships this is why spirits in trees have vital force over man who can use these forces in nature to strengthen his own life. The Igbo Africans believes in sacrifices offered to the invisible spirits, deities and ancestors to obtain favors or to avert dangers.

The Igbos believes in the operation or manipulation of occult powers because of the interaction of forces in the universe, more like a spider's web, linking all things together. It is on the ground of this that life forces can be enhanced or diminished except there is a resort to sacrifice. Hence, "the traditional Igbo man retrieves the power of spirit, hidden powers as a scientist retrieves data from the computer. To this end, the Igbo belief in sacrifices, rituals and their efficacy are evidence of their unmistaken belief in occult realities, as well as charms and amulets.

It is glaring that what the Igbo-African calls charms or amulet is a material object that is believed to carry force or power to influence others or situations. Some of these amulets can be tied on the wrist, waist, and neck or even put in a pocket. They are fashioned after the similitude of what it is intended to achieve. For instance, protective charm "… is prepared by those things in nature whose actions are protective such as strong bulwarks, nails of a strong man, body parts of Lion, Leopards, Tigers or other strong animals.[20]

On the other hand, love charms require the use of attractive objects and good natured ingredients since love attracts hence the ontological similitude. Igbo Africans believes that everything in life has a purpose and so is existence. This is why life forces can be tapped from

other things in life based on their potency in nature. The conception of forces in Igbo worldview is really not different from those held by other Africans despite the great divide and distance. The highpoint is that vital force emanates from the Supreme Being and finds expression in other beings whether natural or supernatural. This position is at variance with modern science in that, forces has no connection with the supernatural.

Following the theory of forces, Kanu, Ikechukwu Anthony takes us into "The Dimensions of African Cosmology". He asserts that, metaphysics has two branches namely ontology and cosmology. Cosmology here is from "the Greek words: Cosmos and Logos, meaning 'universe' and 'science' respectively. Put together, it is the 'science of the universe'. The writer asserts that African cosmology then is the way Africans perceive, conceive and contemplate their universe; the lenses through which they see reality, which affects their value systems and attitudinal orientations; it is the African's search for the meaning of life, and an unconscious but natural tendency to arrive at a unifying base that constitutes a frame of meaning often viewed as (origin), and as (end).

The universe for the African is both natural and supernatural. However the supernatural universe is far real in comparison to the natural one and is the seat of influence. God is at the apex of this universe followed by the ancestors, while man is at the centre. Invariably then, there is a place where God dwells (the sky-not the physical sky), the earth where (man, animals, natural resources, some devils) dwells and the underworld where the ancestors and some bad spirits live. In Igbo ontology, these are called: *Elu-Igwe* (sky) *Alammadu* (the world of the living) and *Alammuo* (the land of the spirits). The interesting thing about this universe is that there is constant interaction despite other separate existence. Talking about God as the grand force of all existence, Kanu avers that:

> God is a reality and not an abstract concept…he is a personal being with whom one can enter into communion and communication…he is conceived as masculine…In some others as feminine…and as both male and female. These attributes…are words or phrases that speak of the traits, properties, qualities, or characteristics of God and what is believed to be his role in relation to the world and man. These attributes bring down the divine from the high mountain of the metaphysical and abstraction to the level ground of the real and concrete.[21]

Furthermore, God is held to be one, unique, the absolute controller of the universe, real and active, the creator, king, omnipotent, eternal and a judge. Now to reach this high and lofty God, one would need intermediaries called divinities who are the offspring of the Supreme Being. These divinities are not ends in themselves but their function is to ensure that God is not bothered; hence the Supreme Being has put certain measures in place through his lieutenants to administer justice, help and even make provision.

The writer further categorizes divinities into: primordial divinities, deified ancestors and personified natural forces and phenomena. The third category has to do with the myriad of spirits that have their abode on mountains, hills, rivers, seas, oceans, trees, roads, markets, caves, brooks, lakes and forests. This goes to show that these natural objects, contains life force in themselves. Their existence is not of themselves like the Western theory of evolution will have us accept. The Supreme Being created them from himself and is inhabited by these spirits some of which are good and some evil. They are held most times as the source of blessings or calamities in the community. This is why sacrifice is placed most times to appease these gods or to seek for their blessings. The writer gives further insight into spirits in the African cosmos thus: "the African universe is made up of myriad of spirits. Earth is not understood as the final end of man. After death, the soul *Akpulobi* goes back to *Chukwu*. The after-life for the Africa is cyclic: birth, death and rebirth. Those who lived good lives and died at ripe old age, receiving the appropriate funeral rites, in relation to their status, go to the spirit-land (*Ala-mmuo*), where they continue to live until they reincarnate".[22]

The highpoint of the work is that the African universe is not just the natural plane of existence but supernatural or spiritual as well. Man is at the centre of the universe and its existence with every other reality relating to him. Man is the spark of divinity or emanation of God. Man has a purpose on earth to fulfill. He is not just a mechanistic being in a manner that the West views man but a force that interacts with other forces especially with God through libation and divinities. To this end, the African universe is a unified one where everything is bound up together in an unbroken chain. This is the reason why a phenomenon cannot be explained only in naturalistic terms in African worldview but in a supernatural term too.

Similarly, B. Abanuka in his *Myth and the African Universe* examines the role myth plays in understanding the African universe. Myth to him is held to contain elements of symbolic language and community ownership. In explaining the element of symbolic language, the author points out two factors which underline the use of such language and they are: man's desire to give some meaning to his universe and that myth answers question of origin by giving hints-albeit absolute and dogmatic-as opposed to giving strict mathematical or logical resolution.

The work is very relevant to the current discourse because it gives us insight into the origin of the material universe-one issue that is very controversial today even in the world of natural science. Myth has a close religious connection to man's way of understanding the origin of the world, phenomena and events and accommodates man's desire to have ultimate meaning. To this end, myth usually employs a hierarchy of gods and goddesses, with the Supreme Being as head of the invisible and visible world. In this respect, man's primary attitude to the universe is religious.

The work investigates further, how myth fundamentally contributes to shaping the worldview and culture of its community of origin and how each tribal or natural group lives in its own world. Myth, despite its anonymity, various interpretations, obscurity and ambivalence: "is produced by the activity of the human mind, but as a product of the mind, it is not open to a logically coherent or exact explanation…some might argue that the obscurity and many-sided meaning that is characteristic of myth stems from the temporal or contingent nature of man, the myth maker. Myth in this view would be man's answer to the many-sided aspects of nature and his environment in his early days".[23]

Myth is a simple and symbolic answer to the question of origin. This question span the origin of the universe itself, the origin of human occupations and tools of work and the origin of human suffering and death. In itself, myth is not meaningless or an expression of mere human fantasies. Myth is neither naïve nor childish. The use of symbols and the simple approach adopted by the myth-maker seems dictated by a certain intuitive openness of the human mind to reality as it exists in its ambivalence and contrasts, which are manifested in the concrete and realizable features of nature itself.

The author further opines that, folktales are imaginary stories which are instructive for the individual's involvement in practical life in the community. The principal character of folktales usually represents the genius of the community who can hardly be deceived or defeated in any encounter. Legends are usually based on the history of the community and originate at periods in the civilization of the community in which history and fiction are mixed up with one another and are transmitted by oral tradition.

Myth it would seem then is a linguistic vehicle for articulating a given understanding of the order of the universe. In the African universe, myth is grounded in religion and religion

recognizes the existence of a Supreme Being, the soul of man, spirits and deities, ancestors and spiritual force. It is interesting to note that myth has great relationship with religion, philosophy, arts and science. Talking about myth and science, the author iterates:

> …the aim of scientific research is not only to discover and describe events and phenomena in the world but also, and more fundamentally, to explain why these events and phenomena occur as they do. Why do objects move? Why do planets move in an elliptical orbit? Why are protons stable and neutrons unstable?...in seeking for the why of things, the scientist is certainly looking for the causes of events and phenomena, but the criterion of fidelity to empirical evidence constrains him to exclude unknown or immaterial forces from his enquiry.[24]

The scientist does not usually seek the "first cause" or origin of things directly but the metaphysicists does. Thus, myths offers explanation as to the cause of things and the description of it and the scientists does same too but not in the investigation of the first cause of events. And in carrying out his task, the scientist is committed to empirical evidence and the strictness of logical formulation. The origin of the visible world is at the heart of myth and Africa is replete with numerous myths that attempt to answer that question. The author avers further that: "the Supreme Being is the head of the invisible and visible world. The gods and goddesses are his principal messengers; together with the lesser spirits they ensure that events in the world take place according to the good pleasure of the Supreme Being. The proper habitation of the Supreme Being, gods and spirits is the invisible world. However, since the gods and spirits are messengers of the Supreme Being, some of them are sent down to the visible world".[25]

One may asked for a natural justification or empirical evidence of the myth that the Africans hold with regards to the origin of the universe. But to do that is to be ignorant of the true meaning of myth. Myth is a community property and dates back into distant time. It is transmitted orally from one generation to another. It gives us great insight into the fundamental beliefs of a people and their conception of time, space and the meaning of life. Thus, we gain a lot of insight into forces in African worldview as we examine the diverse myths Africans hold

and as we interpret them correctly. This is what has shaped the African worldview and asserts her culture. However, the same cannot be said about the Westerners who see myths as primitive and worthless following the scientific method.

Daniel A Offiong in his *Witchcraft, Sorcery, Magic and Social Order among the Ibibio of Nigeria* recounts the knowledge of forces in the Ibibio-African and their display through several mediums. The work basically revolved around the theme of the Ibibio-African worldview with other aspects such as *mbiam* (oath taking), magic and sorcery, witches and witchcraft. The Ibibio live in the southeastern part of Nigeria, Akwa Ibom State (before September 1987 part of Cross River) and number more than two million, according to the 1963 census.

Mbiam as it is known by the Ibibio's is a magically potent object used in swearing oaths and in fortifying one's property against thieves, which has the supernatural ability to detect the innocent and the guilty as well as punish the offender. *Mbiam* causes the guilty to have whooping cough, paralysis, dysentery and death. *Mbiam* can be liquid, sacred drum, certain leaves, human blood and so on. Infact anything or object believed by the people to be sacred can be used as *Mbiam*.

Magic on the other hand amongst the Ibibio's involves those supernatural devices employed by man to achieve his end with the help of spirits and gods. Magic can control either impersonal forces or supernatural beings. Rites of magic can be part of the complexities of ritual acts that include or emphasize prayers, or worship. It can be employed for either benign (benevolent) as well as malign (malevolent) ends. It can be used to bring good luck, to assist in fore-telling one's future, to cure an illness, and so on. Observation according to the author indicates that magic often does appear to produce the expected results.

Mayik as the Ibibio calls it refers to something mysterious or beyond comprehension[26]. The word that approximates magic in Ibibio is ***Ibok*** and it is classified into two types: Medicinal (curative medicine) and magical. Magical ***Ibok*** is subdivided into benevolent or benign and malevolent. Those who practice malevolent magic are referred to as *Ifot* (Sorcerers) as opposed to *ifót* (witches). People who practice curative medicine and magic are known as *mbia Ibok* (traditional doctors or healers).

Ibok techniques can be taught and learned, bought and sold, bequeathed and inherited. It is also believed among the Ibibio that certain people have preternatural, innate powers associated with *Ibok*. These are people who claim to be taught the techniques in dreams; and dreams are seen as the gateway to the supernatural. These classes of *Ibok* practitioners are recruited by the ancestors. The signs that they have been recruited by the ancestor are barrenness of wife, birth to only female children, constant accidents, incessant headache and eye pains, among other. At other times, the would-be initiate dream about participating in *Ibok* rites or may see his dead uncle, father or grandfather telling him to get initiated.

All these information tells about a realm that is supernatural yet interacts with the natural world in the furtherance of its course. What we call magic, sorcery or witchcraft has to do with the understanding of some of the laws of nature and using spiritual principles to manipulate them. This is why magic employs the principle of similarity, contiguity and unusualness. This is only possible because the African universe is seen as being charged with power (life force) hence words, gestures and objects are believed to be effective because they are charged with power.[27] Thus, there is a lot of power in natural things that can work upon all things both far and near in African belief system.

In the work *Modern Theories in African Philosophy*, Godwin Azenabor attempts to show that African philosophy has gone beyond the question of its existence or non-existence to the nature, scope, substance, content and methodology. He went about this by discussing several theories of African philosophy that have been propounded by great African thinkers such as Olubi Sodipo and Dagogo Idoniboye.

Sodipo posits that causal explanation and the essential feature of an African philosophy is religious and metaphysical as such, it satisfies emotional and aesthetic needs. Thus the actions of the Gods and spiritual agents can affect human interest in a manner that the scientific method cannot explain. Sodipo, in formulating his theory of causality, distinguishes between cause and chance among the Yoruba-African and how the African and scientific concept of causality differ. The Africans would attribute their luck or misfortune to a God or the Gods. By this, Sodipo argues that science takes care of the "how" questions but the why questions finds explanation in God.

Sodipo made the point that Western Science finds every means to explain an occurrence from a naturalistic point of view. But this is not the case with the African especially since he believes in a hierarchy of forces, mystical and spiritual realities. The African sees every natural event as having a spiritual undertone and this colours his explanation. The West may find it difficult to accept such an explanation because they are also committed to a certain ontological disposition.

On the other hand, Idoniboye asserts that "the ontology of any distinctively African worldview is replete with "spirits". These spirits are the only constant in all African belief systems. Spirits are normally invisible and intangible though they can be seen at will by diviners or mediums. Spirits according to Idoniboye, are as real as tables and chairs, peoples and places.

Idoniboye also holds the reality of spirit as the distinguishing character of African Metaphysics. Spirit to him is as real as matter and its reality is primordial and it is, if not, superior at least as primitive as that of matter. Spirit is the animating, sustaining, creative life-force of the universe. To him, in human bodies, it becomes the mind or soul.

Spirits are not just symbols of social norms and relations, but invisible entities such as forces or electrons in scientific explanatory schemes. Idoniboye tells us that there are basically two types of spirits-'nature spirits', these are spirits created as such and 'ancestral spirits', these are spirits that were once human beings and Idoniboye's theory of spirits is in the first sense of the word. Idoniboye's theory of spiritism according to Azenabor, led to his concept of mind-body in African metaphysics as this is where its relevance lies, so that the mind is capable of being in *unembodied* state and *disembodied* state. Idoniboye rejects the Cartesian concept of a causal interaction between spirit and matter, and rather favours the idea of "symbiosis" as expressing the relationship between the two. However, they are separate, distinct entities, capable of independent existence.[28]

Idoniboye's theory of mind credits the mind with two parts-an "active" principle "and a "quiescent counterpart". The former can depart leaving the latter but both must be present in a body before the resulting physical entity is able to go about its normal activities. Idoniboye according to Azenabor also uses the theory of mind-body relationship to explain the idea and reality of witchcraft, which hitherto had been unfathomable, especially to the Western minds because of their inability to see the logic, theoretical framework of the invidious practice.[29] This is easily clear and more intelligible if one understands the "active principle" and "quiescent counterpart" theory in African metaphysics.

Idoniboye's theory of spiritism is very much known and understood by traditional Africans. The power to turn into other objects like cat, bats, snakes and so on is real in African belief system. This is made possible by the knowledge of certain supernatural workings leading to magic, sorcery or witchcraft. To subject this reality to whatever form of external experimentation of the West might be an effort in futility if the cultural worldview is neglected.

In the work *Studies in Igbo Traditional Religion*, Udobata Onunwa highlights the contents of Igbo traditional religion which houses the Igbo life and Igbo moral, ethical and humane practices. The work according to the author, intends to serve two purposes: the first is to attempt a hermeneutical exposition of the themes in African Traditional Religion from the viewpoints of the votaries of the faith themselves. Here lies the essence of the reality of the traditional religion and indeed every religion. The second is to provide a systematically set answer to many questions on some of the themes in African religion agitating the minds of students in the universities.

The author discusses issues that bother on factors of unity in stateless African societies, secret societies and social order, Igbo concept of "sacred" kings, spirit possession and prophecy, healing ministry in the traditional religion, concept of reincarnation, oath-taking and the power of the Gods and so on. But our interest here lies on elucidating the aspect that touches on force or power and the supernatural reality of the gods. The author discusses the Igbo beliefs with regards to reincarnation thus:

> Death is not a complete annihilation of a person's authentic self, but can be seen as a departure from one state of life to the other or a portal to a wider world beyond. One's relations include, therefore, the living, the dead and those yet unborn. The dead member are said to be more interested in the affairs of the people as it is through the living members that they would seek re-entry into the world of *time and space*. Igbo belief in the survival of the human person after death, in ancestors and in reincarnation suggests their belief and concept of life after death.[30]

The Igbo-African belief in reincarnation gives us an awareness of the spiritual world as well as the relationship between that world and the natural world. There is a conception of a spiritual universe in which one may discover a fundamental vital 'force' which controls the whole system. The universe therefore has a cyclical continuity in which there is a sequence of one event after the other (in an ordered succession) symbolically expressing harmony, persistence and dynamism. The human soul is believed to be indestructible in that it continues to live in another sphere of the universe undiminished.

According to the author, oath-taking is one of the rituals in Igbo-African traditional religion. Because of the dynamic society of the Igbos, there is the need for an establishment of the sincerity of each party in a contract. If a cordial relationship between one party and the other is to be maintained, a form of agreement has to be enacted and a pact signed and sealed with the gods as reliable witnesses. Thus the author notes that: "we gather the recognition and involvement of two principal characters: one taking the oath and the deity who acts both as the witness and the executor of the terms of the oath to justify the truth or punish the one telling lies. The gods are believed to be in the position to punish or justify because they are regarded as impartial judges. They can punish the one who breaks the stipulations of an oath or justify one who is innocent. It is only a superior power like the deity that can administer justice without fear or favour".[31]

The Igbo-African belief in a god or deity makes all the difference in the determination of forces. God is seen as all powerful and primordial which is why he is able to mediate in an oath situation and other matters as he is consulted through libation, prayers and sacrifices. God is here seen as all knowing and impartial. The belief in the ability of the gods to give impartial judgment has been the bedrock of oath-taking in traditional African society. The gods are also seen as custodians of morality who venerate the innocent and punishes the offenders. This belief system

is at variance with the Western system of science which places much premium on human logic and experiment in he determination of truth.

In the *Yoruba Beliefs and Sacrificial Rites* J. Omosade Awolalu survey the fundamental beliefs of the Yoruba-African. The Yoruba people who live in Nigeria and some neighboring countries are held as being among the most numerous and coherent of the peoples in Africa. The work captures the religious beliefs of the Yoruba's and the sacrificial rites needed to make contact with God. The people whose beliefs and rites the author was considering are concentrated in South-Western Nigeria (in the then Oyo, Ondo, Ogun, Lagos and Kwara States) and in a section of the then Bendel state of Nigeria.

By belief here, the author "emphasize the firm persuasion of the truth of a body of religious tenets held by the people; it is the faith that keeps them going; it is the acceptance of what they hold to be true. The Yoruba as indicated by the author believes in the Supreme Being, divinities and spirits, ancestors and mysterious powers. The author asserts that:

> Among the indigenous Yoruba people, the existence of the Supreme Being is taken as a matter of course. It is rare, if not impossible, to come across a Yoruba who will doubt the existence of the Supreme Being or claim to be an atheist. In other words, we are suggesting that an indigenous Yoruba has a belief in the existence of a self-existent being who is believed to be responsible for the creation and maintenance of heaven and earth, of men and women, and who also has brought into being divinities and spirits who are believed to be his functionaries in the theocratic world as well as intermediaries between mankind and the self-existent Being.[32]

From the afore-quoted, we can draw a nexus between the belief in a Supreme Being and mysterious powers or what we might call vital force in Africa or energy in the modern science. These mystical preternatural and esoteric powers are virtually inexplicable, but they cannot escape notice when they are manipulated by those who have access to them. The author quickly reminds us that those foreign investigators of the people's religion tend to dismiss such powers

as superstitions; others class them as *mumbo-jumbo* and the likes. But we should realize, the author reminds that "one man's superstition is another man's belief.[33]

Mysterious powers among the Yoruba people manifest themselves in different ways in the form of incantations, medicine, magic, sorcery and witchcraft. Belief in these powers which can alter the course of nature is very real and prevalent among the Yoruba. Since man as a creature recognizes his limitations with regards to his numerous needs, he can obtain the abundant supernatural resources in the universe for his benefits by two different means: (i) by appealing to the transcendental Being to satisfy his needs, (ii) by devising a means of tapping the elemental forces which are already created in the universe by the supreme Being and which can be procured by those who know "how".

In the mental and social attitudes of the Yoruba's and of traditional Africans in general, there is no belief more profoundly ingrained than that of the existence of witches (áje). All strange diseases, untimely death, inability to gain promotions in office, failure in examinations and business enterprise, disappointment in love, bareness in women, impotence in men, failure of crops and a thousand other evils are attributed to witchcraft. The author also claim that the foreign investigators who dismisses the reality of witchcraft are doing that under the psychologists fallacy of thinking that simply because a particular person has not experienced something, that something must unnecessarily be unreal or untrue.

Witchcraft, where ever it is practiced has distinctive features in Yoruba land some of which are sorcery, intangible, regular natural meetings and destruction. Since witches have the one agenda to destroy other lives because of their ingrained wickedness or evil, it becomes imperative to carry on some sacrificial rites usually after divination. Divination can be used to know the sources of one's problem and afterward the right sacrifices will be performed.

According to the author, by means of divination, man knows what the gods desire; and almost always, divination ends in the prescription of sacrifice.

To make sense of the Yoruba beliefs and sacrificial rites, one must take a firm hold of the ontology of the people's cultural belief. Where these beliefs are disparaged, it is most likely that the observer or investigator is coming from another cultural standpoint. The Yoruba culture believes in the reality of forces both supernatural and natural and this is what has given explanatory credence to the various realities that have been identified and discussed thus far.

In the article "Metaphysical Thinking in Africa" Lebisa J. Teffo and Abraham P. J. Roux attempts to show why the African think in a particular way and why their thought is also rational. They contend that human kind have a need to understand the world they are living in and to make sense of the kind of reality they find themselves in. For instance, questions like: why does lighting kill people and destroy property? Why are some people successful whereas others, despite their efforts fail? Why do innocent and good people become ill and die? To attempt an answer to these questions, the authors opine that: "people who ask the above questions have a teleological conception of reality that is, reality hangs together because of aims; and it is driven by aims: there are no blind happenings but only planned action. Those who reject these questions as meaningless think of reality in mechanical terms, in terms of mechanical causation. That a house or a person was struck by lightning has, according to them, to be understood in scientific terms, in terms of mechanical causation and not in terms of some or other aim behind it".[34]

A thinking that focuses on what is real or the nature of reality is metaphysical. Our perceptions are usually influenced by our expectations, beliefs, emotions, conceptual schemes, histories, social circumstances and even the language we use in communication. This makes the conception of the nature of reality to vary from culture to culture, almost suggesting that

different cultural communities live in different worlds. This dilemma informs two crucial problems thus:

> (i) If we are dealing with different conceptions of the world, is it possible for a person to know and to discuss other conceptions, or are we totally fenced in by our own conceptions? And if it is possible to know and discuss other conceptions, can this be of any use? Is it possible to change or even to replace a 'given' way of conceiving of reality?
> (ii) Is it necessary to spend time on conceptions which we believe are wrong because they clash with what is scientifically accepted? [35]

The authors establish the point that in present day philosophical activity on the continent of Africa there is a strong tendency to approach philosophy in a culture specific way, that is, not to try and come up with views which are supposed to apply to all groups on the continent, but rather to describe and discuss the viewers of specific cultural groups such as the Akan, the Igbo, the Yoruba or the Zulu's, example being the analysis of the Akan/Yoruba conception of a person. There is no denying that people who believe in witchcraft or a Supreme Being have particular conceptions of reality which include aspects such as causality, personality and responsibility, the nature of matter, and so on.

Metaphysical discourse in Africa must be based on the African perception of reality determined by a history, geographical circumstances and such cultural phenomena as religion, thought/belief systems and linguistic conventions entrenched in the African worldview. This implies that most metaphysical discourses on the continent have certain common features. Central to African metaphysics are religious belief relating to the African conception of God, the universe and their interrelations. Further notions such as spirit, causality, person, space and time, and reality play a significant role in the life of Africans as they grapple with existential realities through phenomena such as religion, ancestral veneration, witchcraft, magic and so on.

Furthermore, African metaphysics is holistic in nature. Reality is seen as a closed system so that everything hangs together and is affected by any change in the system. The authors iterate: "…African metaphysics is organized around a number of principles and laws which control so called vital forces. There is a principle concerning the interaction of forces that is between God and humankind, between different people, between humankind and animals, and between human kind and material things. The forces are hierarchically placed and form a "chain of being' in the hierarchy God, the creator and source of all vital forces being at the apex".[36]

Tempels states the three laws of vital causality to be: man, inferior beings and rational beings. Since metaphysical discourse is generally about non-physical aspects of phenomena that transcend space and time, African metaphysics can rightly be called supernatural. This of course is the reason behind explanation in African belief or thought system. The system of vital forces constitutes a closed universe so that when one element gains force another loses it. For example, when someone gets ill, he or she has lost vital force, which has been taken from her/him in some or other way by someone or something else. In this way disasters such as illness and death are explained from a worldview system. This position of the African is at variance with modern science as every explanation must be from a materialistic point of view.

Jonathan Chimakonam Okeke took a bold move towards articulating what African science might look like in his "Towards a Theory of African Science: Methods and Justification". At first glance, one would wonder if African thought system that is ontologically spiritual can have any bearing with modern science as we know it through its observational and experimental method. The author declared that the attempt of African scientific experience is to increase the horizon of our knowledge and decrease the landscape of our doubt.

A very fundamental question that the work tries to reconcile is: what makes African science different from Western Science and why is it called a science in the face of this difference? Reacting to this, the writer attests: "unlike Western science which captures nature and employs different means to force scientific knowledge out of her, African science approaches nature with equanimity, like a man approaching a maiden he wishes to marry furiously but gentle. This is because the scientists is not different from nature neither are his instruments. A man stitching own wound is likely to be gentle. This gentility in conducting scientific enquiries crystallizes in the observance of…(the law of uniformity)".[37]

The writer avers that in African conception, reality consists of the physical, the non-physical as well as the union of the two. While the first two are partial forms of existence, the third is full. The three-valued trait in African thought system derives from this metaphysics and from it we obtain African logic which is three-valued in character. African metaphysics holds that realities exist in a network of interconnection. Thus African logic explains the basic assumptions of African scientific practice.

African science as quoted from Ozumba is "African man's way of observing, systematizing, testing, confirming facts of his environment, with the aim of achieving a high level of understanding of his environment to aid him in controlling or manipulating the forces of nature to his advantage or at least to escape the heavy consequences of uncertainties which characterized natural phenomena".[38] The writer also quoted Uduigwomen and Akpan who identify four methods of what they called African science. Summarily, they are: mythico-religious, trial and error, causality, combined methods of the empirical and religious-mythical.

In African science, the writer noted that there is a thin membrane otherwise called the sacred line which experimentation cannot cross without humanitarian and environmental crisis.

The writer amplified the methods of science as theorized by Udwgwomen and Akpan tackling each method squarely and showing how they expand the African knowledge of the workings of the universe they find themselves. Thus the justification for African science is on the need to raise a science fit with African native thought system, an alternative science which will be eco-friendly and then offer a safe and adequate energy to the world.[39] In all, African science may not be as systematized as Western science, but this work is a bold attempt at connecting all the strands that makes for a better understanding of African science with its logic which cannot be free from metaphysical underpinning.

2.2 Literature on Force in Western Science

In this section, our focus shall be on western science's notion of force as contained in Newton's major work as well as other scientists. We shall also sample varied theories and explanation of force as held in modern science without delving into its complex mathematical formalism.

In the work *Physics made simple*, Ira M. Freeman discusses such material notions as: matter and energy, force, motion and energy, heat, sound, light, magnetism and electricity, electronics and nuclear physics. But of great importance to our study is the concept of force. In most of the practical situations we deal with, not one but a number of forces act on the body in question. In order to describe a force completely, we must specify not only its amount (say, in kilograms) but its direction in space; obviously it makes a difference whether a force acts to the left or to the right, or whether it acts upward or downward.

According to Freeman, it is found by experience that when a number of forces act on a body they can always be replaced by a single force having a definite size and direction. This single force which replaces the effects of all the others is called their resultant. Another

dimension of forces is that in which all the forces acting on a body just hold it at rest. This balancing of the applied force will occur if their resultant is zero. When this happens, the body is said to be in equilibrium. Conversely, if a body is observed to remain at rest we know that the resultant of all the acting forces must be zero.

Going further, Freeman asserts that in most cases we meet in practice, the forces acting on a body are not all applied at a single point, but at several different places. The weight of a body is a good example. The earth's gravity pulls downward on every particle of a material body with a force equal to the weight of that particle. However, we can replace all these separate forces by a single one, equal to the entire weight of the object. This force must be considered to act at a given place called the centre of gravity of the body.[40]

Again in general, if the forces applied to a body do not all act at a single point, there is the possibility that the body will rotate. The turning effect of a force is called the torque or moment. The author concludes his discourse on force by stating that one of the greatest scientific achievements of all time was Newton's discovery of the law of gravitation around the middle of the seventeenth century. Earlier, the astronomer Kepler had found certain regularities about the motion of the planets around the sun. Newton, trying to explain these rules, decided that the planets must move in the observed way because they are pulled by a force exerted by the sun.

Newton, avers Freeman concluded that this force of gravitation exists not only between the sun and the planets but between any two objects in the universe, and he worked out the factors on which the amount of force depends. This is stated by his law of gravitation: any two bodies in the universe attract each other with a force that is directly proportional to their masses and inversely proportional to the square of their distance apart.[41]

We must emphasize that, while Newton's law allows us to calculate the amount of the attraction in any case, it does not tell us what gravitation is or why such a force exists. It only analyses mathematically, what is the "given" but does not tell us why objects are in motion or at rest. This lacuna seems taking care of by traditional African thought/belief system which explains the source of all being and their propelling forces and motion.

In the work *Physics: An Introduction,* Ernest C. Pollard and Douglas C. Huston discusses Newton's laws of motion. We look at our universe today and find that it is anything but an extension and amplification of what we can readily perceive; indeed, it is often totally at variance with the plain evidence of our senses. For example, the sun does not revolve about the earth, at least not in the rational scheme we now adopt. Even the bricks are not really still, not in the inmost motion of the atoms which make bricks.[42]

The authors want the readers to believe them when they assert that the most valuable scientific knowledge acquired by man is comprised in the laws of motion. But what causes motion? First, we have to look into something which goes against our direct experience: we have to ask whether there is any kind of motion that has no cause at all. They contend that this feeling that the idea of motion without active causes is foolish is one of the "intuitive" feelings which have kept mankind back for thousands of years and it was adopted by Aristotle twenty three centuries ago.

The first inkling that it was a grand illusion, not a reality in nature, came from Galileo's experiments. Out of the ideas contained in these experiments and those suggested by the nature of the motion of planets, Newton drew a bold and sweeping generalization. He asserted that: "there are two kinds of motion for which no cause need be supposed: the obvious case where there is no motion at all, i.e. the condition of rest, and the case where the motion, no matter how

fast, is quite uniform and in straight line. Every other condition, said Newton, has to have a cause, and he called the cause a force. Thus Newton asserted that force causes motion".[43]

Newton first law of motion reads: Every body continues in a state of rest or of uniform motion in a straight line unless compelled to do otherwise by an impressed force. If force is that which causes motion, how do we explain the case of a force without motion? And Newton himself said that there can be motion without force. To get around these two opposing facts, of motionless force and forceless motion, Newton stated his "third" law of motion: To every action there is an equal and opposite reaction. There are two forces then, one exerted by you, and one exerted on you. The authors observed thus: "Newton failed to make clear two important qualifications to both these laws. In the first law he should have said that there is no motion unless an unbalanced or net or excess force acts on the body, and in the third law he should have said that, if there is no acceleration, then to every action there is an equal and opposite reaction".[44]

Newton's laws of motion are contained in his *The Mathematical Principles of Natural Philosophy,* also known as *The Principia* from its Latin title. In the work, he introduced a tremendous innovation, which brought with it a considerable shock to many that a body moving in a straight line, with uniform speed, no matter how fast it is going, also has no force on it. Thus, force acts to change either a resting condition or a condition of uniform motion in a straight line.

The authors affirm further that Newton knew that muscular effort produced a force which sometimes did and sometimes didn't move things. He knew that the earth pulls down with force and that it too, sometimes does and sometimes doesn't move things. So he supposed that whenever a force obviously acts and no motion takes place, two forces act-one to disturb and one to resist. Only when one of the two wins out does motion occur. Thus Newton's "second" law

of motion states: the rate of change of motion is proportional to the motive force impressed and takes place in the direction of that force.

One of the terms in Newton's motion is *mass*, a measure of the amount of material in the thing to be moved or a measure of the "inertia". This concept of massiveness is one aspect; the other is velocity or what we colloquially call speed. The addition then of the mass of a body and its velocity will give us motion. On the other hand, there are really only four actual causes for force or kinds of force and they are: gravitational, electrical, strong and weak nuclear.

From the forgoing, it must be conceded that the method of systematic observation and experimentation has aided our understanding of physical motion and force. But inherent in the study of motion and force are issues that themselves do not seem to be physical as have been noted. Thus the origin of motion and force in the universe still calls for serious deliberation and this is where traditional African explanation of reality differs from the West and provides some metaphysical explanatory basis to that effect.

In the work, *Fundamentals of Physics* David Halliday et al discusses on a wider theme of physics such as measurement, motion along a straight-line, vectors, motion in two and three dimensions, force and motion, kinetic energy and work, potential energy and conservation of energy, systems of particles, collisions, rotation, gravitation, fluids and so on. With respect to force and motion, the authors states that 'an interaction that causes an acceleration of a body is called force which is loosely speaking, a push or pull. The study of the relationship between a force and the acceleration it causes is called Newtonian mechanics.

The authors states that Newtonian mechanics does not apply to all situations. If the speed of the interacting bodies is an appreciable fraction of the speed of light, we must replace

Newtonian mechanics with Einstein's special theory of relativity which holds at any speed, including those near the speed of light. If the interacting bodies are on the scale of atomic structure (for example, they might be electrons within an atom) we must replace Newtonian mechanics with quantum mechanics. Before Newton formulated his mechanics, it was thought that some influence, a "force" was needed to keep a body moving at constant velocity.[45]

Similarly, a body was thought to be in its "natural state" when it was at rest. For it to move with constant velocity, it seemingly had to be propelled in some way by a push or a pull otherwise it would "naturally" stop moving. The authors were led to conclude that you do not need a force to keep a body moving with constant velocity. Newton's first law they held is sometimes called the law of inertia and the reference frames that it defines are called inertial reference frames or just inertial frames.

According to the authors, force is measured by the acceleration it produces. But acceleration is a vector quantity with both magnitude and direction. Forces are indeed vector quantities because they have magnitudes and directions. Some particular forces includes: weight which is a force that pulls the body directly toward a nearby astronomical body-the earth. The force is actually due to an attraction called a gravitational attraction between the two bodies. Also, when a body is pressed against a surface, the body experiences a force that is perpendicular to the surface; the force is called the normal force.

Writing further, the authors hold that if we slide or attempt to slide a body over a surface, the motion is resisted by a bonding between the body and surface. The resistance is considered to be a single force called the frictional force or simply friction. We also have tension force i.e. when a cord, rope, or other object is attached to a body and pulled taut, the cord is said to be under tension. If we do not need a force to keep a body moving as opined by the authors, we at

least certainly need a force to set the body accelerating[46]. If this is the case, then it can be explained that a force sets the universe into motion and since then, everything has been in motion. This position has implications for metaphysical explanation of the origin of the universe and its motion propelled by the vital force of a supreme being in African belief system. This is one of the dimensions that the current research seeks to expatiate.

In the work *College Physics,* Raymond A. Serway and Jerry S. Faughn gives us further insights into the laws of motion and the concept of force. Eulogizing Newton, the authors picked from his tomb at Westminster Abbey the epitaph: "mortals congratulate yourselves that so great a man lived for the honor of the human race". The authors holds that classical or Newtonian mechanics deals with objects that (a) are large compared with the dimensions of atoms ($\approx 10^{-10}$m) and (b) move at speeds that are much less than the speed of light (3×10^{8}m/s).[44] The question: what force (if any) causes a distant star to move freely through space was answered by Newton who states that the change in velocity of an object is caused by forces. Therefore, if an object moves with uniform motion (constant velocity) no force is required to maintain the motion. Since only a force can cause a change in velocity, a force can be viewed as that which causes an object to accelerate.[47]

The authors wrote about kinds of forces in that, whenever a force is exerted on an object, its shape can change. For example, when you squeeze a rubber ball or strike a punching bag with your fist, the object will deform to some extent. Others are automobiles and collision forces. These are all examples of class of forces called contact forces. They arise as a result of physical contact between two objects. Another class of force is known as the field forces. These forces do not involve physical contact between an object and its surroundings, but act through space. The force of gravitational attraction between two objects is an example of this class of force.

Early scientists according to the authors including Newton were uneasy with the concept of force acting between two disconnected objects. To overcome these conceptual problems, Michael Faraday (1791-1867) introduced the concept of a *field*. The authors mention that the distinction between contact forces and field forces is not as sharp as one may be led to believe. At the atomic level, the so-called contact forces are actually due to repulsive electric forces between charges, which themselves are field forces.

The planets of our solar system move in their elliptical orbits under the action of gravitational forces exerted on them by the sun. Another common example of a field force is the electric force that one electric charge exerts on another electric charge. These charges might be an electron and proton pair forming the hydrogen atom. Another example of a field force is the force that a bar magnet exerts on a piece of iron.

Field forces are invisible (immaterial) even though their effects can be explained. Naturally, the universe is held to contain enormous forces interacting on a different scale (similar to that held by the traditional Africans) which accounts for its continuous existence and survival. The theory that the universe is self caused or self propelled is rather unsatisfactory in explaining the origin of the universe. This lacuna can be bridged by looking at the African belief system with regards to this all important and sensitive issue.

Joseph Silk in *The Big Bang* takes us into the modern version of creation, a topic of fascination since the dawn of humanity. Silk opines though contestably that science has supplanted mysticism as the source of inspiration about the beginning of the universe. The purpose of his work is to present an accessible description of the scientific approach to the origin of the structures around us, ranging in scale from planets and stars to galaxies and great clusters of galaxies to the entire observable universe.

According to the author, the big bang theory is based on astronomical data painstakingly gathered at observatories around the world, and on recent advances in particle physics toward an understanding of the ultimate nature of matter. However, he noted that "the search is far from over, and the theory is still incomplete. Nevertheless, the moment is at hand to describe where we are and where we are going.[48]

The big bang theory as captured in the book reveals an immense vista of cosmic evolution since the cosmic expansion was initiated about 15 billion years ago. Conditions at this initial instant and before this instant are matters for speculation that the conventional theory does not address. Further explanation goes thus: "the early universe was very hot, very dense, and perhaps also very irregular. The irregularity and anisotropy gradually decayed. Within minutes after the big bang, some nuclear reactions occurred; essentially all the helium in the universe was synthesized at that time. As the universe expanded, it cooled, much as hot air expands and cools. As the matter in the universe cooled, it eventually condensed into galaxies, according to one scenario for the evolution of the universe. The galaxies fragmented into stars and clustered together to form great aggregations over vast regions of space".

The author states further that as the first generations of stars were born and died, the heavy elements, such as carbon, oxygen silicon and iron, were gradually synthesized. As stars evolved into red giants, they ejected matter that condensed into dust grains. New stars formed from clouds of gas and dust. In at least one such nebula, the cold dust collapsed into a thin disk surrounding the stars. Dust grains adhered to one another by coalescence and accumulated into larger bodies that grew in size by their gravitational attraction forming the diverse array of bodies, from tiny asteroids to giant planets that constitutes the solar system.

The evidence for the big bang as stated by the author is on the age of the occurrence of the big bang so that it is inferred to be 4.6 billion years from dating of the oldest meteorites. However today by a new dating technique, the universe is held to be about 15 billion years. The initial instant of the big bang is called a singularity. We may well know the age that the big bang occurred, but did the universe exist prior to that moment is one question that science is yet to answer; because clearly if it did, the universe might have existed for an infinite time.

The limitation of knowing what was there before the big bang is a major concern to the scientific community but not to traditional Africans. The best answer science has today is "we don't know yet". This implies that science only relies on the "given" in its investigation and cannot in anyway break into that which is not given empirically. If we have such massive force of matter blasting and expanding, then it will suggest that before the implosion, there was something for something cannot come out of nothing. Speculation therefore seems inescapable in modern science sliding it into the domain of metaphysics.

Accordingly, in the work *Prisons of light: Black Holes,* Kitty Ferguson makes the point that with radio and x-ray telescopes and later with infrared and gamma ray telescopes we discovered that the universe is not after all, the serene universe we thought we knew early in the twentieth century. It is much more violent and complex less easy to predict with stars ripping hot gas from their neighbors, beams of radiation sweeping around from swiftly rotating pulsars, cataclysmic explosions in the cores of galaxies, quasars changing in brightness over very short periods of time, and jets of gas spewing out over tremendous reaches of space from the nuclei of galaxies and quasars.

The author asserts that despite the powerful telescopes probing the universe, we still don't see everything we know is out there. No one has observed a black hole, nor it seems, will anyone

ever observe one. Interestingly, the author asserts that: "the idea that there might be "dark stars' with gravitational attraction so powerful that all their light is pulled back in is not a product of twentieth century science. It came from the British natural philosopher John Michael in 1783 about a hundred years after Isaac Newton introduced his theories of gravity".[49]

The evidence of a black hole is indirect evidence; circumstantial evidence it would be called in a court of law. No telescope has shown us a picture of a black hole; finding real black holes hasn't allowed scientists to probe inside them. The author had to ask: "what are these inscrutable, invincible objects? Where do they come from? What is the source of their incredible power? What makes us so certain they are there, if we can't ever actually observe them?

The idea behind the black hole according to the author is that, when a star collapsed it formed a black hole. According to the theory, it is impossible for anything that can't go faster than the speed of light to escape from inside this surface and get away to a distance in space: no rocket ship, no space probe, no astronaut, no radio signal, no light, nothing at all. Photons at the event horizon can't be pulled in and can't get away; they just hover there. The singularity is an unimaginably small point at the exact centre of the black hole. Here, all the mass of the collapsing star has been compressed to near infinite density so that the curvature of space-time here is near infinite. Anything falling into the black hole will be drawn to the singularity. When it arrives there, it will have reached the end of space and time as we presently understand them.

As the author states, some of us would very much like to know what it is like in there between the event horizon and at the singularity. We can theorize about it, but we have little hope of collecting any direct evidence short of making a personal one way journey. The black hole is held as a physical reality by science as a result of the synthesis of mathematical equations, calculus and other theories but not a direct observational fact and mathematics is not an

observational science. In fact the author boldly asserts that "such an expedition is impossible with our present technology and with any we are likely to have soon. However, incredible voyages of discovery can be undertaken in our minds and they need not be strictly fantasy".[50] The question need be posed here thus: why should science accept fantasy of some sort and dismiss similar fantasy in African thought system? This is one area of bias that the current study shall attempt to expose.

Heinz R. Pagels in the work, *The Cosmic Code: Quantum Physics as the Language of Nature* shares the excitement of the recent discoveries of physics giving insights into the ultimate structure of matter, the origin and end of the universe as well as the new quantum reality. He opines that "the visible world is neither matter nor spirit but the invisible organization of energy".[50] The author divides the work into three parts with the first describing the development of quantum of the atom. The second part describes the voyage into matter reaching down to the core of the atom which is the nucleus while the third part of the book describes the nature of physical laws and how physicists find them. According to the author, the earliest version of quantum theory was formulated in 1900 by Max Planck and Albert Einstein pioneered the transition from Newtonian to quantum theory.

Newtonian physics was built upon the foundation of determinism whereas quantum theory has as its foundation chance and randomness. The basic ideas of Planck's quantum hypothesis is that the continuous view of the world with respect to physical quantities like energy, momentum and spin must be replaced by a discrete one. This is because the discreteness of physical quantities is so very small and is not perceptible to our senses. Pagels puts it thus: "if we look at a pile of wheat from a distance it appears to be a continuous smooth hill. But up close, we recognize the illusion and see that in fact it is made of tiny grains. The discrete grains are the quanta of the pile of wheat".[51]

Pagel's tells us that Einstein in his paper on the "Photoelectric Effect" used Planck's quantum hypothesis and went beyond Planck to make the radical assumption that light itself was quantized (i.e. consisting of tiny particles). Most physicists including Planck thought that light were a wave-like phenomenon in accord with the view of nature as a continuum. Einstein's hypothesis implied that actually light was a rain of particles consisting of the light quanta called photons (little packets of definite energy).

The physics of the new quantum theory can be contrasted with the older Newtonian physics which it replaced. Newton's laws brought order to the visible world of ordinary objects and events like stones falling, the motion of the planets, the flow of rivers and the tides. In quantum theory, these common sense interpretations of the world like determinism and objectivity cannot be maintained. Another contrast as stated by Pagels with regards to quantum theory is that: "quantum theory requires that what an observer decides to measure influences the measurement. What actually is going on in the quantum world depends on how we decide to observe it. The world just isn't 'there" independent of our observing it; what is 'there" depends in part on what we choose to see-reality is particularly created by the observer".[52]

Going on further, Pagels discusses quantum weird behaviour which comes about when we start to ask certain kinds of questions about atoms, electrons, and photons. For example, if we try to measure precisely both the position of an electron and its velocity by repeated measurements we find it can't be done.[53] Every time we measure its position, the velocity changes, and vice versa; the electron has a kind of quantum slipperiness. If the electron were ordinary objects, we would be able to determine simultaneously both its position and velocity.

This brings us to questioning the status of the electron as a material object. Does the electron have a nature that shudders between the material and the immaterial? Why does the

electron move in such tremendous velocity in the void? Why does it have a dual nature of waves and particles? Why is the mathematics of quantum mechanics correct but the experimental/philosophical approach problematic? Doesn't this gap necessitate shifting our focus on other worldviews like that of the African for possible explanation? Clearly, it will not be out of place to take a shift of explanation in one worldview or thought system to another just to get an eclectic perspective about a particular concept or problems and this is what the current research aims to achieve.

In the work *Quantum Mechanics*, Leonard I. Schiff sets out to explain the physical concepts of quantum mechanics, describing the mathematical formalism and presenting illustrative examples of both its ideas and the methods. The author states that at the present stage of human knowledge, quantum mechanics can be regarded as the fundamental theory of atomic phenomena. The experimental data on which it is based are derived from physical events that lie almost entirely beyond the range of direct human perception.

The theory embodies physical concepts that are foreign to common daily experience. According to Schiff, these concepts did not appear in the historical development of quantum mechanics, until a quite complete mathematical formalism had been evolved. The need for quantitative comparison with observation which is the ultimate test of any physical theory in this case, led first to the formalism and only later to its interpretation in physical terms.

Schiff asserts that experimental physics prior to 1900 had demonstrated the existence of a wide variety of phenomena, which for the most part were believed to be explicable in terms of what we now call classical theoretical physics. The difficulties in the understanding of experimental results that remained at the beginning of this century were largely concerned with the development of a suitable atomic model and with the late discoveries of x-rays and

radioactivity. However, there were also difficulties associated with phenomena that should have been understood but actually were not such things as: the spectral distribution of thermal radiation from a blackbody, the low-temperature of specific heats of solids and so on.

It was Planck who was able to explain the blackbody spectrum in terms of the assumed emission and absorption of electro-magnetic radiation in discreet *quanta,* each of which contains an amount of energy *E* that is equal to the frequency of the radiation *V* multiplied by a universal constant *h* (called Planck's constant) that is, E=hv. This quantum idea was later used by Einstein in accounting for some of the experimental observations of the photoelectric effect. In this way, the dual character of electromagnetic radiation became established. It sometimes behaves like a wave motion and sometimes like a stream of corpuscular quanta.

Accordingly, the theoretical physics of the first quarter of this century thus contained two important inferences obtained from the experiments and their interpretations that had not existed in 1900; and the dual character of electromagnetic radiation and the existence of discrete values for physical quantities. A third theoretical inference appeared in 1924 with the suggestion by De Broglie that matter also has a dual (particle like and wavelike) character.[54] The author also mentions the uncertainty principle in quantum mechanics developed by Warner Heisenberg in 1927. According to this principle, it is impossible to specify precisely and simultaneously the position and velocity of a sub-atomic particle such as the electron. The reason for this is not far-fetched as electrons are not as localized as atoms (matter) in the Newtonian system. Secondly, they move with a velocity equaling that of light so that they behave like waves and particles.

The challenge posed by this uncertainty or indeterminacy principle of Heisenberg prompted Neils Bohr to come up with his principle of complimentarity in 1928. The principle states that atomic phenomena cannot be described with the completeness demanded by classical

dynamics. Some of the elements that complete each other to make up a complete classical description are mutually exclusive and these complementary elements are all necessary for the description of various aspects of the phenomena.

From the point of view of the experimenter, the complementarity principle asserts that the physical apparatus available to him has such properties that more precise measurements than those indicated by the uncertainty principle cannot be made. This is not to be regarded as a deficiency of the experimenter or of his techniques though. According to Schiff, it is rather a law of nature that whenever an attempt is made to measure precisely one of the pair of canonical variables, the other is changed by an amount that cannot be too closely calculated without interfering with the primary attempt.[55]

What we can deduce from all these is that, science though held as a sure path to material knowledge about the physical workings of the universe still has multiplicity of interpretations and explanations amongst scientific practitioners bringing to question the issue of objectivity. If the personal idiosyncrasies and the most cherished "beliefs" of the scientists interfere in how reality is understood, it means then that ascertaining the truth about such reality as force may be difficult since science holds no opinions as it were but certain knowledge. What then is the problem with African belief/thought system which holds its own cherished cultural presuppositions about the universe and its force? Certainly, not because it is metaphysical in outlook and approach as that will amount to a positivist's bias.

Accordingly, N. F. Mott in his *Elementary Quantum Mechanics* asserts that quantum mechanics is the branch of physics which describes the behaviour of electrons in atoms, in molecules and in solids. For electrons and also for other particles of atomic physics, it replaces Newtonian mechanics. Accordingly, he asserts that: "quantum mechanics was introduced more

than forty years ago and whatever disputes there may be about the philosophical principles involved in its interpretation, its ability to explain a very wide range of natural phenomena is established without any doubt at all.[56]

The writer seems to be very wrong about his averment on the philosophical principles of quantum mechanics as they are yet to be resolved. If they have been resolved, there would have been no need for the current research. However, there are important perspectives to quantum mechanics which the author exposes us to. He avers that a light wave contains energy. The most striking evidence that light gives up its energy to matter in quantized amounts is provided by the photoelectric effect which is the ejection of electrons from a metal by the action of light.

Since light behaves as waves and particles it means that light has energy in itself same as particles. This follows that light carries a force within itself that animate it and other objects. Little wonder, quantum mechanics is sometimes called "wave mechanics." One of the main achievements of quantum mechanics according to the author is its ability to explain why within an atom the energy of an electron (or of a system of electrons interacting with each other) is limited to a series of discrete values.[57] Energy is held as neither created nor can be destroyed by science and this is in line with the African belief about God, the Supreme Force. At the quantum level, energy is a defining property whether potential or kinetic. Thus, force at the quantum level is condensed to high energy state. The identification of force or energy in physical systems follows the same principles with spiritual forces as held and believed by the Africans. It is this cross-cultural relationship that this current research attempts to amplify.

In the work *Basic Concepts of Quantum Mechanics,* L.V. Tarasov noted that anyone who starts studying quantum mechanics encounters some sort of psychological barrier and this is not because of the mathematical complexity. The challenge arises from the fact that it is difficult to

break away from accepted concepts and to reorganize one's pattern of thinking which are based on everyday experience. Quantum theory or mechanics describes the properties of matter at the level of *microphenomena* and it considers the laws of motion of *microparticles*. Micro particles (molecules, atoms, elementary particles) are the main "characters" in the drama of quantum mechanics. In comparison with classical physics, quantum mechanics considers the properties of matter on a deeper and more fundamental level. According to Tarasov, it provides answers to many questions which remained unsolved in classical physics. For example, why is diamond hard? Why does the electric conductivity of a semiconductor increase with temperature? Why does a magnet lose its properties upon heating?

The concept of force and how it is understood in classical mechanics does not always apply in the same case when we resort to quantum mechanics. According to Tarasov, "when transferring the concepts of energy, momentum and angular momentum from classical physics to quantum mechanics, the specific nature of the microparticles must be taken into account."[58] The reason responsible is the quantization of physical quantities and the idea of wave-particle duality. Thus, the energy of any microparticle in a bound state like that of an electron in an atom, is quantized. The energy of a freely moving microparticle is however not quantized.

Going on, Tarasov holds that the discreteness of energy does not mean in any case that the electron is 'doomed" to remain forever in the initial energy state. The electron may go over to another energy state by acquiring or releasing the corresponding amount of energy. Such a transition is called quantum transition. Again, he asserts that:

> Classical physics acquaints us with two types of motion: *corpuscular* and *wave* motion. The first type is characterized by a localization of the object in space and the existence of a definite trajectory of its motion. The second type on the contrary, is characterized by delocalization in space. No localized object corresponds to the motion of macrophenomena, the corpuscular and wave motions are clearly distinguished. The motion of a stone

> thrown upward is something entirely different from the motion of a wave breaking a beach.[59]

These usual concepts however, cannot be transferred to quantum mechanics. In the world of microparticles, the above-mentioned strict demarcation between the two types of motion is considerably obliterated. The motion of a microparticle is characterized simultaneously by wave and corpuscular (particles) properties.

All elementary particles the author asserts except the photon, electron, proton and both neutrinos are unstable. This means that they decay spontaneously without any external influence and are transformed into other particles. For example, a neutron spontaneously decays into a proton, an electron and an electronic antineutrino. It is impossible to predict precisely at what time a particular neutron will decay since each individual act of disintegration occurs randomly[60].

The implication of this fact is that micro particles which form the building block of matter have an inherent force that does not disintegrate but can change from one form to another. This goes to show that there is enormous energy in the universe that sustains its survival, a similar belief held by the Africans. It follows also that we can draw an analogy from the physical to understanding the supernatural realm which is not given to direct observation. It is this comparative dimension that brings out the novelty in the current research.

Gary Zukav in *The Dancing WuLi Masters: An Overview of the New Physics* asserts that the new physics as it is used in his book means quantum mechanics which began with Max Planck's theory of quanta in 1900 and relativity which began with Albert Einstein's special theory of relativity in 1905. The old physics is the physics of Isaac Newton which he discovered about three hundred years ago. Classical physics according to Zukav means any physics that

attempts to explain reality in such a manner that for every element of physical reality there is a corresponding element in the theory.

Zukav in this work tries to show the similarities between Eastern philosophies (Buddhism) in particular and physics. This is very novel because it makes the point very clear that reality is interconnected whether material or immaterial. *WuLi* as a Chinese word means different things. For instance: physics = *WuLi*. *WuLi* = patterns of organic energy. *WuLi* = my way. *WuLi* = Nonsense. *WuLi* = I clutch my ideas and *WuLi* = enlightenment. Continuing, he avers that most people believe that physicists are explaining the world. Some physicists even believe that but the *WuLi* masters know that they are only dancing with it. Zukav also notes that quantum mechanics shows us that we are not as separate from the rest of the world as we once thought. Particle physics shows us that the "rest of the world" does not sit idly "out there". It is a sparkling realm of continual creation, transformation, and annihilation. A 'quantum" is a quantity of something, a specific amount and "mechanics" is the study of motion. Therefore, 'quantum mechanics" is the study of the motion of quantities.

Quantum theory says that nature comes in bits and pieces (quanta) and quantum mechanics is the study of this phenomenon. Contrary to Newtonian physics, quantum mechanics tells us that our knowledge of what governs events on the subatomic level is not nearly what we assumed it would be. It tells us that we cannot predict subatomic phenomena with any certainty. We can only predict their probabilities. Zukav avers further that: "philosophically, however, the implications of quantum mechanics are psychedelic. Not only do we influence our reality, but, in some degree, we actually create it because it is the nature of things that we can know either the momentum of a particle or its position, but not both, we must choose which of these two properties we want to determine. Metaphysically, this is very close to saying that we create certain properties because we choose to measure those properties".[61]

Here we seem to come face to face with the complexities that we encounter as humans in trying to make sense of reality at the subatomic level of reality. This epistemic void is one recurrent decimal in quantum mechanics. Why are there still gaps in the explanation of the holistic behaviour of subatomic particles? Could it be because of science positivists approach? What if we explain quantum phenomena from analogy using African supernatural paradigm? This was the entire aim of Zukav in his work which has a lot of link and furtherance with the current research.

In the work, *A Brief History of Time* Stephen Hawking attempted to empirically answer the big questions like: where did we come from and why is the universe the way it is? The book captures such interesting topics as our picture of the universe, space and time, the expanding universe, the uncertainty principle, elementary particles and the forces of nature and so on. Under elementary particles and the forces of nature, the author began with Aristotelian physics in that Aristotle believed all the matter in the universe was made up of four basic elements: earth, air, fire, and water. These elements were acted on by two forces: gravity, the tendency for earth and water to sink, and lavity, the tendency for air and fire to rise.

He also made reference to Democritus who held that matter was inherently grainy and that everything was made up of large numbers of various different kinds of atoms and the word *atom* means "indivisible" in Greek. In 1803 the British chemist and physicist John Dalton pointed out that the fact that chemical compounds always combined in certain proportions could be explained by the grouping together of atoms to form units called molecules. Einstein provided one of the important pieces of physical evidence to that in his 1905 paper. J. J. Thomson demonstrated the existence of a particle of matter, called the electron. With regards to force at the quantum level of reality, Hawking asserts thus: "in quantum mechanics, the forces or interactions between matter particles are all supposed to be carried by particles of integer spin –

0, 1, or 2. What happens is that a matter particle, such as an electron or a quark, emits a force carrying particles. The recoil from this emission changes the velocity of the matter particle. The force carrying particle then collides with another matter particle and is absorbed. This collision changes the velocity of the second particle, just as if there had been a force between the two matter particles".[62]

Hawking states further that it is an important property of the force-carrying particles that they do not obey the exclusion principle. This means that there is no limit to the number that can be exchanged and so they can give rise to a strong force. However, if the force-carrying particles have a high mass, it will be difficult to produce and exchange them over a large distance. So the forces that they carry will have only a short range. On the other hand, if the force carrying particles have no mass of their own, the forces will be long range.

Hawking explained further that the force-carrying particles exchanged between matter particles are said to be virtual particles because, unlike "real" particles, they cannot be directly detected by a particle detector. We know they exist, however, because they do not have a measurable effect they give rise to forces between matter particles. Force-carrying particles can be grouped into four categories according to the strength of the force that they carry and the particles with which they interact. Hence:

> The first category is the gravitational force. This force is universal, that is, every particle feels the force of gravity, according to its mass or energy. The next category is the electromagnetic force which interacts with electricity charged particles like electrons and quarks, but not with uncharged particles such as gravitons…the third category is called the weak nuclear force which is responsible for radioactivity…the fourth category is the strong nuclear force, which holds the quarks together in the proton and neutron in the nucleus of an atom.[63]

What is seen playing out here involves naming certain phenomena in nature as best as we can make sense of them. Force or high energy particles are charged with a certain power that

nature provides. This power or energy is at the very core of being or reality to the intent that we can know them by their effects without actually observing them empirically. Similar belief is held by Africans with regards to the supernatural. The focus of the current research attempts to look at force or energy as a metaphysical unification of "being" the same project scientists are currently working on called the grand unified theories which attempts to explain everything about force.

Frank Wilczek in the article "The Origin of Mass" has as his objective, the description of sub-nuclear forces from the world of quarks and gluons because it casts a brilliant new light on one such child-like question as he puts it: what is the origin of mass? The author holds that, everyday work at the frontiers of modern physics usually involves complex concepts and extreme conditions such as quantum fields, entanglement or supersymmetry and the analysis of the ridiculously small or the incomprehensibly large. The author reiterates: that is where the unknown is as "…a body without mass would not know how to move, this is how important the mass of a body is which is why we can't get rid of mass without getting rid of gravity.

According to the author, when a collision between a high-energy electron and a high-energy positron occurs, we often observe that many particles emerge from the event. The total mass of these particles can be thousands of times the mass of the original electron and positron. Thus mass has been created physically from energy so that ordinary matter is from atoms. The mass of atom is overwhelmingly concentrated in their nuclei. Nuclei, which provide the lion's share of mass are assembled from protons and neutrons. Newer and perhaps less familiar, but by now no less well-established, is the next step: protons and neutrons are made from quarks and gluons. Thus most of the mass of matter can be traced ultimately back to quarks and gluons.

The theory of quarks and gluons is called quantum chromodynamics or (QCD) and is a generalization of quantum electrodynamics (QED). The basic concept of (QED) is the response of photons (light energy) to electric charge. Since experiment is the ultimate arbiter of scientific truth, there are many experiments that test the basic principles of (QCD). According to the principles of quantum mechanics:

> The result of an individual collision is unpredictable. We can, and do control the energies and spins of the electrons and positrons precisely, so that precisely the same kind of collision occurs repeatedly; nevertheless, different results emerge. By making repetitions, we can determine the probabilities for different outcomes. These probabilities encode basic information about the underlying fundamental interactions; according to quantum mechanics, they contain all the meaningful information.[64]

The author asserts that the goal of theoretical physics is to describe the world with the greatest possible economy of concepts. Thus, he tries to show by way of theory and experiment that it is an important result that we can largely eliminate mass as an independent property and that we are forced to introduce it in order to describe matter accurately. Hence, the equations that describe the behaviour of elementary particles become fundamentally simpler and more symmetrical when the mass of the particles is zero. So eliminating mass enables us to bring more symmetry into the mathematical description of nature.

Mass, a seemingly irreducible property of matter, and a by word for its resistance to change and sluggishness turns out to reflect a harmonious interplay of symmetry, uncertainty and energy. This is not to say that we have understood all there is to mass as the value of the electron mass in particular remains deeply mysterious even to the unification (quantum gravity) and string theory in physics. Is this mystery that veils nature a function of a supernatural intelligence as opined in African belief system? Could scientific epistemic limitation a pointer that there is a limit to human knowledge? Is there a possibility where consciousness may be used to explain

some of these physical difficulties? These and other possibilities are what the current research will bring to the table of intellectual discourse.

Accordingly, Raymond L. Orbach and Michael Turner in *Quantum Universe: The Revolution in 21st Century Particle Physics,* declares that quantum universe presents the quest to explain the universe in terms of quantum physics, which governs the behaviour of the microscopic, subatomic world. It describes a revolution in particle physics and a quantum leap in our understanding of the mystery and beauty of the universe. The authors assert that:

> The quest to answer the most basic questions about the universe has reached a singular moment. As the 21st century begins, physicists have developed a commanding knowledge of the particles and forces that characterized the ordinary matter around us. At the same time, astrophysical and cosmological space observations have revealed that this picture of the universe is incomplete that 95 percent of the cosmos is not made of ordinary matter, but of a mysterious something else: dark matter and dark energy. We have learned that in fact we do not know what most of the universe is made of.[65]

To answer then, the fundamental questions about the nature of the universe, astro-physical observations of the relics of the big bang must agree with data from physics experiments recreating the particles and forces of the early universe. Thus, the authors opines that, our quest to discover the fundamental laws of nature has led to the revelation that the laws of physics, and the particles they govern, exists because of underlying symmetries of nature, some of them lost since the big bang. Just as for every particle there exist an antiparticle; supersymmetry predicts that for every known particle there also exist a super partner, particle.

Part of the strong theoretical appeal of super symmetry, an essential part of string theory, is its possible connections to dark energy and the fact that it provides a natural candidate for dark matter, the neutralino. Recent measurements with telescopes and space probes have shown, according to the authors that a mysterious force – dark energy fills the vacuum of empty space,

accelerating the universe's expansion. To answer the question if there are extra dimensions of space? They declare that: "the revolutionary concept string theory is a bold realization of Einstein's dream of an ultimate explanation for everything from the tiniest quanta of particle of physics to the cosmos itself. String theory unifies physics by producing all known forces and particles as different vibrations of a single substance called superstrings. String theory brings quantum consistency to physics with an elegant mathematical construct that appears to be unique".[66]

Physicists have identified 57 distinct species of elementary particles and have determined many of their properties in exquisite details. Most of the matter in the universe is dark; without dark matter, galaxies and stars would not have formed and life would not exist. Dark matter holds the universe together. But this dark matter is unlike any form of matter that have been discovered or measured in the laboratory.

The authors also noted that, ubiquitous, elusive and full of surprises, are neutrinos which are the most mysterious of the known particles in the universe. They interact so weakly with other particles that trillions of them pass through our bodies each second without leaving a trace. Why is there something, rather than nothing? This question seems to make a lot of sense with regards to understanding the complexity of the quantum universe. We see a universe where its fundamental constituents are in a class of their own and behave in a manner that is at best weird, incoherent and fuzzy. Why is the behaviour of these tiny different particles that constitute our universe a great mystery to unravel from an experimental basis? Couldn't beliefs take care of some of these complexities that box us in a corner? If not, why not? This perspective shall be discussed in the current research.

In the article "Philosophical Inclusion in the Measurement Problem in Quantum Theory" Kyrian A Ojong and Emmanuel I. Archibong understandably focuses on the subject of measurement because as they noted "it is at the heart of quantum theory". They writers observed that measurement problem in quantum theory is informed by the difficulties which howbeit, fall under philosophical investigation, involving the behaviour of subatomic particles, especially as it has to do with interaction between the mental and the physical. Measurement they hold can be described as an interaction between an object and an observer, or even as a synthesis of the two. The observer can also mean a cognitive subject with his full psychical equipment; as well as a classically describable apparatus. They capture the measurement problem in quantum theory thus: "in quantum theory, the measurement problem ultimately shows the inseparability of the observer from the observed. There are no measurable, solid realities "out there" independent of the measurer. What is 'out there' when we are not looking is an infinite wavy cloud of criss-crossing possibilities. Then when we focus our attention on something, the wave function collapses into a defined particle in a definite location for us to observe".[67]

The measurement problem raises a central question about the role of the observer in quantum reality as shown by Erwin Schrodinger. His famous cat-in-the-box thought experiment shows us the wave/particle state of an electron before observation or measurement is made. Paradoxically, before observation, the cat is both dead and alive at the same time.

The writers agree that the philosophical debate that has a similar bent with the measurement problem in quantum theory is realism and idealism. Realism in its strictly philosophical sense is the position that the objects of our senses are real in their own right; they exist independently of their being known, perceived by, or related to the human mind. For the realist, the universe is so inexorably "out there" that the only thing we can do is to come to the best terms possible with it.[68]

On the other hand, the idealists contend that an object known or experienced is different from the object before it entered into such a relationship. Thus, they contend that measurement can interact with the system state as illustrated by the Double Slit experiment in quantum mechanics. The problem of measurement is thus linked to the claim that in the course of determining the position and momentum of quantum particles, the instrument or apparatus of our measurement affects or distorts either its position or velocity so that we cannot determine that two simultaneously.

Since we have the presence of force or energy in every matter in the universe whether in the scientists himself or the instrument he is using, it becomes a case of "obstruction" in trying to understand a thing apart from other influences. This also shows that measurement itself, philosophical speaking cannot be correct because of interfering variables. This leaves us with concerns as to determining what is true from mere facts that the scientists is interested about revealing that, the ontological status of a given reality might not be attained from experimental or measurement process alone. Thus, there is every need to incorporate ontology as a metaphysical quest for the understanding of being and its attribute into discussion that bothers on inquiry about truth such as quantum mechanics.

From all the works reviewed under this chapter, a lot of insights have gained with regards to the fundamental category of traditional Africa and scientific understanding of force. Also seen is the cultural commitment of traditional Africa and scientific most cherished beliefs in their thought system and how it informs the explanation of reality within the framework of methods. From the reviews so far, it is imperative that a closer attention has not been paid to a critical scrutiny of what force is in itself in modern science as well as how methods of arriving at knowledge is founded first upon certain presuppositional beliefs. The discussions in the next

chapter examine more closely, the framework of force in traditional Africa and scientific thought systems.

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CHAPTER THREE

THE FRAMEWORK OF FORCE IN AFRICAN AND WESTERN WORLDVIEWS

3.1 What is Force in African Worldview?

How Traditional Africans conceive the notion of force to a larger extent, determines other aspects of their individual and collective lives, and their most consistent cherished cultural beliefs and thought system. It also determines what they make of 'being' as well as the surrounding universe in which they live. However, it must be conceded that, "African concept of being is force; that what is, in whatever form is endowed with force; that mind and matter have never been apart; that forces interact, intermingle and interpenetrate into one another in an egregious sense.[1]

Placide Tempels presented the traditional African worldview of the theory of forces from the Bantu-African. In the minds of Bantu, all beings in the universe possesses vital force of their own: human, animal, vegetable, or inanimate objects. Each being has been endowed by God, the Supreme Force with a certain force, capable of strengthening the vital energy of the strongest being of all creation: man.[2] Force is also referred to as the potent life, vital energy and vital force. Thus, Tempels avers that:

> We need not be surprised that the Bantu allude to this vital force in their greetings one to another, using such forms of address as: "you are strong", or "you have life in you", "you have life strongly in you", and that they express sympathy in such phrases as "your vital force is lowered", "your vital energy is sapped. A similar idea is found in the form of sympathy,…"you are dying",… In their own minds they are simply indicating a diminution of vital force…[3]

The key to traditional Africa (Bantu thought system) is the idea of vital force, of which the source is God.[4] Vital force is the reality which though invisible, is supreme in man. Man can renew this vital force by tapping the strength of other creatures. Thus the fundamental notion under which being is conceived lie within the category of forces. Temples asserts further that:

> Force in his thought is a necessary element in "being", and the concept "force" is inseparable from the definition of "being". There is no idea among Bantu of "being" divorced from the idea of "force". Without the element "force", "being" cannot be conceived. We hold a *static* conception of "being", they a *dynamic*. What has been said above should be accepted as the basis of Bantu Ontology: in particular, the concept "force" is bound to the concept "being" even in the most abstract thinking upon the notion of being.[5]

To the Bantu-African, it is because all being is force and exists only in that it is force, that the category "force" includes of necessity all "beings": God, man living and departed animals, plants, and minerals. Since being is force, all these beings appear to the Bantu as forces. It appears then, from Tempels assessment that the Bantu does not believe that the human being can have any real existence outside the hierarchy of forces.[6]

For Alex Kagame, there are four categories of African philosophy: *Muntu* (human being), *Kintu* (thing), *Hantu* (place and time), *Kuntu* (modality). All that exist in the universe of being and becoming must be summed up under any of these categories so that "everything there is must necessarily belong to one of these four categories and must be conceived not as substance but as force".[7] To this end, man (Muntu) is a force, dog (Kintu) is also a force. West and yesterday (Hantu) are forces; beauty and laughter (Kuntu) are also forces. Being forces, they are all related to each other. Their relationship to each other is seen in the determinative *Ntu;* this is common to all of them.[8] Ntu is the central force in which all four categories find their unity and express their being. But to define force would be contrary to the very nature of force as it can only be described and not defined. In African worldview therefore, force has a metaphysical connotation. It is not accessible to science; in its meta-empirical state, it is dynamic.[9]

With respect to force, it is held that "being" as it is understood in Western worldview which is the most important value in the West, is classified here in the second position, and it becomes the instrument determining the principles of causality, activity and movement. Once

life is placed as the first principle, all we need to do is consider it as the most permanent force, the so called vital force.[10] With the principle of vital force in mind, we can say that African philosophical worldview or thought system cannot do without a historical concrete context of its past. African thought should be sought in the traditions and customs of the ancestors, in the present time and in the works of African writers of all times.

Force for the Africans then is being and being is that which force is. Where being is discussed, force must of necessity come into the picture. There is no separation between being and force as we find in Western logic or thought system. There is no idea among the Bantu-African of being divorced from the idea of force. Without the element force, being cannot be conceived. In particular, the concept of force is bound to the concept of being even in the most abstract thinking about the notion of being. Force for the Bantu is not an adventitious accidental reality. Force is even more than a necessary attribute of being; force is the nature of being, force is being, being is force.[11]

The understanding of force in traditional African worldview accounts for the beliefs in mystical power, magic, witchcraft and sorcery. J S. Mbiti had argued that this mystical power is not a fiction: whatever it is, it is a reality and one with which African peoples have had to reckon with. Everyone is directly or indirectly affected for better or for worse by beliefs and activities connected with this power, particularly in its manifestation as magic, sorcery and witchcraft.[12] To Tempels, it is the theory of "vital force" that can explain everything about African thinking and action. Life force or vital force refers essentially to the quality of life. Everything experienced is charged with life forces.[13]

Apart from the fact that several scholars like: Alexis Kagame, Johanez Jahn's, Placide Tempels, Dagogo Idoniboye, Martins Nkemnkia, have written down their thoughts about force

or vital force, it must be stressed that force is a community belief and practice too. African's across vast distances have an idea of vital force as a principle of being. In fact Tempels declares that Bantu "philosophy of vital force is accepted by everyone.[14] The notion of force therefore corresponds to the notion of being in Western philosophy. Force is not merely an attribute of being: force is being and being is force.

Moreover, unlike the Western understanding of the notion of being, the Bantu notion of force is a dynamic one: the vital force can increase or diminish. A person who is befallen by misfortunes, for instance, would experience a diminution of his vital force, and thus the curtailment of his essence; conversely, an increase in his socio-political power corresponds to an increase in his nature as a human being.[15] This clearly shows that everything in existence is interconnected in a web like manner so that some things can actually increase the vital force of a person, or diminish it. This idea suggests that all that is out there is force and its interaction. There are forces in both animate and inanimate objects and there seems to be this silent cold war of forces going on around. So that the theory of force can be held as "… a distinctive African mode of thought".[16]

The nature of traditional African thought system can be found in its basic assumptions about reality and the theoretical scheme of explanatory models, which are epistemological, metaphysical and religious. Within this framework, spirit, life force or vital forces are the primary axioms, that is, everything is alive.[17] Thus, no being however exist in isolation but ontologically in connection and interaction with other beings (both material and immaterial). The African therefore realizes himself only in the midst of hierarchy of force some acting above and others below, outside of which human beings have no existence.[18]

There has been a lot of criticism on Tempels idea of Bantu African force from such personalities as Mbiti, Oruka, Hountondji and Asouzu bothering on whether Tempels' is qualified to be called an African philosopher and whether the theory of vital force is a belief by African people in general. Also, whether Tempels' work isn't addressed to the Europeans than to African audience for the benefit of European colonizers and whether Bantu philosophy of vital force is a myth rather than reality. In all of these, Asouzu's criticism which led to the description of Tempels' Bantu philosophy as the "Tempelsian Damage" predicated on Tempels' understanding of the Bantu notion of being as vital force which for him is dynamic and the fact that Bantu ontology is something that has inherently causal predeterminism seems to be the fieriest.

Asouzu opines that "this force is nothing other than Aristotle's being as being which is static in its abstractness. One is therefore not surprised at his conclusion putting into account Tempels mindset, which is moulded after Aristotle in the sense of substance…since it is specifically tailored to suit the Bantu, it is his own creation".[19] For Asouzu then, the correct interpretation of vital force in Bantu ontology outside the legitimacy provided by mutual complementary interrelatedness will always present difficulties and will end up distorting the African picture of reality. Asouzu concludes that Tempels traditional African ontology of vital force remains deficient as it fails to recognize also that reality has an inherent static dimension.

The point that is easily inferred from all these is not that there is a contention about the belief in the reality of vital force in Bantu African ontology, but its nature or proper description is what is being queried by Asouzu and the misinterpretation by other critiques which has not in any way eroded the belief in the reality of vital force in African worldview. For Mulago, "the unifying factor, the cement that holds all things together is vital union, which transcends the

merely visible and biological and reaches out to the invisible world". [20] The study now examines the hierarchical order of force in African worldview from its distinctive parts.

3.2 Hierarchy of Force in African Worldview

Arising from the notion of force in Traditional African worldview is the notion of "hierarchy". It is part of the characteristics of force apart from its dynamism, to be in hierarchical order. Vital forces are in hierarchical order from God the supreme vital force through to the ancestors-the living dead, to the living humans, to animals, plants and minerals-non-living things. A force is very much in relation to other forces. Ijiomah writing along this line opines that: "the process of relationship between and among realities in an African worldview involves a dovetailing of realities into one another. It is this type of relationship that equilibrium is maintained in the universe of things. In an attempt to normalize this balance an African resorts to charms, sacrifices and libations". [21]

Forces for the Africans differ in their essence. Africans hold that there is the divine force, celestial or terrestrial forces, human forces, animal forces, vegetable and even material or mineral forces. Since being is force and exists only in that it is force, then the category includes of necessity all beings: God, men-living and departed, animals, plants, minerals and so on. Aliko Songolo iterates that:

> Hence it follows that social order is based on hierarchy of forces which interact according to the respective position of each being. The higher being can confer a quantity of force on a lower being, or it can take it away, thereby increasing or diminishing the latter's essence. At the top of this hierarchy is the "creator," followed by the first fathers…, founders of the different clans, who provide an important link between the creator and humans and are therefore ranked higher than the ordinary dead.[22]

Following Tempels, Ekanem avers that life forces are in hierarchical order. The highest of force is God, followed by divinities, ancestors, spirits, man, animals, plants and minerals.[23] Tempels argues that the Bantu conceive life as essentially constituted and categorized by

different forces. In his view, the Bantu conceive of force in hierarchical terms. God is placed as the possessor of ultimate force and beneath him are the ancestors, divinities who are followed by living human beings and then animals, plants and all inanimate objects. Human beings occupy the third position in the hierarchy of force after God and the ancestors. They possess great force and have dominion over all created things. Tempels captures this point thus:

> …the universe of forces is organically constructed in what we can call an ontological hierarchy: The interaction of forces and the exercise of vital influences occur, infact, according to determined laws. The Bantu universe is not chaotic, tangle or unordered forces blindly struggling with one another. Nor must we believe that this theory of forces is the incoherent product of a savage imagination, or that the action of the same force can be now propitious and now pernicious, without a determining power to justify the fact.[24]

The hierarchy of force is an important belief held in African worldview which expounds order both in the visible and invisible world. This order helps to maintain the equilibrium or balance in the universe of the African. It is the issue of unity in diversity where every distinct force is related to other forces in a seamless manner. Here, there is no quantum chaos or randomness as is held in modern science. The study now accesses each distinct part of this hierarchy of forces.

3.2.1 God, Ancestors and Divinities

At the apex of the hierarchy of forces in African worldview is God held as "the great Muntu"[25], the supreme Being, creator of everything visible and invisible, the source and sustainer of force, the uncaused cause of everything at rest or in motion. God is the highest of force; he is a spirit, and it is he who has force, power, in himself. He gives existence, power of survival and of increase, to other forces. God is very important to the African because everything about existence revolves around him. He is the perfect picture and definition of truth and reality.

This Supreme Being God is also conceived as the supreme King who has divinities appointed to minister each department in his theocratic government of the world and the ancestors (the living-dead) clearly set forth as intermediaries between the Supreme Being and the living. Thus God (the Supreme Being) refers to:

> The Living eternal being who is the creator and source of all living and whose life existed from dateless past. God (Supreme Being) is self existing and an all knowing being whose power sustains the universe and sees all things at the same time without any modern instrument. This great Being has revealed Himself in many different ways, and human beings have always felt His presence and responded to Him in worship. This manifestation or revelation of God (the Supreme Being) has brought about a living relationship between God and mankind, leading to what we now call "religion".[26]

The belief in God is firmly rooted in African worldview and is tied to the entire fabric of the lives of the African. Hardly will the African separate the reality of God from his social, political, economic, moral, scientific and intellectual live. The understanding of this point explains why the African is seen as being very religious because the idea of God regulates his entire existence. God is held to be omniscient for His knowledge encompasses all things. He beholds the thoughts of all mankind and secrets of their hearts by His knowledge which was from aforetime.

The physical world, what modern science calls the planets and galaxies are all the works of his hands as they are his creatures. He also determines the laws and principles that govern them. He is believed to be the one who sets the universe into motion and appointed times and seasons. On knowing this Supreme Being, Mbiti avers that: "…though the knowledge of God as supreme being is not documented in any sacred book, yet it is "expressed in proverbs, short statements, songs, prayers, names, myths, stories and religious ceremonies. One should not therefore, expect long dissertations about God. But God is no stranger to African peoples, and in traditional life there are no atheists".[27]

On the other hand, the faith in ancestors (the living-dead) is a very focal belief in African motion of force, culminating into a practice and the involvement in ancestral rituals in an attempt to preserve good relations with the departed kin. In African worldview practice, ancestors are serviced but not worshipped thus, the events of slaughtering an animal, pouring down beer or water on the ground (libation) is a service of remembering or thanking the ancestors and for communicating with the ancestors, asking for blessings and good fortune.[28]

The ancestors are believed to have taken a spiritual form and are now closer to God so that it becomes easier to bridge the gap between man and God through these intermediaries. This is why the living resorts to the ancestors and other divinities because they can assist them in difficult times or situations. So that by ancestors, traditional Africans have in mind, all the dead departed who are physically dead but are still believed to be alive in the memory of those who remember them when they were in the community. They are regarded as integral members of the family in Africa. They are seen as always present and have interests in the affairs of their families. This is the more reason why members of their families venerate them and offer sacrifices to seek for their protection, blessing and intervention in times of wars and difficulties.

This practice is occasioned by the belief in the interconnection of forces just like a web which is why such a connection can be made. It must be stressed here that the living-dead are referred to as good spirits of those departed having fulfilled the laid down qualifications for becoming ancestors such as having had children, lived a good life and dying in a ripe old age.[29] Those departed who were not given admittance into the ancestral world becomes ghosts, haunting the living because they lived a bad life, must have committed suicide or died without proper burial rites. All of these suggest that Africans believe in the immortality of the soul and the afterlife.

Divinities in African beliefs go by several names such as 'gods' 'demigods', 'nature spirits' and the likes. This belief in divinities "is a common phenomenon especially in West Africa, while in other parts of Africa, the concept is not succinctly expressed".[30] Mbiti argues that divinities were created by the Supreme Being in the ontological category of the spirits. They are associated with Him, and often stand for His activities or manifestation either as personifications or as the spiritual beings in charge of these major objects or phenomena of nature".[31] Thus divinities are under the Supreme Being in the order of things. They can also be seen as manifestations of the characteristics of attributes of the Supreme Being.

Whether divinities were created by the Supreme Being, or they were brought into being, or that they came into being in the nature of things with regards to divine ordering of the universe, divinities can be seen as spirits or human beings of distant past who by their heroic activities where deified.[32] But the belief that divinities were created makes much more sense because only god is uncreated. So that divinities are created by God initially as spirits and are largely the personifications of natural objects and forces of the universe. To this end, J. K. Oluponona gives a concise summary thus:

> …African cosmogony posits the existence of Supreme Being who created the universe and everything in it. African myths frequently describe numerous lesser deities who assist the Supreme Being while performing diverse functions in the created world. Spirits may be divided into human spirits and nature spirits. Each has a life force devoid of physical form. Individuals who have died, usually ancestors in particular lineages are the human spirits. These spirits play a role in community affairs and ensure a link between each clan and the spirit world. Natural objects, such as rivers, mountains, trees, and the sun (as well as forces such as wind and rain), represent the nature spirits. Africans integrate this religious worldview into every aspect of life.[33]

Having examined lucidly, God the Supreme Being, ancestors, divinities, the study now turns to man who happens to be the grand creation of God.

3.2.2 Man

Man is in the fourth position in the hierarchy of force in African worldview and is at the centre of the forces above him and those below. He is a paradox and an enigma in the sense that, he is very strong but at the same time, very weak. He is very intelligent but at the same time very foolish. He can believe in one instance and then doubt in the next. *Muntu*, which signifies vital force, endowed with intelligence and will is a man. This is different from the *bintu*, what we call things, but according to Bantu philosophy they are beings, that is to say forces not endowed with reason, not living. Tempels avers that:

> Man is not suspended in thin air. He lives on his land, where he finds himself to be the sovereign vital force, ruling the land and all that lives on it; man, animal, or plant. The eldest of a group or of a clan is, for Bantu, by divine law the sustaining link of life, binding ancestors and their descendants. It is he who "reinforces" the life of his people and of all inferior forces, animal, vegetable and inorganic, that exist, grow, or live on the foundation which he provides for the welfare of his people.[34]

Man is held to be created by the Supreme Being in traditional African worldview. Even though there may be discrepancies about how he actually came about, the whole idea still points to man as being God's priceless creation. This belief is different from the one held by the Westerners with regards to science as we shall see subsequently. David Burnett avers that:

> In most African traditional cultures, there seem to be no distinction between man and the rest of creation. There is no dichotomy in the human nature, between the material and the immaterial. Therefore, the soul is capable of leaving the body since it is not viewed as encased by the human body. This is what gives rise to the belief in sickness caused by soul-stealing by witches since the human soul is not an entity but "several inter-related souls".[35]

Though David Burnett's averment isn't completely correct, the individual man in African worldview is seen within the context of the collective. Individual existence does not rest on the principle of individual survival; rather people are connected to their relatives, living and dead, as well as to the natural environment in which they live. Put simply, a person exists because nature and other people exist.[36] Humans in African worldview, gain knowledge not necessarily on what

is based on researched and scientifically verified facts but on the experiences of individuals and what they learn from others in their environment, especially from members of the community.

Since man is at the very centre of existence in African worldview, it follows then that his existence bridges the gap between God on one hand, and the environment on the other. Thus, man plays an active role in nature and he is also seen as the express image of the Supreme Creator. He actively participates in the mysterious forces which keeps and propels the universe. Mbiti asserts that, "even inferior beings such as inanimate beings and minerals are forces which by reason of their nature have been put at the disposal of man, of living human forces or of man's vital forces".[37]

An African sees in man the living force, i.e. the force or the being that possesses life that is true, active and full. Man therefore in African worldview is the most powerful among created beings. He finds his essence in his participation to a greater extent in the force of God. Man (living or dead) can directly reinforce or diminish the being of another man since all force can be strengthened or enfeebled. Man therefore, grows, develops, acquires knowledge and in the process, increases his force or vitality. But this does not mean that man is a god or can ever assume the status of a god. It doesn't matter how sophisticated man becomes in his knowledge acquisition, he is still a force that is dependent on the greatest force which is God.

The reason why man cannot operate independently of God in traditional African worldview is because he needs knowledge and wisdom from God and thus passes through intermediaries such as diviners, witch doctors, sorcerers and so on to get it through the living-dead which are believed to be nearer to God and in a realm of perfect knowledge. This is also why the individual man is lost in the community and his actions can affect the community either positively or negatively. It must be emphasized also that, however powerful man is, at a point in

time he will lose his vital force and come to an end in the complete annihilation of his very self known as death. Death however, is the door that leads to the realm of the spirit where the dead lives on. Ontologically speaking then, man is the peak of cosmic perfection and he bears rules in the material universe.

Man's ultimate destiny in traditional African worldview is premised on several factors such as God, fate or himself.[38] This power is invisible and metaphysical as it controls the activity of individuals in such a complex unfathomable way that is thought of as determined in advance. Following this, Iroegbu observed that "… for the African, nothing occurs in the physical that does not root itself in the spiritual (metaphysical). The spiritual dimension of reality holds as the foundation of the physical world".[39]

From the foregoing exposition of man in African worldview, the similarities and differences as conceived by the Westerners becomes evident. Scholars like Aquinas, Mills, and others accept that man is endowed with the faculty of reason with freedom of choice and responsibility. But current controversies may arise as to whether man is a created being or he evolved naturally thus whether he owes his existence to a Supernatural Being outside of himself. Let us now examine the other aspects of forces in the hierarchy after man.

3.2.3 Plants, Animals and Minerals

The natural environment or habitat houses man, plants, animals and various mineral deposits. Man is seen to be co-habiting with the environment and forces permeate everything in the natural habitats. Unlike the West where dominance and conquering the environment is common place, the African cosmology is one that is spiritual and complements man. According to Sussy Gumo *et al*:

> Humankind, according to the African thought and belief, is not an isolated creature. Humanity is only part of the universe which is full of animals, plants and inanimate objects. All these components are related to each other in various ways, and all these are dependent on the supreme God for their appearance and their continued existence. The African spiritual worldviews create respect for nature, reverence for hills, forest, animals, and rivers.[40]

Traditional Africa has a high regard for certain animals because it is believed that the ancestors communicate with the living through them. Spirits are believed to operate in the human world of animals, birds and fishes. This is the reason why certain animals cannot be killed or eaten in some African communities because there are shared relationship between animals and humans, animals and the deity, humans and humans, nature and humans, the dead and the living. These animals are totemic and have taboo attached to them. By that, they become sacred just like other non-human components of nature. Mbiti asserts that "…man is the centre of this ontology, the animals, plants and natural phenomena and objects constitute the environment in which man lives, provides a means of existence and, if need be, man established a mystical relation with them".[41]

The religious practices of the Africans seek to maintain the harmony and balance that exist in nature, reality, and the natural community of things in which gods, deities, spirits and ancestors are made manifest. Thus, traditional Africans see mountains, trees, rivers, and different animals as representations or embodiment of deities or spirits, and as such, they are divine, sacred, and are given due reverence. Ikuenobe avers that:

> Natural objects have religious significance, and as such, they are treated by humans with reverence. Africans believe that rites such as pouring libation, praying, and making sacrifices and offerings in shrines, which are usually natural objects, are some of the ways in which humans are in communion and fellowship with the spiritual world, the sacred and divine. Some shrines are at the bases of trees, mountains, and banks of rivers which are adorned with gifts of natural objects, and usually, sacred animals are sacrificed and offered to the deities that are embodied in these natural objects.[42]

Africans hold the belief that spirits dwell in the woods, bushes, forests, rivers, and mountains or just around the villages as custodians of the sacred laws of nature. Thus most plants have healing potency and can increase the life force of man or diminish it. Man then avoids the ones that can bring harm to him, while taking advantage of the ones that can increase his life force. All of these are possible because of the place of forest in the environment for without it, there will be no trees, shrubs and other plants. Every other thing will be bare sand, stones, mountains and a natural landscape without the beauty of forest and trees. Thus, M. O. Ikeke further opines that:

> A landscape without forest will greatly harm human health as one of the essential elements that take carbon dioxide from the atmosphere and produces oxygen for human survival is lacking. The forests are not only important to human life, but also important for the survival of other non-human lives and species that depend on the forest environment for survival and flourishing.[43]

The African worldview of forest is one that cannot be isolated from its cosmological view of reality since reality is seen as an integrated and interrelated web. Since there is no pure and absolute dualism in the African worldview, the forest is an Integral part of the African, a gift bequeathed by the Supreme Being. The forest plays significant role in the sustenance of not just man's life-force but that of the world. This understanding can forge an argument for the conservation of the forest as an exclusive contribution from African worldview.

For the African, nature incorporating the forest and plants is sacred. Plants are hereby infused with potent life forces beneficial to man and the entire cosmos. The sacredness of certain forests is common knowledge in African worldview. This is so because it is believed that some forests are the habitat of ancestral spirits since they serve as burial sites of kings and chiefs. It is also believed that some evil or malignant spirits inhabits these forests too hence one could easily disappear if the entrance is wrongly done without appropriate rituals. The same applies to fishing in certain lakes or rivers and hunting for animals in the forest. There is also the belief

where in entering a strange spot in a forest, one is not permitted to make any comment so as not to anger the ancestral spirits of the region.

Furthermore, some trees are seen as sacred so that they need not be fell down or touched with an axe because it is believed that there are spirits inhabiting them who will be very upset and that can bring about calamity to the community. This is why it is common place to see trees in some communities that have existed for so long a time, some very gigantic with an aura that is breathe-taken. The explanation for this is premised on the grounds that most aspects of nature are perceived as kin, and are endowed with consciousness and the power of ancestral spirits. Trees, animals, insects and plants are all to be approached with great caution and consideration. Regarding minerals, the same worldview applies. The environment or nature is endowed by God with abundant mineral resources such as mountains, hills valleys, rocks and other mineral deposits like bronze, iron ore, gold, silver and so on. These are used in art work that also mimic the gods and preserve the sacredness of the spiritual dimension of African reality and for economic reasons. They are deposits that come with the intelligent creation of the world. This is why "all life, spirits, humans, animals, plants, trees, oceans, rocks and so on come from God. They depend on God the creator for their existence and sustenance."[44]

The African is conscious about the minerals that are in the environment. He sees them as the benevolence of the creator towards making the environment to be rich and endowed. However, there is no distinction between object and subject as the Africans do not believe that objects exists unknown by a subject or known objectively. Traditional Africans thoughts have no use for the idea of an objective reality that exists independently of its being known by anyone. Reality is what it is known or experienced by human's robust communion with it. Traditional Africans "epistemological views' is fundamentally, *experientialist,* but not in the sense in which

modern science sees it by denying the supernatural in that people get knowledge from their robust experience of communion with reality".[45]

Traditional Africans are aware that mineral deposits in the environment contain life force. But they don't look for the cause outside of God. Traditional Africa description and explanation of these minerals are from the perspective of their being a determinate act of God. Africans do not invest time trying to break through the particles of this minerals or classifying them into periodic tables as the Westerners does. That does not seem to be the ultimate commitment and concern of the African. The African is content in knowing that "…every being, everything, be it only a grain of sand, radiates a life force, a sort of wave- particle; and sages, priests, kings, doctors, and artists all use it to help bring the universe to its fulfillment".[46]

Furthermore, by reason of language, the Africans are able to name these various mineral deposits in their own indigenous mother tongue. So that what we call gold for instance, is identified as gold everywhere but with a different nomenclature for it. This is similar to the concept of force that the study is examining which is one metaphysical reality but with different name and interpretation for it. The traditional African then gets to know his environment as he co-habits with it for his survival, enjoyment and leisure. He goes about this not forgetting his spiritual worldview for that is the foundation upon which reality makes meaning to him. The environment, "including the life support provided by the air, water, land, animals and the entire ecosystem of which man is a part of "[47] is for the African charged with life force from the creator which complements other hierarchy of forces in an interconnected web of symmetry.

3.3 The Interaction of Force in African Worldview

In traditional African worldview, events are caused and are a product of "being". Being and force have the same ontological status in African worldview as nothing just happened to an

African without a spiritual cause. This suggests that there is some kind of deterministic belief that the Africans hold. But interestingly, the spiritual realm is more profound to the African and that is where reality is determined and understood. The physical plane to the African is far lesser and real compared to the spiritual plane where God dwells as well as the spirits and ancestors. Before anything happens in the physical plane, it must have happened in the spiritual plane. Teffo and Roux assert thus:

> Since metaphysical discourse is generally about non-physical aspects of phenomena that transcend space and time, the bulk of the subject matter of African metaphysics falls under the category that is traditionally described in western metaphysics as "supernatural". Two considerations are important here. On the one hand, as will be emphasized repeatedly, dualism which is the stock-in-trade of western metaphysics, such as those between matter and mind/soul/spirit, do not appear in African metaphysics.[48]

That Africans place a very high premium on the supernatural or immaterial aspect of reality should not be misunderstood. It does not in any way mean they do not exist in time and space. Much of the African day to day lives are based on empirically verifiable facts. But the only difference is that, the African reduces all of these facts to supernatural causes so that all the activities that takes place in the natural realm or plane is a direct consequence of what goes on in the supernatural realm through causal interaction.

Causality in African worldview is founded on beliefs. This is different from how it is perceived in modern science. For a statement to be considered causal in modern science, it has to fulfill "three properties which mean that the cause must precede the effect, cause and effect must be materially related, and whenever the cause happens, the effect must take place".[49] Explaining causality from cause can be supernaturally determined for the African. For instance, a material cause can be informed by a supernatural interaction or means. This view is predicated on the "being" of God.

God or the Supreme Being in traditional Africa worldview is a spirit being. The nature of His being is such that can affect matter even by a mere spoken word. For the Africans, each reality, whether spiritual or physical, appears and disappears into and takes the nature of the opposite reality.[50] This is to say that, the natural world is a consequence of the supernatural where the Supreme Being, spirits and ancestors dwell. In other words, there is a constant interaction between these parallel universes. For this reason, "…reality is cyclical. The spiritual appears as a physical reality and goes back to the spiritual world and the cycle continues. This means that the physical has an inbuilt spirituality and the spiritual has an inbuilt physicality.[51]

The reality of this truth accounts for the explanation of certain events that doesn't make meaning within the purview of Western scientific category. For instance, when a person is to be poisoned in Africa, it is not necessary that the poison should have a direct contact with say, the food or drink. Just holding the bottle or glass is enough to transmit the poison into the content. Just like we have the presence of radio waves everywhere in the universe, we also have a web of interaction with regards to force. And as long as the force we are talking about is fundamentally spiritual, it can affect the material aspect of reality. Mbiti asserts that:

> The whole psychic atmosphere of African village life is filled with belief in this mystical power. African peoples know that the universe has a power, force or whatever else one may call it, in addition to the items in the ontological categories. It is difficult to know exactly what it is or how it functions. Even where allowance is made for conjuring tricks, obvious cheating, superstition, manipulating of hidden means of communication and other skilled use of laws of nature, one is left and confronted with phenomena which as yet cannot be scientifically explain away.[52]

Causality in African worldview works by interaction. The interaction is from the supernatural to the natural and vice versa. The Supreme Being interacts with His creatures by infusing "life force" into them. All of creation exhibits this causal life force. It is in rocks, trees, flowers, birds, plants, animals, man and so on. It animates existence and forms the bedrock of

everything living or that which has the possibility of being real. Knowledge of their existence is important in harnessing these powers. The powers can be used constructively or destructively depending on the spirits behind it as there are good spirits and evil spirits. Mbiti notes that "there is mystical power which causes people to walk on fire, to lie on thorns or nails, to send curses or harm, including death, from a distance to change into animals (Lycanthropy), to spit on snakes and cause them to split open and die…"[53] The study shall now examine how the material force is a consequence of spiritual cause.

3.3.1 Spiritual Force with a Material Effect in African Worldview

The major reason why it seems weird for something supernatural, spiritual or immaterial to affect a material object is because of a people's outlook to reality via worldview or logic of thought. When discussing the concept of cause from the scientific point of view, it is expected that there must be material connection which in turn produces a material effect. To say that something A is the cause of an effect B is to be understood from a material perspective. This kind of explanation is not really necessary when we shift our attention to traditional Africa worldview. Africans believe that every material effect has a spiritual cause as matter itself is a product of the spiritual or supernatural. Tempels alluded to the point lucidly below:

> The fundamental notion under which being is conceived lies within the category of force. Metaphysics studies this reality existing in everything and in every being in the universe. It is in virtue of this reality that all beings have something in common, so that the definition of this reality may be applied to all existent forms of being. To arrive at this reality common to all beings, or rather which is identical in all beings, it is necessary to eliminate all forms of reality which belong to one category only among beings. We pay attention to the elements, which are common to all beings. Such elements are, e.g. the origin, the growth, the changes, the construction or the achievement of the beings, passive and active causality and particularly the nature of the being as such supporting those universal phenomena. These elements constitute the object of metaphysical knowledge, that is to say, of knowledge embracing all the physical or the real.[54]

In modern science, there is a place for mysterious and invincible forces of nature. But the difference is that, they are all reduced to material processes. For instance, most parts of the universe are just forces and its fields (dark matter/black holes). These realities are not apprehensible by direct observation except through their effects. For instance, the reality of the wind is informed by the leaves shaking. There is a lot that also seems to be hidden from human consciousness with ontological appendages; granted that physics only became an independent field of study in the 17th Century. Before that time, it was called *Natural Philosophy.* The window through which 'matter' is known by the scientists is through the senses, majorly five.

The supernatural realm has been a very contentious subject for modern science since the advent of science because modern science reduces all of the natural including man to "matter". Man therefore following science is just a composite of atoms without a soul or spirit. Thus, any claim to the supernatural realm is described as hallucination or delusion something that is not real with regards to material reality. As Mawere and Mubaya opines, "while we appreciate the universality of philosophy as a discipline anchored on rationality and critical inquiry, we examine the question in cultural and geographical frames in order to try to bring out to the surface that which distinguishes African philosophy from other philosophies such as Western philosophy or Chinese philosophy".[55]

From a physicist's angle, it will sound absurd to assert that a supernatural entity or force without form or shape can influence matter. But to doubt this possibility is to also be coming from a particular thought system. To dismiss the reality of mind over matter as utter balderdash is to be judgmental based on a supposed superior thought system. Africans have often been berated by the Westerners on account of their worldview system with regards to the supernatural. Thus, it is a belief in African worldview well held that the supernatural is a realm more real than the physical.

Modern science views reality as predominantly material with a reductionists approach so that the mind is just a brain activity and not an independent entity as captured in the Cartesian dualism. The physicalists then is "someone who is prepared to say that every event can be described in micro-structural terms, a description which mentions only elementary particles, and can be explained by reference to other events so described.[56] Furthermore, with regards to the mind, the physicalists will say indifferently that we are dispensing with mental states and events in favour of a bodily ones or explaining mental states and events as bodily ones.[57] Safro Kwame rejecting the thesis of physicalism, captures Kwasi Wiredu words, what he calls quasi-physicalism thus:

> Quasi physicalism does for physicalism what physicalism did for materialism expressed exclusively in terms of atoms and other elementary particles. It stretches the limits of matter or materialism as far as is compatible with what we know or do not know, without embracing dualism. It admits the possibility of quasi-physical objects as belonging to a category between the realm of the obviously physical, i.e. those objects that obey the known laws of physics and the realm of the so-called spiritual or completely immaterial objects that do not obey any of the known laws of physics. These are the "fuzziest" objects that quasi-physicalism recognizes as being compatible with a limited version of physcialism. They, unlike outright spiritual or immaterial objects, are recognized as existing together with atoms, fields, energies, sets and numbers.[58]

When an African is talking about the spiritual affecting the physical or material, he is doing that from a face valued point of view. He is not referring to brain or mental processes but to a reality outside of matter which can influence it. The influence in question is outside of the material; it is a supernatural influence over the material.

The material dimension of the African universe is not highly regarded by modern science despite its perceived impenetrability. It is like saying hypothetically that one could break into a rock or go back in time in a bodily manner. Why this would seem to be a ridiculous thing still bothers on the subject of a thought system. Traditional Africans are very much at home with

magic, sorcery and witchcraft. There are cases where every effect of matter is removed completely in African worldview. The fire is seen as having no effect on a material body, same as a sharp knife and poisonous reptiles because a person is believed to have fortified himself by a life force using rituals, sacrifices, offerings, prayers and invocations.

There is the firm belief in teleportation in traditional African worldview so that in times of natural disaster, a person can stay safe even when the odds do not agree with it. This is why talisman and amulets are highly priced by Africans because they contain forces that can prevent harm or death, prepared by experienced medicine men. The same principle of life force applies in preparing charms for love, wealth, protection or destruction of a perceived enemy.

Arising from the belief in a world full of hostile spiritual powers, every material event is believed to have an underlying spiritual cause. This cause-effect belief is so strong that it overrides all events or happening in the African universe. This is why African traditional societies put emphasis on the need to know how not to disturb these forces. This is why magic refers to the use of mystical powers to protect oneself from "misfortune, danger, evil spirits, sickness, and to get control over other people and situations".[59]

There is also the belief in persons taking the nature of an animal, tree or ant-hill. This conversion or transformation is on the account that there is more predominant influence of the spiritual over the material. This reality may never be accepted neither will it make sense to a person who does not believe in the spiritual or supernatural realm. Thus it will be dismissed as mere illusion of falsehood. But this does not however negate the truth that traditional Africans know how to manipulate the forces in nature to their advantage. By understanding the secrets of the forces in nature and with the right sacrifices, prayers and rituals, one can walk on hot coals of fire, nails, thorns, disappear, fly as a bird, and take the form of an animal[60] or a pretty maiden.

Mystical power, magic, witchcraft and sorcery are all part of the African universe. This of course is so because of the framework of this universe. The hierarchy of forces just considered alongside the belief in force in everything makes this possible. The spiritual plane of reality for the African, though immaterial, has influence over the material such that it can temporarily suspend the laws of nature or matter. This is why the material aspect of reality of force is at the base of the hierarchy. In fact, the very last is minerals with atoms and its particles. While modern science prized the mineral or material aspect of reality so highly, for the African, it is the least of all forces not worth giving much attention.

The spiritual dimension of reality is not really far away from the material as it is contained in it which is why matter is easier to manipulate or influenced over mind by the African. The African is believed to have known this truth which is why he takes advantages of that realm to also influence and manipulate other humans, materials and situations. Man can transform himself into a pure spirit and together with others in the same state, live a spiritual life. Accordingly, "since in every event there is an explanation, especially when it concerns evil, a disaster or even death itself, in many cases the cause is attributed to the spiritual spheres: to any failure or a violation of the power of the "men-spirits". In any case, there must always be someone to blame or to accuse".[61]

3.3.2 The Supreme Being as the Creator and Unifier of Reality through Force in African Worldview

The African worldview is structured in a manner that God the Supreme Being is hierarchically at the apex by virtue of His supernatural powers and abilities. He is the causal explanation and unifier of all of reality. This belief is germane if one must make meaning of the African worldview and thought explanation in its entire ramification. The things we come into awareness of in nature have only one explanation for their manifolds existence and it is God. To

raise an objection to this belief or to question its validity is to be coming from another thought system with its logic different from that held by the Africans. The African universe is framed in the hierarchy of being or forces. The realization of the marvels of the universe through folklores, myths and legends handed down from generation to generation must have aided the knowledge gained by Africans about the supremacy of God as the creator and unifier of all things, visible and invisible in their diversities. Even the origin of God might be difficult to explain as several African societies have varied accounts but there still lie a common denominator about the belief in a supernatural God.

Western science is currently on a research mission to discover a unifying theory that will account for every phenomena and laws in nature. This is known as the grand theory or unified theory. The benefit of this venture has a lot of epistemic value in that it will take us back to how reality is interconnected and emanating from one source. Africans traditionally knew about this in their worldview of forces with God as the creator and sustainer of everything. This informs why O'Donovan states that in traditional African societies, God is revered as being everywhere; he is omnipresent. Thus, 'He is like air', the one who fills everything and… 'He who is met everyhere'.[62]

For the Africans, tracing the cause of a phenomenon to God is an indication that He is acknowledged as supreme and has a will of His own. But we must stress that God cannot be responsible for certain natural phenomena but wicked malignant spirits and the will of men. God is also held as omniscient who knows every detail of the universe as well as the people in it hence he is often acknowledged as a judge and king who cannot be fallible. He is both transcendent and immanent at the same time. W. O' Donovan avers further that:

> Another attribute of the traditional African God is that he is omnipotent; the all-powerful one. All majestic deeds, such as earthquakes, rain etc are attributed to him. Small wonder

> according to the Zulu, He is the One "who roars so that nations be struck with terror". Furthermore, God is seen as the provider; the one who provides rain to enable people to farm and animals or wild fruits for food. Indeed he is the provider of the ultimate gift-life.[63]

God therefore for the Africans fills the gap and can rightly be called the "God of the gap" following similar thinking in modern science. It is in God that reality makes sense. It is only in God that the jigsaw puzzles of creation and life can be satisfactorily explained. The Supreme Being, the divinities, the demi-gods, and the spirits operate in the created world. And together, they create balance and harmony in the world. Africans do not believe that the world came as a result of blind chance neither do they believe that the universe has always been in existence and is eternal. The material universe for the Africans is just one realm of force housing man and the other forces below him. However, God though a spirit being, still makes contact with the material world through the living-dead and other divinities.

Since God is the creator and sustainer of the universe, he is seen by the Africans as the first cause in the universe and through him all other aspect of the universe is unified. In other words, everything in the universe whether material or immaterial have their essence in God as well as their expression. This point cannot be disputed as far as African belief is concerned. Thus, Okeke and Ekeopara have argued that:

> So many writers especially the arm chair scholars from the West argue that God in the African concept is far removed that they see Him as "absentee landlord". They conclude that though Africans have a faint knowledge of God, but that God is far removed from them so that they rather go to the divinity for help. This is a big error. You cannot emphasize God's remoteness to Africans to the exclusion of His nearness. The transcendence and immanence of God are two divine attributes that are paradoxically complementary.[64]

The point being made here is that God is the cause as well as the source of all things to the Africans. Explanations cannot be isolated from God. He being at the apex of the hierarchy of force commands his supremacy and in the process unifies all of his creation giving meaning to

reality and existence. Whether this belief is accepted by the Westerners or not on the grounds of their scientific logic is inconsequential here as Africans have a basis for their belief system just as do the scientists. For the Africans, beliefs are grounded on some experience or intuitions which are all epistemological. As the study shift its focus to force in modern science, the basis for the conception and understanding of force in science which is also founded upon some epistemological theory will be made glaring.

3.4 What is Force in Western Science?

One of the things to be easily noticed with respect to modern science is that it is replete with individual names. This is different from African worldview where knowledge or beliefs are communally held or a community property. This is why it is not difficult to discern that most laws or theories in science have individual names attached to the founders or discoverers. So in tracing the study of the development of modern science, the study shall be engaging more with individuals. Before Isaac Newton came into the picture of science in the modern era, there were forerunners who laid the ground work for science some of whom are: Aristotle, Ptolemy, Nicholas Copernicus, Galileo Galilei and Johannes Kepler.

Before the 17^{th} century, the science of physics was still being studied under the domain of philosophy. It was christened "Natural Philosophy" thus the names associated with it then were considered as natural philosophers. These natural philosophers were instrumental to the empirically oriented status of the natural sciences over the past two to three hundred years because they synthesized and systematized what is given through the senses and reason. Today as it were, the scientific method is held as the leading method by which one gets to understand the world, especially with regards to truth about the material universe.

The name Isaac Newton opens up a new vista in modern science as it mediates between the ancient and the contemporary period. Newton is the founding practitioner of what we have come to understand as the methods of natural science. Other scientists as well as Newton are not held to be preoccupied with matters not known empirically so that the interests of the scientist does not preclude things that are "transcendent" or "metaphysical". In his *Philosophiae Naturalis Principia Mathematica*, Newton observes that:

> All the difficulty of philosophy seem to consist in this-from the phenomena of motions to investigate the forces of nature, and then from these forces to demonstrate other phenomena. By the propositions mathematically demonstrated in the former books, we in the third derive from the celestial phenomena the forces of gravity with which bodies tend to the sun and the several planets.[65]

What made Newton somewhat different from his famous predecessors is that Newton stated his method clearly with experimentation, logic and mathematics. In scientific discovery and formulation, he was a marvelous genius. As a philosopher, he was uncritical, sketchy and inconsistent. Newton's ideal of empirical success as exemplified in his deductions of the phenomena is what illuminates the transition from natural philosophy to natural science. The revolution in science bearing Newton's name is not a shift from one scientific theory to another but rather, a transition to a new way (thought system) of inquiring into nature.

Newtonian mechanics is the system of mechanics which relies on Newton's laws of motion concerning the relations between forces acting and motions occurring. It is otherwise called classical mechanics and deals with the question of how:

> An object moves when it is subjected to various forces, and also with the question of what forces act on an object which is not moving. The word "classical" indicates that we are not discussing phenomena on the atomic scale and we are not discussing situations in which an object moves with a velocity which is an appreciable fraction of the velocity of light, the description of atomic phenomena requires quantum mechanics, and the description of phenomena at very high velocities requires Einstein's theory of Relativity…the laws of classical mechanics were stated by Sir Isaac Newton in 1687.[66]

The laws of classical mechanics enable us to calculate the trajectories of baseballs and bullets, space vehicles, (during the time when the engines are burning and subsequently) and planets as they move around the sun. Using these laws, the position versus-time relation for a rolling down cylinder and even the tension in the wire when a picture is hanging on a wall can be known. Thus, classical mechanics is useful in demonstrating how objects move and interact with other bodies in a world which contains automobiles, buildings, airplanes, bridges and ballistic missiles. Newtonian mechanics explains an incredible multitude of phenomena in the macro-world on the basis of a minimal, number of simple principles. Talking about the impact of Newtonian Mechanics, E. Anderson States that:

> Since the inception of civilization, there has been practical demand for "terrestrial mechanics' in the form of Engineering and for 'celestial mechanics': due to its time keeping. The underlying laws for these, however, were largely not understood prior to Newton, especially as regards a unified theoretical paradigm. Indeed Newton's laws of mechanics alongside Newton's universal law of gravitation unified the previously separated subjects of terrestrial and celestial mechanics. This Newtonian paradigm also provided the practical means of further understanding and predicting a very wide range of phenomena.[67]

Newtonian mechanics introduced a new material reality especially in the understanding of the laws of nature at the macro level of reality and its systematization. This saw to the practical application of mathematics in representing physical reality in an abstract manner that is quite intellectually stimulating. From here, modern science became fully entrenched as a reliable way of knowing the world associated with the West. Hence, if the present state of an object is known, it is possible to predict the laws of Newtonian mechanics how it will move in the future (determinism) and how it has moved in the past (reversibility).

Newtonian mechanics therefore describes the motion of bodies under the influence of a system of forces. It provides extremely accurate results when studying large objects that are not extremely massive and speeds not approaching the speed of light. It further uses common sense

notions of how matter and forces exist and interact. It assumes that matter and energy have definite, knowable attributes such as location in space and speed. Thus, Alexandre Koyre, asserts that:

> The great success of Isaac Newton in using mathematical reasoning and observation to discover the law of universal gravitation and in employing experiments to determine the various colors in a ray of sunlight convinced many that his method was capable of solving virtually all problems. Alexander Pope expressed a widely held feeling with his famous couplet: Nature and Nature's laws lay hid in night: God said let Newton be! And all was light.[68]

The overwhelming success of Newtonian mechanics or physics made it practically inevitable that its particular features became thought of as essential for the building of science, of any kind of science. As such, all the new sciences that emerged in the eighteenth century sciences of man and society tried to conform to the Newtonian pattern of *empirico-deductive* knowledge, and Newton rules as laid down in his *Principia.* A very important element of Newtonian laws of motion is force. We shall now examine the place of force in his three laws of motion.

3.4.1 Newton's First Law of Motion

Newton's first law of motion has been stated variedly though without its meaning being affected. The law basically states that: A body continues in a state of rest or of uniform motion in a straight line unless acted upon by an impressed force. It can be put differently as: a body remains at rest or in uniform motion unless acted upon by a force. This law is also called the law of inertia and the philosophical issue to this law is whether it is a law of motion (of free bodies) or a statement of existence i.e. of inertial reference frames. When we say that: every body continues in its state of rest, or of uniform motion in a right line unless it is compelled to change that state by forces impressed upon it, are we not describing the behaviour of objects as being

either at rest or in motion? But what kept it at rest or in motion? Science will say it is "force" but what is force in itself without any analogy? Can force be observed in itself?

The first law is associated with the concept of inertia and with the identification of inertial reference frames in the context of Newton's classical mechanics in many discussions in which it is presented. It is argued that the empirical confirmation of this law in a certain reference frame, that is, the confirmation of the fact that an object maintains a constant velocity when no forces act on it, is a warranty that the frame is an inertial one. Luis Gomez states that:

> Since the presentation of the *Principia* in 1687, Newton's first law has been accepted as one of the fundamental laws or axioms in the theory of Newtonian mechanics. This idea has rooted so deeply that even today's textbooks on physics present the law as one of these fundamental principles or axioms. However, when the nature of 'axiom' as a logical independent statement is examined, it is doubtful that this law may be considered as such because it provided no additional information to the theory than the one provided by the second law.[69]

Philosophically speaking therefore, the first law of motion contains in it, insufficient information with regards to the concept of force and its source leading to rest or motion of an object. So the force in question becomes a fictitious force and we should not forget that we are dealing with experimental science here and the first law does not provide empirically, any additional knowledge or information to the analysis from that provided by the second law. However, some scholars think that there is nothing actually wrong with Newton's laws as described and Jessica Wilson contends that:

> Newtonian forces are pushes and pulls, possessing magnitude and direction, that are exerted (in the first instance) by objects, and which cause (in particular) motions. I defend Newtonian forces against the four best reasons for denying or doubting their existence. A running theme in my defense of forces will be the suggestion that Newtonian mechanics is a special science, and as such has certain *prima facie* ontological rights and privileges that may be maintained against various challenges.[70]

The introduction of ontology to the discourse appears to give Newtonian Mechanics the status of a special science whose truth might be beyond the given construct of the law. Thus, forces are supposed to be causes of motions, but they are also supposed to be dependent on non-force entitles (e.g., objects and their properties) which we have independent reason to accept, and which also appears to be the cause of these motions. If we posit forces in addition to these non-force entities, won't every motion purportedly caused by a force be implausibly, systematically causally over determined? While thinking about this perspective, the second law is next in our examination.

3.4.2 Newton's Second Law of Motion

This law states that: the change of motion is proportional to the motive force impressed; and it is made in the direction of the right line in which that force is impressed. Ontological issues that are deducible from this law are: is this law and the first independent of each other? Because it appears that the first law as we have observed is redundant, being no more than a special case of the second law. Furthermore, is the second law a true law or a definition of force, since the law states that in inertial reference frames all changes in the body velocity are caused by the influence of external forces? Newton declares that:

> I have not yet been able to discover the reason for these properties of gravity from phenomena, and I do not feign hypotheses. For whatever is not deduced from the phenomena must be called a hypothesis; and hypotheses, whether metaphysical or physical, or based on occult qualities, or mechanical have no place in experimental philosophy. In this philosophy particular propositions are inferred from the phenomena, and afterwards rendered by induction.[71]

The first law of motion expresses the idea that when no force acts on a body, it will remain at rest or maintain uniform motion when a force acts on it. When a force is applied to a body; it will change its state of motion. The second law states that if any force generates a motion, a double force will generate double the motion a triple force will triple the motion,

whether that force is impressed altogether and at once or gradually and successively. And this motion (being always directed the same way with the generating force) if the body moved before, is added or subtracted from the former motion, according as they directly conspire with or are directly contrary to each other.[72]

Because force is defined in terms of change in motion, the second law appears to be a restatement of the definition F = Ma which is force is the product of mass and acceleration and devoid of predictive power since force is only determined by measuring acceleration. However, what transforms the second law from just merely a definition is the additional input that comes from force laws that are based on experimental observations on the interactions between bodies.

Newton's second law is basically the product of mass with acceleration. Acceleration is a mathematical description of how the velocity of a body changes. If we know the acceleration of a body we can in principle, predict the velocity and position of that body at all future times by integration techniques. However, logically speaking, the "experimental" verification of Newton's second law will lead to a logical circle because it won't mean much for practical purposes since Newtonian axioms are consistent and makes it possible to pose and solve a lot of problems. But forces and masses usually stay behind the science, so to say as all observations concerns motions and trajectories. Scientists such as H. Hertz, H. Poincare and A. Einstein, have pointed out the logical incompleteness in the experimental basis of classical mechanics. So that it appears then that force and mass are not two essences, but one which manifest itself differently.

3.4.3 Newton's Third Law of Motion

Isaac Newton realized that when two bodies interact via a force, then the force on one body is equal in magnitude and opposite in direction to the force acting on the other body. Thus

the third law of motion states that: To every action there is always opposed and equal reaction; or the mutual action of two bodies upon each other is always equal, and directed to contrary parts. Whatever draws or presses another is as much drawn or pressed by that other. If you press on a stone with your finger, the finger is also pressed by the stone.[73]

It calls for wonder if the third law is more fundamental than conservation of momentum, or is it the other way round? Newton realized that a force is not a thing in itself. A force is always part of a mutual action that involves another force. A mutual action is an interaction between one thing and other. In the case of the interaction between the hammer and a nail, a hammer exerts a force on the nail and drives it into a board. But this force is only half the story, for there must also be a force exerted on the hammer to halt it in the process. The nail exerts this force, thus Newton reasoned that while the hammer exerts a force on the nail, the nail exerts a force on the hammer. This is the law of action and reaction.

Newton's third law describes the relationship between two forces in an interaction. The law states that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first object. One force is called the action force while the other force is called the reaction force. These forces are equal in strength but opposite in direction. For example, humans interact with the floor on which they walk on. When there is a push against the floor, the floor simultaneously pushes back. Likewise, the tires push against the road, and the road simultaneously pushes back on the tires. When swimming, the swimmer interacts with the water. When there is a push on the water backward, the water pushes back forward. Now these interactions also depend on friction. Friction doesn't allow one exert an action force such as walking on an ice. And without the action force there cannot be a reaction force, and thus there is no resulting forward motion.

From the forgoing therefore, we can see that Newtonian mechanics is basically concerned with motion caused by interaction of forces which are all metaphysical in their ontological nature. The first and second law says that a body accelerates due to external forces so that the net external force equals the mass of the body times its acceleration. These laws (the first and second) do not tell us where this force comes from, what it is or how we can apprehend its empirical nature. Does the force that drives a car come from the engine? If so, why is the car stuck on wet clay road when the engine is running in full throttle? The third law says that the force that pushes the car forward does not come from the engine but from the road due to friction between the tire and the road and is called friction or traction and it has enormous implications in the understanding of force. Hence, nothing in the universe can act without being acted upon.[74] The study moves on to examine force in relativistic physics.

3.5 Force in Relativistic Theory

The inadequacies of Newtonian mechanics to describe and explain the behavior of objects at the micro level of reality moving close to the speed of light in random motion necessitated the science of relativity. Relativity physics, theory or Relativistic mechanics refers to mechanics that is in tandem with the special relativity (SR) and general relativity (GR) which are all the discoveries of Albert Einstein. Before Einstein, Galileo Galilei did some work on relativity but it was Einstein who systematized it covering areas that Galileo didn't touch on. The foundations of relativistic mechanics are the postulates of special relativity and general relativity which shall be discussed shortly. The unification of special relativity with quantum mechanics is called relativistic quantum mechanics, while the attempts for that of General relativity is quantum gravity, an unresolved current problem in physics hitherto.

In relativistic mechanics or theory, forces act on particles or is exerted by particles. Thus, what appears to be "moving" and what is "at rest" as we know it in Newtonian Mechanics,

depends on the relative motion of "observers" who measure in frames of reference i.e. the point where they are standing. Bertrand Russell asserts that:

> In astronomy, although the sun, moon and stars continue to exist year after year, yet in other respects the world we have to deal with is very different from that of everyday life. As already observed, we depend exclusively on sight; the heavenly bodies cannot be touched, heard, smelt or tasted. Everything in the heavens is moving relatively to everything else. The earth is going round the sun, the sun is moving very much faster than an express train, towards a point in the constellation. Hercules, the "fixed" stars are scurrying hither thither. There are no well-marked places in the sky.[75]

In physics, everything in the physical world is relative to an observer. The theory of relativity is wholly concerned to exclude what is relative in order to arrive at a statement of physical laws that shall in no way depend upon the circumstances of the observer. It is true that there are circumstances that have been found to have more effect upon what appears to the observer than they were formerly thought to have, but at the same time the theory of relativity shows how to discount this effect completely. This according to Russell is the source of almost everything that is surprising in the theory.[76]

Some definition and concepts from Newtonian mechanics are carried over into special relativity such as force as the time derivative of momentum as found in the second law of motion, the work done by a particle as the line integral of force exerted on the particle along a path and power as the time derivative of work done. In special relativity, motion is relative and the laws of physics are the same for all observers irrespective of their inertial reference frames. Relativistic mechanics also modify notions of space and time into space-time and forces one to reconsider the concepts of mass, momentum and energy all of which are important constructs in Newtonian mechanics. Li Wen-Xiu puts all of these into definite perspective thus:

> There is no doubt that the physical universe is the only object of study of physics. The basic view of the world, underlying all physical theories and justified by history of physics, is the doctrine that the world is made up of objects whose existence is

> independent of human consciousness. The objectivity, reality, and uniqueness of the universe are therefore the initial premises of natural science. Based on this view, the phenomena of nature, which ultimately depend only upon interaction between matter and relative motion thereof, can simultaneously be described by means of a single coordinate system, i.e. nothing in the universe can be changed by the employment of a coordinate system.[77]

Relativistic mechanics therefore is different from non-relativistic mechanics i.e. Newtonian mechanics because of the premium given to motion, especially the one close to that of light. Pondering on objects moving close to this speed (299, 792, 458 ms-1) leads to some of the most amazing physical idea ever. The bodies or objects concerned may be sufficiently small that their internal structure and size may be ignored and they become regarded as point particles, in which case they become relativistic point-particle mechanics. If the account of their internal structure is taking into consideration, then it can be spoken of as relativistic continuum mechanics. To understand Relativistic mechanics better, there is a need to examine closely its two parts.

3.5.1 Special Theory of Relativity

Special theory of relativity is called special because it deals with simple systems where things are moving in nice straight lines at constant velocity, and where there are no forces and no acceleration. The special theory of relativity has two postulates. They are:

i. The laws of physics are the same in all inertial reference frames and

ii. The speed of light in a vacuum is constant independent of the observer or light source.

What these means is that, there is no absolute motion. If one for instance is travelling in a car (coordinate system) moving at 100mph, there is no way to prove that one is even moving. It could be the earth and everything on it except the one and the car is moving backwards at 100mph, and if you wanted to say that was happening, you wouldn't be wrong, as the laws of

physics would back it up. All one can say is that one thing is moving relative to another; which one we pick as a stationary reference frame is up to you. Natarayanan Sen avers that:

> Einstein was a great believer in simplicity and universality. He therefore made the bold hypothesis that all the laws of physics, not just Maxwell's equations, must be the same in all inertial frames. In other words, there is no special frame in nature which can be considered to be at absolute rest. Einstein soon realized that this idea of democracy between all inertial frames meant that our earlier notion of time needed to be modified… Einstein showed that the constancy of the speed of light implies that simultaneity is not an absolute concept. Hence, the difference in the time coordinates of two events depends on the inertial frame in which it is measured.[78]

Accordingly, this inter play between the relativity of motion for all material objects and the absoluteness of the speed of light is at the root of all the unfamiliar features of the world.[79] The universe have one time and three space dimension (length, breathe and width) combined to form space time continuum. Space-time, different from space as a distinct reality from time continues to be one of the great scientific mysteries of the universe. Hawking asserts that 'we must accept that time is not completely different from and independent of space, but it is combined with it to form an object called space time.[80]

The special theory of relativity has a wide range of extrapolation that have been experimentally verified including the counter intuitive ones such as length contraction, time dilation and relativity of simultaneity which contradict the classical notion that the duration of the time interval between two events is equal for all observers. On the other hand, it introduces the space-time interval which is invariant. Mbat and Archibong states that "combined with other laws of physics, the two postulates of special relativity predict the equivalence of matter and energy as expressed in the mass energy equivalences formular $E=mc^2$ where c is the speed of light in a vacuum".[81]

With regard to time dilation as a consequence in special relativity, (henceforth SR), it means that due to the speed of light being invariant, (an entity, quantity that is unaltered by a particular transformation of coordinates) and all laws being the same for constant velocities, time can slow down. Time it turns out is not a constant throughout the universe but is totally relative. The faster one travels, the more time slows down. Speed or velocity is calculated as distance travelled divided by time, but if time can change then so must distance in order to keep the speed of light constant. If time is getting bigger by a set factor then distance should get smaller by the same factor in order to leave the speed of light unchanged for a moving observer. This is the idea behind length contraction all of which are metaphysical in outlook.

There is however a limitation in the special theory of relativity and it is that," it does not consider non-uniformly accelerated frames and systems. In other words, it does not deal with motions resulting from gravitation. Thus, there was the need to discover a system that will include gravitation."[82] Such a system is the general theory of relativity and to it the study now turns.

3.5.2 General Theory of Relativity

General theory of relativity, (henceforth GR) is Einstein's theory of gravity published in 1915 which extended special relativity to take into account non-inertial frames of reference (areas that are accelerating with respect to each other). The theory takes the form of field equations describing the curvature of space-time and the distribution of matter throughout space-time so that the effects of matter and space-time on each other are what we perceive as gravity.

To get the idea behind this theory, let us first make recourse to Newton's first law of motion which states that an object remains at rest or in uniform motion unless acted upon by a force. That means if we feel no force at all, we would either sit still or slide forever in a straight

line at a constant speed. But if we ask: what happens if a person steps off a high-rise roof? While the person is free falling he feels weightless. He doesn't feel any force, even as he accelerates toward the ground. There is the paradox: an object that feels no force should travel at a constant speed. But something accelerating because of gravity feels no force. The resolution of this paradox explains the origin of gravity.

Einstein discovers that massive objects like Earth warp space-time. This means that a free falling object then follows the straightest possible path in space-time. Even though that path doesn't look straight to us, the object experiences no force. Mbat and Archibong explain further that:

> The theory treats gravity not as a Newtonian force acting in an unknown way across distance, but as a metrical property of a space time continuum that is curved in the vicinity of matter. Because acceleration bends light and because acceleration and gravity are equivalent, Einstein reasoned that gravitation should bend light too.[83]

It is important to note that this theory was developed by Einstein with little or no experimental motivation but driven instead by such philosophical questions as: why are inertial frames of reference so special? Why is it that we do not feel gravity's pull when we are freely falling? Why should absolute velocities be forbidden but absolute accelerations are accepted? Looking at these questions from the perspective of Newton's gravitation, and why a new theory of gravitation is needed, Lewis Ryder explains that:

> Newton's theory of gravitation is a spectacularly successful theory. For centuries it has been used by astronomers to calculate the motions of the planets, with a staggering success rate. It was, however, the fatal flaw that it is inconsistent with special relativity… faced with such dramatic situation, the instinctive, and perfectly sensible reaction of most physicists would be to try to "tinker" with Newton's law; to change it slightly, in order to make it compatible with special Relativity. And indeed many such attempts were made, but none were successful.[84]

It was Einstein who eventually concluded that nothing less than a complete "new look' at the problem of gravitation had to be taken. Thus, a profound study of gravitation enabled Einstein to discard Newton's law of gravitation which maintained that between any two particles there is a force which is proportional to the square of their distance. Accordingly, Einstein also discarded Euclidean geometry of space and time having found that gravitational force affects the metrics of space and time.[85] So while the special theory of relativity solved completely a certain definite problem, to account for the experimental fact that when two bodies are in uniform relative motion all the laws of physics, both those of ordinary dynamics and those connected with electricity and magnetism are exactly the same for two bodies.[86] Russell writing on GR states thus:

> I have given only a qualitative description of Einstein's law of gravitation; to give its exact quantitative formulation is impossible without more mathematics than I am permitting myself. The most interesting point about it is that it makes the law no longer the result of action at a distance; the sun exerts no force on the planets whatever. Just as geometry has become physics, so, in a sense, physics has become geometry. The law of gravitation has become the geometrical law that everybody pursues the easiest course from place to place, but this course is affected by the hills and valleys that are encountered on the road.[87]

When you are standing on the earth, you are subject to electromagnetic forces: the electrons and protons in the neighborhood of your feet exert repulsion on your feet which is just enough to overcome the earth's gravitation. According to Einstein, this is what prevents you from falling through the earth which solid as it looks, is mostly empty space. For Einstein, gravity like electricity must be conveyed by a field as well "a gravitational field" analogous to the electrical field. The gravitational field is not diffused through space; the gravitational field is that space itself. This is the idea of the theory of general relativity. Newton's "space" through which things move and the "gravitational field" are one and the same.

Space then is no longer something distinct from matter. It is one of the "material" components of the world. It is an entity that undulates, flexes, curves, twists. We are not

contained within an invisible, rigid infrastructure: we are immersed in a gigantic, flexible snail shell. The sun bends space around itself, and the earth does not turn around it because of a mysterious force but because it is racing directly in a space which inclines, like a marble that rolls in a funnel. There are no mysterious forces generated at the centre of the funnel; it is the curved nature of the walls which causes the marble to roll. Planets circle around the sun, and things fall, because space curves. However, the metaphysical angle is that, is this curved space perceptible to man or just a mere conjecture and speculation? Does this curved space contain in itself force? The study now proceeds to examining the third system of modern science which is quantum mechanics.

3.5.3 Force in Quantum Mechanics

Before we can delineate the idea of force in the quantum scientific system, it will be pertinent we elucidate what quantum mechanics represents. Physical objects seem to have the characteristics of both particles and waves. Newtonian mechanics describes the particle properties of objects, while quantum mechanics describes the wave properties of objects. It is not that particles such as electrons are waves, but that the laws of motion in the micro world are wave-like in character thus, waves particles seem to predominate for small object.

Quantum mechanics describes objects in terms of probability waves so that an object completely at rest extends uniformly throughout space leading to a probability distribution that is the same everywhere and is a constant throughout all space. Also an object moving at constant velocity would be described by a wave function amplitude, and would equally be located Anywhere. But in the Newtonian mechanics, human sized objects are not found anywhere throughout space with equal probability, they are localized at particular positions. Quantum mechanical descriptions thus clashes with our experience and do not describe the objects we are familiar with in our everyday Newtonian world. Gary Zukav explains that:

> A "quantum" is a quantity of something, a specific amount: "Mechanics" is the study of motion. Therefore, "quantum mechanics" is the study of the motion of quantities. Quantum theory says that nature comes in bits and pieces (quanta), and quantum mechanics is the study of this phenomenon. Quantum mechanics does not replace Newtonian physics, it includes it. The physics of Newton remains valid within its limits…what we actually discover is that the way that we have been looking at nature is no longer comprehensive enough to explain all that we can observe.[88]

Quantum mechanics deals with the motion and behavior of sub-atomic particles leading to randomness because of their wave like behavior. This has led to a lot of interpretations from individual physicists who all try to view quantum mechanical phenomenon from varied perspective beginning from Max Planck. One of such interpretation is the uncertainty principle developed by Werner Heisenberg "which held that atomic particles can never be completely defined, for the more their motion is pinned down, the more uncertain their position becomes.[89]

The birth of quantum theory in 1900 and special relativity theory in 1905 were major advances that profoundly changed our picture of the physical world. But they first changed our understanding of the nature of electromagnetic radiation and matter on the sub-microscopic scale and the second changed our concept of space and time on the cosmic scale. Albert Einstein's contribution to quantum theory was his concept of light as "light quanta". Neils Bohr's was the extension of that to the atom and its role in understanding optical spectra. De Broglie's hold the notion of wave-particle duality applying to matter. Erwin Schrodinger's was wave mechanics and Werner Heisenberg was matrix mechanics. Heinsenberg's uncertainty principles and Bohr's principles of complementarity together gave rise to the Copenhagen interpretation of quantum mechanics. We also have the aspect of quantum entanglement or what is called the EPR Paradox i.e. Einstein, Podolski and Rosen's Paradox which Einstein calls "spooky action at a distance". The idea is that, particles can affect one another without any causal connection.

There are a lot of other theories in quantum mechanics all geared towards giving us a holistic and comprehensive understanding of the mechanics of sub-atomic particles. This is why quantum mechanics seem very vast and difficult to grasp especially when we approach it from its abstract mathematics. But it is sufficient at the level of this work to state that:

> Quantum mechanics is commonly defined as the system of mechanics that was developed from quantum theory to explain the properties of atoms and molecules. A number of developments led to the establishment of a quantum mechanics. First Planck's discovery immediately overturned the universally accepted notion in classical physics that energy is a continuous variable. Instead, it is 'granular' and 'discrete'. The concept was taken forward crucially by Einstein, who explained details in the photoelectric effect by proposing that radiation itself is "quantized".[90]

The concept of force therefore in quantum mechanics is to be found in the characteristics of particles and what energizes them. Since these particles are wave-like in nature, they must be propagated by electromagnetic forces. It could either be kinetic energy or potential energy. These particles like the electron, moves in empty space and space is believed to have its own force fields which are a metaphysical construct. The physical force that is responsible for friction and touch is the electromagnetic force as have been said. However, electrons at the surface of "touching" object repel each other. There is also the perspective with regards to force in quantum mechanics where "experimental arrangements compel electrons to take certain values as position and momentum".[91] Basically then, there are no force vectors *parse* in quantum mechanics only expressions of energy. This is why quantum mechanics is also called high energy physics.

3.6 Summary of the Four Interaction of Force in Western Science

In western science, there are four descriptions that cover every discussion of force. So far, the study has been discussing them without delineating each. They are: gravitational, electromagnetic, strong and weak forces and they govern how objects or particles interact and how certain particles decay. It is a fact in science that all the known forces of nature are

characterized under these fundamental interactions and on the basis of the types of particles that experience the force, the relative strength of the force, the range over which the force is effective and the nature of the particles that mediate the force. Below are the summary of these four fundamental forces:

3.6.1 Gravitational force

Isaac Newton was the first to systematize this force which acts between all objects having mass. The same force causes apples to fall from trees and determines the orbits of the planets around the sun. Any two objects that have mass attract each other by the force which is called gravity. The earth has a lot of mass which makes it easier for us to notice a big gravitational force it exerts on us. The force we feel is called weight. Before Newton, it was thought that gravity was simply the natural tendency of objects to move downward.

Humans weigh less when we stand on the moon, because the force of attraction is less. Not that we have changed as we are made of the same atoms (mass). This is why physicists will say your mass hasn't changed only your weight. This weight change is due to the attractive force of gravity of the earth or whatever planet or satellite we are standing on. The equation that describes the pull of gravity between two objects says that the force of attraction is proportional to the mass; double the mass and the force doubles. The force also depends on the distance. It is an inverse square law because when the distance gets larger, the force gets smaller; and a square because if you triple the distance, the force decreases by nine. Newton's third law better exemplifies the force of gravity. Gravity and its effect are all metaphysical and not given in observational experience.

3.6.2 Electromagnetic Force

Electromagnetism is a branch of physics involving the study of the electromagnetic force, a type of physical interaction that occurs between electrically charged particles. This force usually exhibits electromagnetic fields such as electric fields, magnetic fields and light. The word is from two Greek terms *electron* ("amber") and *magnetis lithos*, which means "magnesian stone" a type of iron ore. Electromagnetic phenomena are defined in terms of the electromagnetic force, sometimes called Lorentz force which includes both electricity and magnetism as different manifestation of the same thing. Electrons are bound by the electromagnetic force to atomic nuclei, and their orbital shapes and influence on nearby atoms with their electrons is described by quantum mechanics. The electromagnetic force governs all chemical processes, which arises from interactions between the electrons of neighboring atoms. The theoretical implications of electromagnetism particularly the establishment of the speed of light based on properties of the medium of propagation led to the development of special relativity by Einstein in 1905.

3.6.3 Strong Nuclear Force

This force is one which holds the nucleus of an atom together. It acts between the protons and neutrons of atoms. Neutrons and protons, both nucleons are affected by the nuclear force almost identically. Since protons have positive charge, they experience an electric force that tends to push them apart. But at short range the attractive nuclear force is strong enough to overcome the electromagnetic force. The nuclear force binds nucleons into atomic nuclei. The nuclear force plays an essential role in storing energy that is used in nuclear power and nuclear weapons. Work (energy) is required to bring charged protons together against their electric repulsion. This energy is stored when the protons and neutrons are bound together by the nuclear force to form a nucleus. Energy is release when a heavy nucleus breaks apart into two or more lighter nuclei. This energy is the electromagnetic potential energy that is released when the

nuclear force no longer holds the charged nuclear fragments together. Particles like mesons, quarks (hadrons) fermions and so on fits into the strong nuclear force. All these elementary particles are more metaphysical than can be envisaged.

3.6.4 Weak Nuclear Force

The strong nuclear force is distinct from what historically was known as the weak nuclear force. The weak interaction plays a role in such process as beta decay, neutrons to protons decay and vice versa. It also includes electron and an electron antineutrino. The weak interaction takes place only at very small, sub-atomic distances. It is the cause of radio-active decay and plays an essential role in nuclear fission. The theory is sometimes called quantum flavordynamics (QFD) in contrast to quantum chromodynamics for strong interaction and quantum electrodynamics for electromagnetic force. Most fermions (particles) will decay by a weak interaction over time. Such decay makes radio carbon dating possible. The study shall discuss the extrapolated implications of the ontological concept of force from an African and western scientific perspectives in the next chapter.

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CHAPTER FOUR

IMPLICATIONS OF FORCE, AREAS OF CONVERGENCE AND DIVERGENCE IN AFRICAN AND WESTERN SCIENCE

4.1 An Ontological Inquiry into the Status of Material Reality in Western Science

Before looking into the implications and by extension, the points of convergence and divergence that the concept of force generates for man and the material universe especially from a metaphysical, physical and social dimension, it would be germane to closely examine the ontological status of "material reality" in science as this study presupposes that what scientists calls "matter" generates a lot of controversy because "matter" in modern science is no longer that which has weight and occupies space but that which is empty space itself. Though Berkeley was an empiricist, he posed the idea that matter is an illusion in his *Two Dialogue between Hylas and Philonus*. He never envisaged perhaps that the ontological status of the materially real will pose such a difficult challenge even as he slide into the metaphysical by introducing the mind of God into his epistemological framework.

When the atomists Democritus, Leucippus and Lucretius came up with the idea of atom as the smallest indivisible particle of matter, some kind of reality akin to Spinoza's *monads*, little was it conceived that it will only take a matter of time for scientists to discover other hundreds of micro particles that are not perceptible to the direct senses moving with a speed equal to that of light occasioned by fields of force. This was known because scientists have evolved a method that has made science very fascinating and reliable with regards to knowledge attainment of nature and its processes.

The scientific method also known as induction is one built around hypotheses formulation and theories. Theories in science must match observable phenomena in nature usually beginning from the known to extrapolating the unknown. The method also thrives by observation and experimentation with data collection, testing and re-testing with the possibility

of a replication by other practicing scientists with an outcome that is the same leading to objectivity in science. But the word objectivity is a problem in science just as the word, fact. Granted that scientific knowledge provides a level of verisimilitude (truth-likeness) following Popper in terms of nearness to the truth, we still find that the scientific method cannot guarantee indubitable truth just as facts. This is perhaps what Stephen Jay Gould had in mind when he asserts that "in science, "fact" can only mean "confirmed to such a degree that it could be perverse to withhold provisional assent".[1]

The systematization project of science began around the renaissance through to the modern and contemporary time. Science became an instrument for knowing, understanding and interpreting the world. With the synthesis of rationality and experimentation, the basic constituents of matter began to be identified and the unfolding process lead to its justification. Thus the context of justification is:

> Concerned with the rational features of scientific practice, and particularly with the issue of how theories are justified, or supported by the evidence. This is open to investigation by philosophers because it covers what is rational about science…. They hypothetico-deductive account is a very well-known and much-discussed view of how science works. It meshes with the Romantic view of discovery by insisting that science works by coming up with hypotheses in some creative way and then justifies these hypotheses by testing their experimental consequences.[2]

What constitutes the structure of material reality has been the utmost concern of thinkers about nature. Beginning from the Ionians down through Aristotle, substance seems separated from its accidents just as atoms seem separated from its particles. Paul R. Durbin sets the issue at hand in perspective when he opined that "an approach to the intelligibility of the world can be mechanistic, realistic and positivistic: but what about the world itself that is being approached? The most fundamental aspect of this world as an object of science and the philosophy of science is matter. What is it? What are its components? How does it act, if at all? How is it structured, interrelated, locked together to form a world that can, because of it, be called "material"?[3]

Historically, it was Ernest Rutherford in the modern era that proved that the atom is not the smallest unit of matter. He demonstrated that an atom is mostly empty space containing a very tiny, positively charged nucleus of massive protons surrounded by a negatively charged orbiting cloud of light weight electrons.[4] Then Rutherford's student Niels Bohr suggested that orbiting electrons could jump from one orbit to another. With each jump, an electron would either give up a discrete amount (a "quantum") of energy in the form of a photon, or absorb energy in discrete quanta if it was struck with a photon. Here we are talking about the ontological world of an atom where its constitutive parts in the forms of particles have a wave behavior that is fuzzy as well as random. This also lends credence to the fact that even inanimate objects are infused or ingrained with force or energy; a belief that is also held in traditional African worldview. The study of material reality is vastly more complex than it once seemed so that to delineate what is real becomes a gargantuan task. Christian opines in line with this point that:

> The critical distinction between what is real and what is only experiential has been entirely obliterated in physical thinking, making it virtually impossible to honor the principle that demands that we think about objects in their true contexts and not commit the error of interpreting them in terms of false functions. I once asked a physicist to tell me how physicists deal with the subject-object problem. His reply: "they just ignore it". As they must-as physicists.[5]

The material dimension of reality often cut across the mental and emotional processes of human beings in making contact with the external world. We could also call it the psychological underpinning of human existential reality. But there is a problem if we try to subject thoughts to measurement. How can we measure thought processes? How can behaviours be predicted? What causal links can be inferred from psychological reality? This task is arduous because "it would be foolish, for example, to try to explain the concept of atom in physics solely in terms of what goes on in our (conscious and unconscious) minds without considering the actual material things that are described by this concept".[6] The primacy of a psychological explanation in

science cannot be overlooked howsoever. For the various economic, political, and historical forces are social forces, in the sense that they represent the drives and tendencies of a community or group of human beings or perhaps, of the human race as a whole. This would perhaps account for why Thomas Kuhn sees science as what a community of scientists accepts to be "normal" except anomalies are encountered. Science is therefore seen as the most complex system of knowledge with clear distinctive features. Judith Willer sees science as "all thinking which combines rational, empirical and abstractive thought. Neither catalogues of empirical facts nor rational systems such as mathematics are scientific thinking by themselves. No system of knowledge is scientific unless it connects the observational and theoretical levels".[7]

The dichotomy between the method for material investigation of reality and the immaterial aspect brought together Scientists, mathematicians and philosophers to converge at Vienna in Austria. They went by the name Positivists, Logical Positivists or Logical Empiricists. Though Karl Popper refused to be called a positivist, he nevertheless contributed to the discourse of demarcation in science a course pursued by the Logical Positivists. He avers that:

> My main reason for rejecting inductive logics is precisely that it does not provide a suitable distinguishing mark of the empirical, non-metaphysical character of a theoretical system; or in other words, that it does not provide a suitable criterion of demarcation. The problem of finding a criterion which will enable us to distinguish between the empirical sciences on the one hand, and mathematics and logic as well as 'metaphysical systems on the other, I call the problem of demarcation.[8]

This demarcation project seems to be better carried out using the scientific method. With this method therefore, physical concepts can be separated from non-physical ones just like empirical realities from non-empirical ones. The scientific method therefore created a hostility between physics and metaphysics in the sense that metaphysical realities became seen as nonsensical since they cannot be proven using the observable and experimental method of science. Archibong and Nkanta summarized the tenets of positivism to include: "the unity of

science, the rejection of metaphysics, the language of science and the principle of verifiability. Science amidst its diversity in terms of subject matter employs the same methodology. The elimination of metaphysics, on the other hand, presupposes that experience and observation authenticate the scientific attitude".[9]

Karl Popper further adopted falsifiability as a criterion for deciding whether or not a theoretical system belongs to empirical science. This becomes very necessary especially as certain theories are difficult to accept as empirical but they are empirical nonetheless. How did science arrived at the demarcation between what is empirically verifiable and what is not? Popper avers that "statements which do not satisfy the condition of consistency fail to differentiate between any two statements within the totality of all possible statements. Statements which do not satisfy the condition of falsifiability fail to differentiate between any two statements within the totality of all possible empirical basic statement".[10] Since empirical basic statements must be factual, Aigbodioh defines scientific facts as constituting:

> Sense-data (givens) or "empirical truths" about the world. They are the raw and primitive ingredients from which scientific hypotheses, laws and theories are formulated and extracted out of experience…Newton's theory or laws about celestial mechanics (that is about the forces or dynamics of physical bodies) are said by Newton himself to be wrested…from experience by induction" and logically derived from the truth of certain observation statements….Which report facts of immediate experience.[11]

Since we have been able to have a clear demarcation of empirical basic statements and non-empirical ones and have noted that empirical facts are to be observed or perceived with any of our five senses of touch, sight, hearing, smell and taste, where can we then place the concept of force? Is force a concept that can be perceived with any of this senses? Can the empirical method of science be able to get to the essence or quiddity of being? Can the empirical method of science be able to exhume or perceive the ultimate nature of material reality or substance? Can the empirical method of science be able to capture what a thing is by itself without its

accidents? Collingswood asserts that "that which was essentially not experienced by the senses, that which was unchangeable and in some way spiritual, became known to the Greeks as the "metaphysical".[12]

Force therefore following the Aristotelian distinction of substance and accident, essence and existence, act and potency, change and permanence must be so understood as having a material and immaterial, scientific and metaphysical aspects in which it can be understood and explained. Force is ontologically an abstract concept because the explanation of its reality is distinct from the study of any particular material being. Thus if force is to be discussed as a material or physical reality, it would readily be understood that we are looking at the effect of force and not what force is in itself.

To know the concept of force whether as a material or immaterial reality swings between the systems of empiricism and rationalism of which Kant sought to reconcile through synthetic apriori and it is engendered by that fact that it points to being or non-being. Deductively then, being can be investigated as well as non-being so that the word nothingness can be extrapolated from something even in science. Poldony asserts that "…the layout of our galaxy and the universe itself, constitute a cosmic whole that is built on a foundation of the void or vacuum".[13] Force therefore can be delineated as one of the perennial problems in metaphysics and it would not be out of place whether it is understood as a material reality or in the laboratory of the mind. Like thought experiments, "we recognize them when we see them as they are visualizable; they involve mental manipulations; they are not the mere consequence of a theory-based calculation; they are often (but not always) impossible to implement as real experiments either because we lack the relevant technology or because they are simply impossible in principle".[14]

When we view the system of the modern science and that of traditional Africans, there are vast similarities and differences in thought system which can be summed up under geography and history. These two systems have their own internal logic and merit which must be understood before it can be appreciated. With respect to force as we have discovered so far in the course of this work, there are similarities and differences in what it is to the Africans and modern scientists. One would wonder what these differences portend with regard to what is held to be reality or truth. Are there several reality or truths or are we being influenced by our thought systems in how we view the world? Below are the comparative defining features of force as they appear in African worldview and western science by deduction:

FORCE		
	African Conception	**Western Scientific Conception**
i	Dynamic and static	Static and dynamic
ii	Metaphysical and Material	Material and metaphysical
iii	Same as Being	An attribute of Being
iv	Spiritual and Religious	Descriptive and Mathematical
v	Non-causal and causal	Causal and non-causal
vi	Community and individuated	Individuated and community
vii	Horizontal and vertical	Vertical and horizontal

There are seven questions that are tackled in every worldview thought system and they are: What is prime reality-the really real? What is the nature of external reality, that is, the world around us? What is a human being? What happens to a person at death? Why is it possible to know anything at all? How do we know what is right and wrong? What is the meaning of human history? These questions cannot meaningfully be answered outside of a belief of thought system. For the fact that we have a universe in motion with conscious humans in it who

understands the central meaning of force and the place it is accorded in our world, it becomes germane to investigate how force as a concept holds enormous implications for some of these questions from these two thought systems comparatively. To make sense of the ensuing discussion, how the question of force is held in traditional African and modern science is imperative. The study will further examine the ontological question of being as force cannot as a concept make any sense without being.

4.2 The Ontological Question of Being

The reality of force presupposes the idea of being. Force is what causes an object to move, changes its state or shape and thus suggests that we are actually dealing with reality of existent things even though we might not be able to grapple with its true nature or essence. Force therefore cannot be discussed satisfactorily except we understood what constitute being and being is one of the fundamental and perplexing subject in the enterprise of philosophy especially in metaphysics. To attempt the answer to the question "What is being" amounts to one of the toughest undertaking as the concept of being has remained an enigma over the ages. But this is not to say that attempts have not been made to understand what being is in its pure light. Jim Unah avers that:

> The way to herald the agenda of a metaphysical inquiry is either to make a categorical assertion about reality, about being, or about whatever is, in the fashion of Parmenides or to raise extraordinary question about what is and what is not in the tradition and formulation of Leibniz. Either way the inquirer would be confronted with the problem of nothingness. No one can deal squarely with what is without being assaulted by the omnipresent phantom of what is not.[15]

Being as a concept encompasses objective and subjective features of reality and existence. By this, everything that falls within the ambit of reality or existence can rightly be called being. However, the usage of the concept being seems limited to subjective entities such as "human being". The quest to nevertheless understand the concept of being has a long history

from the pre-Socratic especially as that which endures or is permanent. Perhaps this informs why Parmenides thought of being as that which 'is" while non-being "is not". Bertrand Russell asserts that:

> The doctrine of Parmenides was set forth in a poem *on Nature*. He considered the senses deceptive, and condemned the multitude of sensible things as mere illusion. The only true being is "the One", which is infinite and indivisible… thou canst not know what is not-that is impossible nor utter it; for it is the same thing that can be thought and that can be.[16]

This classification of being as (noun) by Parmenides led to what is known as 'the substantial being" and Aristotle applies the term category to ten highest level classes which comprise one category of substance existing independently (man, tree) and nine categories of accidents which can only exists in something else (time, place). Aristotle further talked about "the genus" of substance expressing a larger class and the specific differences within the class. While the substance is the (genus) that which is rational is the (difference). However, the species, the genus, and the difference are all equally being as "a being is a being that is being". Thus, there is no simpler intermediary between being and non-being that explains and classifies being. Russell avers further that: "Aristotle makes it obvious that when a number of individuals share a predicate, this cannot be because of relation to something of the same kind as themselves, but more ideal. This much may be taken as proved, but Aristotle's own doctrine is far from clear. It was this lack of clarity that made possible the medieval controversy between the nominalists and realists".[17]

Appearance is not always reality is deduced through reasoning. This is why Parmenides sees being as a homogenous and non-differentiated sphere and the appearance of being is illusory. For Heraclitus, reality does not exist, it flows and beings are illusion up on the flow. The distinction or dichotomy of substance and accidents, essence and existence, act and potency, one and the many, universal and particular is just a way of trying to understand the concept of being whether as a genus or through analogy (substance, predicate). The quest to understand the

concept of being also featured prominently in the Medieval era of philosophy with scholars like Thomas Aquinas continuing the tradition of Aristotle and employing his terminology in order to rest being ultimately on the transcendental, (necessary and contingent).

However, Martin Heidegger began the search for the meaning of being as one "which provided a stimulus for the researches of Plato and Aristotle, only to subside from then on as a theme for actual investigation".[18] He was dissatisfied with the way being was investigated by those who previously theorized on it and sought out to correct previous errors. He started out by asserting thus: "to work out the question of Being adequately, we must make an entity the inquirer-transparent in his own Being. The very asking of this question is an entity's mode of Being; and as such it gets its essential character from what is inquired about namely, Being. This entity which each of us is himself and which includes inquiring as one of the possibilities of its Being, we shall denote by the term "*Dasein".*[19]

Heidegger debunked the accusation of circularity by defining the entity of *Dasein* in its being from facticity as one can determine the nature of entities in their being without necessarily having the explicit concept of the meaning of being at one's disposal. He made the claim that being has been presupposed in all ontology up till now, but not as a concept at one's disposal, not as the sort of thing he was seeking. For to him, being is always being of an entity and the totality of entities can become a field for investigating certain definite areas of subject matter like history, nature, space, life, *Dasein*, language and so on. Thus even the sciences of mathematics, biology and theology which examine entities as entities of such and such a type cannot truly grasp the meaning of being. Heidegger avers that: "basically, all ontology, no matter how rich and firmly compacted a system of categories it has at its disposal, remains blind and perverted from its own most aim, if it has not first adequately clarified the meaning of Being, and conceived this clarification as its fundamental task".[20]

Ontological research itself for Heidegger, when properly understood, gives to the question of being an ontological priority which goes beyond mere resumption of a venerable tradition and advancement with a problem that has study of the nature of being, becoming, existence or reality as well as basic categories of being and their relations. William Wallace traces the word ontology this way:

> Metaphysics means literally "beyond physics", and it is usually understood to be the branch of philosophy that comes after natural philosophy and that has for its study not merely mobile being but being as such. Because the Greek word for being is *on* this discipline is also called *ontology* i.e., **t**he study of the meaning, structure, and principles of whatever is and was much as it is or exists.[21]

Ontology and cosmology informs the two prominent branches of metaphysics alongside cosmogony. Ontology deals predominantly with questions concerning entities and their existence and how such entities may be grouped, subdivided according to similarities and differences and their relation within a hierarchy. Some principal questions of ontology include: what can be said to exist, what is a thing? Into what categories, if any can we sort existing things? What is the meaning of being? What are the various modes of being or entities? What is existence? What does it mean for a being to be? Is existence a property? Is existence a genus or general class divided by specific differences? Which entities, if any, are fundamental? Are all entities objects? How do properties of an object relate to the object itself? Do physical properties actually exist? What features are the essential as opposed to the accidental of a given object? How many levels of existence or ontological levels are there and what constitutes a level? What is physical object? Can one give an account of what it means to say that a physical object exist same as non-physical entity? What constitutes the identity of an object? When does an object go out of existence as opposed to merely changing? Is the subject/object split of modern philosophy inevitable?[22]

For Aristotle, there are four categories by which being may be address simply as being and they are: what it is, how it is, how much it is and where it is. As a result, we have essential ontological dichotomies such as: universals/particulars, substance and accidents, abstract and concrete,essence/existence,determinism/indeterminism,monism/dualism,idealism/materialism. It had been mentioned previously that whichever ontological preference one decides to pitch tent with cannot be divulged of a thought system influence which is why the "understanding of Being is itself a definite characteristics of *Dasein's* Being. *Dasein* is ontically distinctive in that it is ontological...[23] Heidegger writing further avers that:

> Fundamental ontology, from which alone all other ontologies can take their rise, must be sought in the *existential analytic of Dasein*. Dasein accordingly takes priority over all other entities in several ways. The first priority is an ontical one: Dasein is an entity whose Being has the determinate character of existence. The second priority is an ontological one: Dasein is itself 'ontological', because existence is thus determinative for it… Thus Daein has turned out to be, more than any other entity, the one which must be interrogated ontologically.[24]

From the investigation into the ontological question of being so far, there is a prominence in *Dasein* (man) above other existential entities a part of which science experiments and which the Africans affirmed in their traditional thought system. This suggests that man is at the centre of "being" as he is the questioning being who questions the forces of the universe, the transcendental, alongside himself. Man is first a being who exists and as such he can interrogate other existing beings. Following Martin Buber, he is the "I" that relates with "Thou" on the basis of the "Eternal Thou". Thus, ontologically, the primacy of being is man who makes sense of his environment and everything in it. This is not to say that he is the only existing thing in the universe, but following Heidegger, he is over all other entities including force since force is a defining feature of being for the scientific minded while it is being for the African. It behooves on man then to strive continually to understand the true nature of the reality of force in order to gain a better understanding of it as well as know how to use it to his advantage. The same predisposition can be applied to the next question below.

4.2.1 Is there a Supreme Being and if so what is it like?

This question is one that falls under the ontological question of being and our approach in tackling it will be from the point of view of "force" too. It is a truism that force though the same one entity has a scientific perspective as well as an African perspective. Going by the modern scientific conception of force in *strictu sensu*, there is no place for a Supreme Being that exists outside space and time. Mario Bunge gave ten of what he called the credo of the innocent physicists. The first five should capture the major rules of thumb of the physicists (scientists) and they area:

i. Observation is the source and the concern of physical knowledge
ii. Nothing is real unless it can become part of human experience. The whole of physics concerns experience rather than an independent reality. Whence physical reality is a sector of human experience
iii. The hypotheses and theories of physics are but condensed experience i.e., inductive syntheses of experiential items.
iv. Physical theories are not created but discovered: they can be discerned in sets of empirical data, such as laboratory tables. Speculation and invention play hardly any role in physics.
v. The goal of hypothesizing and theorizing is to systematize a part of the growing fund of human experience and to forecast possible new experiences. In no case should one try to explain reality. Least of all should we attempt to grasp essentials.[25]

The scientific method is one that places a high premium on observable phenomena in nature alongside experimentation but do not stop to examine the rudiments of its own method. Like Bunge would assert, nothing is real in science unless it can be apprehended by the senses. But things are known by observation when light rays hit the retina of the eyes. So if there is a hypothesis of a Supreme Being, science would ask: by what procedure can such a being be known empirically aside recourse to belief/faith? However priced this scientific method is, it has been observed that it is the human creation of the mind (thought system) in ordering facts of nature thus it is not a certain way of arriving at indubitable knowledge but a probable one. It also calls for wonder how this is so when we can out rightly see the marvels of science and technology all around. The apparent success of science notwithstanding, Christian argues that:

> We often deceive ourselves by thinking that we have observed the rules, whereas the fact is that we created them to account for consistencies that we remembered while watching matter-in-motion. We never observe the "law of gravity" or the "inverse-square law" which describes the propagation of light, or the "laws" of mass energy transformation. All the "laws" of physics are created in our minds; and all this information we call empirical knowledge.[26]

The above claim exposes the limitation of science to know the transcendental because the senses are not designed to apprehend realty of the supernatural. The irony here is that, science as an attitude values observation as one of the canon of its method but affirm the reality of certain other phenomena without a direct observation like force, dark energy and blackhole. This affirmation of non-observational reality as being out there follows the scientific method of induction. Hume had asked on what grounds we come to our beliefs about the unobserved on the basis of inductive inference. He further introduced the problem of induction as part of an analysis of the notions of cause and effect. On the grounds of this, he challenged the rational basis of any such inference believing that "induction presupposes belief in the uniformity of nature. And this belief had no defense in reason, and merely reflected habit or custom of the mind".[27]

The difficulty in inductive reasoning or causality has challenged the scientific method as a truth yielding enterprise. If all knowledge arrived in science is probabilistic, how can we entrust our lives to this method seeing the future may never resemble the past? Were the logical positivists aware of this limitation when they disparaged metaphysical knowledge, embracing only positive knowledge of science? David Hume who influenced the Logical Positivists of Vienna Circle greatly declares that books on metaphysics, sophistry and religion should be committed to the flames because they do not represent concrete physical reality. The principal purpose of the Vienna Circle then was to bring about a unification of the special sciences and of all knowledge accessible to men. Furthermore:

> The method to be employed was logical analysis and this was to be used negatively, on the one hand, to eliminate metaphysical statements from the natural sciences, mathematics, and human knowledge generally; and positively, on the other hand, to "clarify" the concepts and methods of the sciences, and to show that all human knowledge is constructed from the data of experience.[28]

This hard stance of the methods and attitudes of modern science on other fields of inquiry and their commitments have been frowned at and opposed by scholars who have argued that the scientific-method is just one mode of knowing, and knowing only the materially observed in part. The method cannot penetrate the core of reality not given in sense experience. It is on the ground of this strict positivism that the reality of the Supreme Being is dismissed as impossible or untenable because such a Being has no physical reference frame. Thus, the universe is now held to be some sort of a god (Pantheism) because it seems to be the force behind the motion of objects since it contains force fields. It is also held as a causally self-contained system. Bertrand Russell writes that:

> A universe once in motion will remain in motion forever, unless stopped by a miracle. Aristotle had thought that the planets needed god to push them around their orbits, and that movement on earth could be spontaneously initiated by animals. The motions of matter, on this view, could only be accounted for by taking account of non-material causes. The law of inertia changed this, and made it possible to calculate the motions of matter by means of the laws of dynamics alone.[29]

From the African worldview, the reality of the Supreme Being is not in doubt at all as it is well established. Because African worldview is fundamentally metaphysical, Africans believes in a Supreme Being that is transcendental and immanent at the same time. This is why force as a concept makes meaning from the perspective of the Supreme Being who is force Himself and gives it to all of His creation. Africans holds the belief that God is not a term to be defined, but a "person" to be known. This knowledge is to be sought for on God's nature, character and attributes from man's intellect and confirmed by experience of the reality around him. For instance, besides energy, matter and form, is there a personality in the universe? The

answer is simply that man is a personal being and since personal cannot come from impersonal, then that which is personal must have created man. Also, because God is a personal being, the possibility of feelings and communication between the two is a reality.

Africans further believe that the Supreme Being is a personal infinite God who created and sustains the universe which reflects His unity in diversity. God is the power that organizes and integrates man and the world beyond appearances. Since the self is inseparable from the experienced reality, and since the African does not know the other by detaching himself but by sympathetically embracing the other, he lives in God and God lives in him. K. C. Anyanwu avers that:

> Living in a community, the African believes that there are mysterious forces surrounding him. He is in communion with these forces (his fellow men, nature, the whole universe, animate inanimate forces). He personalizes these forces because, as we have now realized, reality is based on the self and inseparable from the self. His consciousness of the world teaches him that the world also has its own consciousness to some degree. From this awareness of something divine in the experience of reality arises his feeling of divinity.[30]

Because man has this anthropomorphic outlook about reality, man looks at nature and God from the point of his relationship with them. Thus in African worldview, there are many expressions which attributes human nature to God but that can easily be understood since he is anthropocentric. The importance of this anthropomorphism is to aid in the conceptualization of God whom they have not seen. Many African societies visualizes God as father, while few others sees God as a mother by virtue of the former being the universal creator and provider while the latter is because of the idea of cherishing and nursing. Mbiti notes that "some of this anthropomorphism may be literal but most of them seem metaphysical, poetical and liturgical… It is to be noted also that ultimately everything we say about God is in one way or another anthropomorphic since it is expressed in human terms and human thought forms". [31]

From the exposition so far, it becomes glaring why traditional African thought system provide a platform for the believe in the existence of a Supreme Being while the scientific method does not with the explanation contained in the rationale of how each interprets the world by its internal logic and systems.

4.2.2 What is the Origin of Nature and Man?

This is a fundamental question that modern science has been vigorously pursuing hitherto in its search in other to understand the intricacies surrounding the complexities of both. But whether it is making progress or not is debatable. But there are theories in modern science that tries to explain the origin of nature i.e. the universe called the big bang model; for the origin of man, evolution and abiogenesis are the mainstream theories. As usual, no meaningful discussion can be carried out on these concepts without recourse to force as a concept because these theories presupposes force as without force, there cannot be any meaningful discussion about the explosion or implosion of the big bang, the evolution of species, nor the metamorphosis of the single protein cell in abiogenesis from which life is thought to have emanated. All the theories that modern science have come up with and adopted as official explanations of the origin of the universe and man have force at its core. For a better understanding of the discussion, the study examines these concepts closely before bringing in traditional African's explanation.

The idea of the big bang was first published in 1929 by a Catholic priests Georges Lemaitre who postulated by way of conjectures that the universe is expanding and could be traced back in time to an originating single point such that the universe is still expanding today, and getting colder as well. The big bang encapsulates a scientific theory about how the universe started, and how the stars and galaxies were formed. The theory or model holds that the universe began as a very hot, small, and dense super force which is the mix of the four fundamental forces with no stars, atoms, form, or structure called a singularity. Hawking asserts that:

> Since temperature is simply a measure of the average energy-or speed-of the particles, this cooling of the universe would have a major effect on the matter in it. At very high temperatures, particles would be moving around so fast that they could escape any attraction toward each other due to nuclear or electromagnetic force, but as they cooled off one would expect particles that attract each other to start to clump together.[32]

Space science has it that the universe expanded very quickly (big bang) about 13.7 billion years ago even though time could be said to have no meaning before the big bang. If the big bang was the beginning of time, then it follows deductively that there was no universe before the big bang, since there could not be any "before" if there was no time. It is interesting to note that the scientific method of observation does not hold here as no one had ever observed this occurrence and current scientific instruments do not allow astronomers to peer back at the universe's birth so that much of what we understand about the big bang comes from mathematical formulas and models which are highly abstract and metaphysically speculative. Equally interesting is the fact that the big bang is held as a natural explanation of the origin of the universe by modern science.

Regarding evolution, this is a theory in biology put forward by Charles Darwin which means change in the form and behaviour of organisms between generations. The forms of organisms at all levels from DNA sequences to macroscopic morphology and social behaviour, science claims can be modified from those of their ancestors during evolution. Mark Ridley defines evolution thus:

> Most of the processes described in this book concern change between generations within a population of a species, and it is this kind of change we shall call evolution. When members of a population breed and produce the next generation, we can imagine a lineage of populations, made up of a series of populations through time…Evolution is then change between generations within a population lineage. Darwin defined evolution as "descent with modification" and the word "descent" refers to the way evolutionary modification takes place in a series of populations that are descended from one another.[33]

Evolution therefore is a change overtime via descent with modification, thus humans are believed to have evolved from Apes since we are all *homosapiens* and adaptation is a crucial evolutionary concept. Adaptation refers to "design" in life to those properties of living things that enable them to survive and reproduce in nature. The reactions to Darwin's two connected theories-evolution and natural selection-differs. The idea of evolution itself became controversial mainly in the popular sphere only, rather than among biologists. Evolution seemed to "contradict the Bible, in which the various kinds of living things are said to have been created seperatedly".[34]

Since evolution tells us nothing about how life came about but how humans changes in their features with time and how they adapt, it was important to investigate the origin of human life and abiogenesis, a recent area in scientific research and discovery. It is a natural process by which life arises from non-living matter, such as simple organic compounds. This transition from non-living to living entities was not a single event as it is held, but a gradual process of increasing complexity. Jerry Bergman states that:

> Abiogenesis is the theory that under the proper conditions life can arise spontaneously from non-living molecules. One of the most widely cited studies used to support this conclusion is the famous Miller-Urey experiment. Surveys of textbooks find that the Miller-Urey study is the major (or only) research cited to prove abiogenesis. Although widely heralded for decades by the popular press as "proving" that life originated on the early earth entirely under natural conditions, we now realize the experiment actually provided compelling evidence for the opposite conclusion.[35]

Abiogenesis as it were today is a failed theory because it has not been able to prove how life came about from non-life. It was once commonly called 'chemical evolution' but evolutionists today try to distance evolutionary theory from the origin of life. Even Darwin recognized how critical the abiogenesis problem was for his theory. He even conceded that all existing terrestrial life must have descended from some primitive life form that was originally

called into life by the creator. But to admit, as Darwin did, the possibility of "one or a few creations is to open the door to the possibility of many other".[36]

African system of thought from its worldview favours creationism as the explanation of the origin of the universe and man. As we have earlier relayed, there are hierarchy of force in African worldview. God the creator is at the apex, after which there are ancestors, spirits and divinities, man at the centre and then plants, animals and minerals. This structural chain shows that man couldn't have existed of himself as well as the universe he finds himself. This is why God is held as the creator of the universe and everything in it. Leopold Senghor opines that: "this idea of nature as life force is substantially different from the modern scientific reality. He argues that for traditional Africans, the whole of the universe appears as an infinitely small and at the same time an infinitely large network of forces which emanate from God and end in God, who is the source of life. It is He who vitalizes and devitalizes all other beings, all the other life forces".[37]

God is seen as the source, creator, and origin of life in living creatures', gods, deities and spiritual entities. Man then has his origin in God and not some chemical processes as modern science will affirm. Man is just one shade of force that God created. Tempels asserts that, "the Bantu African see in man the living force; the force or the being that possesses life that is true, full and lofty. Man is the supreme force, the most powerful among created beings. He dominates plants, animals and minerals. These lower beings exist by divine decree, only for the assistance of the higher created being, man".[38] Hence, while the origin of nature and man for the modern scientists is chemical, mechanical and natural process, for the African, it is the Supreme Being and creator. Despite the sophistication in modern science in trying to explain the origin of the universe and man's place in it, there are still holes that points to a metaphysical leaning since

these theories are at variance with the accepted scientific methods of observation and experimentation.

4.2.3 What is Reality and what is Ultimate Reality?

The term reality seemed to be so polarized today that it means different things to different persons arising from one's worldview and thought systems. For instance to some, reality is only the materially verified or falsified. For others, it is both the materially verified and falsified, and the immaterially unverified or unfalsified. The concept of reality has divided thought systems into different philosophical schools such as realism, materialism, naturalism, idealism and so on. The same applies to understanding what atoms are and its particulate behaviour at the quantum level of reality. With regards to force, what does its reality entails? For instance, what is the nature of force as that which sets an object in motion, changes its state and shape? The answer tells us nothing about force in itself. Is force therefore mental, material or invisible? Asouzu avers that:

> What is it that makes reality what it is and gives it its character? How do we seek to grasp reality from the perspective of ultimacy goes a long way in determining our idea of the world in its totality. The same thing is applicable to the way we relate with all the things in the world, organize our lives, set our priorities and values. These activities are dependent on our idea of reality. It is for this reason that one can say that the ontology, which an individual or groups of individuals espouse, determines their general outlook to the world. [39]

The question of reality touches on everything that appertains to "being" whether material or immaterial, mind, consciousness and so on. Solomon and Higgins attempts to put this truth in perspective thus: "today most of us believe that reality is what our scientists tell us it is. None of us has ever seen or felt an atom; few of us have ever seen the farthest planets in our solar system…But even professional scientists will admit that it may be impossible to completely explain reality in scientific terms. Einstein's theory of relativity, for example, may have as one of its primary conclusions that impossibility of our ever knowing what the world is really like,

apart from the particular perspective from which we happen to be observing it. If we can't find out the nature of reality from science, where are we to find it?" [40]

Ontological inquiry about what is real has certain levels such as common sense ontology, with the most real entities being chairs, bodies, people and so on while we have the scientific viewpoint which holds that what is most real are those things discovered by science like electrons and genes. Another aspect will be the spiritual approach which ranks God as highest, along with soul. There are other peculiar entities of reality like music, numbers, and so on. Bertrand Russell noted that "in daily life, we assume as certain many things which, on a closer scrutiny are found to be so full of apparent contradictions that only a great amount of thought enables us to know what it is that we really may believe.[41]

In the light of force, what will reality portend for modern science? The answer is not far-fetched as reality will be "matter" ultimately. But it will depend on which scientific systems we want to pitch our tent with as the Newtonian mechanics is not the same as the relativity and quantum systems. In Newtonian mechanics, determinism gives order to the visible universe. But in the quantum world, chaos and randomness is what characterized reality so that "grasping quantum reality requires changing from a reality that can be seen and felt to an instrumentally detected reality that can be perceived intellectually".[42]

The wavicle (wave and particle) behaviour of quantum reality has bewildered the minds of quantum physicists. Erwin Schrodinger's cat-in-the-box-thought experiment reveals this to be so. The thought experiment is often described as a paradox and was intended to illustrate what Schrodinger's saw as the problem of the Copenhagen interpretation of quantum mechanics applied to everyday objects. The outcome presents a cat that is both alive and dead simultaneously as stated in quantum mechanics known as quantum superposition or

entanglement as a result of being linked to a random subatomic event that may or may not occur. The state the cat takes ultimately can only be determined by a conscious observer. Ojong and Archibong noted that:

> When the physical sciences begins to participate in the questions that are wholly philosophical, especially as it relate to the physical and mental realities, it keeps our minds wondering about the possibility of breaking through the kernel of physical reality without some iota of speculation. The measurement problem in quantum mechanics therefore, seems to waiver around the traditionally dominated mind-body debate in philosophy.[43]

In western science, reality is held to be factual i.e. corresponding to an actual state of affair or event and it holds no place for absolute reality because scientific truth are probabilistic. If one is looking for certainty of knowledge, science is not the place to search because scientific truths are not absolute. If science is taking a fundamental question regarding the nature of time, space and matter for instance, it is not for it so go outside the observable but this it does consistently. For instance, we have the "common sense table" and the "scientific table". Looking at a table commonsensically gives us the notion of a plain, smooth table upon our feeling it. But when the same table is viewed using a high power microscope, we see valleys, ridges and contours. Which of the tables then can be said to be real? Perhaps this informs why Craig Callender asserts that "the methods and skills that philosophers and physicists bring to bear on these problems of fundamental questions are often very different. However, and especially in recent years, there is an increasing recognition that these two groups are indeed tackling the same issues, and moreover, that these different methods and skills may all be of use in answering these fundamental questions".[44]

Force then as held in western science is not absolute. Force scientifically is a natural entity the same as its effect as it can be described and calculated mathematically. There is no need looking for a Supernatural Being as the cause of force. But traditional Africans do not see force as wholly material even though it is included. Reality for the Africans therefore is

ultimately "one" which is God who manifest his power in different ways leading to the existence of other forces. Similarly, Ijiomah contends that:

> If one understands the reality of a place, one can easily capture the nature of its environmental logic. At the same time if one understands a people's logic, the people's structure of ontology can easily be mirrored through their logic. This possible correlation between the logic of a place and its ontology makes it possible for a people to predict space and time events.[45]

For the Africans, there are two kinds of realities: material and immaterial. The material is held to be quantitative while the immaterial is qualitative hence contraries with each yearning for the other. This reality is cyclical and Ijiomah opines that "the spiritual appears as physical reality and goes back to the spiritual world and the cycle continues. This means that the physical has an inbuilt spirituality and the spiritual has an inbuilt physicality".[46]

Beyond that, traditional Africans hold reality to be that which endures beyond time; that which is not fleeting, that which is permanent and that which is as against just mere appearances. Traditional Africans subscribes to materialism, realism as well as idealism. But all of these thought systems are not as enduring as the nature of the Supreme Being. So whether we are conscious or not, there is a supreme consciousness that endures. There is an ultimate reality that is more pervasive than matter. To this end, whether we hold reality as one (monism), two (dualism) or multiple (pluralism), there is an ultimate reality that the Africans hold to be God. He is the uncaused cause of everything there is except himself. He is the "One" prime force, prime existent, prime reality and the source of all other reality. This truth is extrapolated from African thought system of force which is not far-fetched from the one held in modern science though the appellation God is substituted for force or nature. Aristotle talked about God being the prime mover and the uncaused cause in his *Physics.* The investigation of modern science today is seriously moving towards the proof of God as nature is found to be exhibiting symmetry

and intelligence that couldn't have been from a blind or random chance. The study shall now examine truth as one of the implications of force.

3.2.4 What is Truth?

This question is an aged old one that man has always sought to understand because of its importance to avoiding falsehood and error. Even Pontius Pilate who condemned Jesus Christ to death, attempted to know what truth is from Jesus who testify to the truth. Ontologically, truth has a dire relationship with reality. Geisler and Bocchino define truth "as an expression, symbol, or statement that matches or corresponds to its object or referent i.e.; that to which it refers, whether it is an abstract idea or a concrete thing".[47] For Aristotle, "to say of what is, that it is not, or of what is not, that it is, is false; while to say of what is, that it is, and of what is not, that it is not, is true".[48]

To define truth in a straight line jacket is not an easy task because contradiction is not permitted in so doing neither is opinion. To get at truth, we must ask: what is it for a set of beliefs to be true? How will we know when our beliefs are true? Sometimes this seem to be obvious (self evident), but what if the obvious is not always so? These questions are the basis for the branch of philosophy known as epistemology, the theory of knowledge. To tell if a reality is true depends on a lot of variables; do we then have one truth or many truths?

Since the concept of force has enormous implications for truth, the study approaches this quest for truth from a critical reflection. There are three major theories of truth in epistemology with each together giving us the big picture of truth. They are the: correspondence theory of truth, coherence theory of truth and pragmatic theory of truth. Truth from the correspondence theory consists in or depends on a relation between a belief or piece of knowledge and a fact in the real world. The coherence theory holds that truth is the relations between judgments

themselves in a system. The pragmatist theory holds that truth stands for beliefs which work in practice.[49]

Truth therefore can be divided into facts and reason. Factual truths are empirical truth while necessary truth stems from reason. Empirical or factual truths are true as a matter of fact and can be known only on the basis of experience (consciousness). Necessary truths such as 2+2=4 cannot possibly be false because they are *apriori*. If these were all there is to truth, then we would not have much problem on our hands. Solomon and Higgins wondered if the answers to the questions: Does God exists? What is reality? Is there a meaning to human life? Are empirical truths necessary and should we appeal to our experience or reason (or both, or neither) to answer them?[50]

Empirical and necessary truths fit into modern science description of force perfectly. This is because force has a mathematical representation of its empirical form. That is seen in Newtonian mechanics, all the way to quantum mechanical systems. Truth in modern science is empirical as well as necessary. But will modern science accept the cosmological argument of the medieval theologian, Thomas Aquinas or the ontological argument of St. Anselm? Obviously modern science would not and the reason is not far-fetched. These arguments are adjudged as not systematized in comparison to that of scientists such as Newton and his likes with proofs that can be replicated. At best, these medieval thinkers' arguments will be dismissed as mere philosophical speculation. Thus for a claim to pass as truth in modern science, it must be empirical in the manner as has been shown in the correspondence theory of truth as well as in the mathematical aggregates of the coherence theory of truth.

Truth for traditional Africans is first pragmatic and has a moral affinity compared to the cognitive dimension of modern science. In the Akan-African language, truth is *nokware* and it is

divided into *ano* meaning literally "mouth" and *koro*, meaning "one". *Nokware*, then, means literally being of one mouth or being of one voice.[51] This oneness of voice is communal unanimity so that truth is that which is agreed by the community and not just individuals. This expresses the communal basis of the Africans so that even truth is a community determinant. By community here, we refer to the sages by age, the medicine men, chiefs and kings. These are the custodians of community truths.

Since force is being to traditional Africans, they know where each hierarchy of forces lies and their place in the scheme of things. They know "what is" which helps them in the ordering of the community. They know the limit of human cognition and based their belief also on the transcendental. They know that truth is unchanging and ageless and is transferred from generation to generation. Traditional African's hold on belief may have been misconstrued, but it does not in any way affect what it accepts as truth. Belief may not be the same thing as truth for the modern scientists, but traditional Africans see no difference between belief and truth from an ontological thought system. Following these, Gene Blocker does not agree with Wiredu's notion of truth[52] because he was coming from a Western philosophical worldview. Truth therefore from the submissions here becomes a reflection of what reality is from a thought system. How the universe and man's place in it is scrutinized and explained by a community of people becomes what they hold as truth. Thus, every thought system held by humans contains a purported aspect of truth about reality in general. The study further examines the cosmological dimension to the discourse as an implication of force.

4.3 The Cosmological Questions

The concept of force as we have examined so far holds a greater deal of entailment for cosmology. Cosmology as a branch of metaphysics deals with questions that bother on the origin and nature of the universe just as ontology deals with the origin and nature

of being. The totality of the material and immaterial universe is therefore the concern of cosmology. If we understand the question: why is there something and not nothing as posed by Heidegger, then we would understand the profundity of the inquiry. However, the investigation is not really different from the one we have discussed under ontological questions. But let us look at some perspectives to the discussion especially the meaning of cosmological questions.

Cosmology is basically the science or a theory of the universe and what there is in the world. It is studied under the branch known as philosophical metaphysics and according to Smith and Oaklander, "it is both consistent with, and in part based upon, current scientific theory, and it uses logical argumentation to arrive at its results. For example, if current science informs us that the universe began to exist 15 billion years ago with an explosion called the "big bang", then metaphysics will take this theory into account in formulating theories about the beginning of time and the universe".[53]

More than most other sciences, cosmology has a metaphysical basis. This is because every cosmological conclusion has serious implications about the nature of reality. In other words, it implies certain things that lie beyond physics. Cosmologists Stephen Hawking had touted that the science of cosmology is near solving everything, i.e. it will be possible in the near future to know exactly why the universe exists, and predict theoretically the probability of every event that can possibly occur. In doing this, there will no longer be a metaphysical inquiry into the cause of the universe nor a philosophical and theological explanation. The discipline of cosmology is thus important because: "every society possesses a body of knowledge through which the universe would be interpreted. The knowledge, otherwise called cosmological ideas represents that society's worldview. The worldview held by an individual in a given society is dependent on the cultural beliefs prevalent in that society".[54]

Cosmology is from the Greek (*Kosmos)* meaning world and (*Logos)* which means discourse. Thus cosmology is the study of the origin, structure and development of the world or universe in its totality. Nwala defines cosmology as: "that framework of concepts and relations which man erects in satisfaction of some emotional or intellectual drive, for the purpose of bringing descriptive order into the world as a whole including himself as one of its elements. The resulting cosmology will accordingly reflect the sociological, philosophical or scientific predilections of the individual and his group".[55]

Glaringly from the above submission of cosmology, it is related with the creation myths of a people or culture as they attempt to address through narratives "the problems bordering on the origin and nature of the world, man and existence generally. These cosmogonic myths have to do with the treatment of the origin of the world and other phenomena contained therein".[56] This gives a balanced perspective of the concept of cosmology in that it is explained from the lenses of a peoples worldview either as individual or a group. The study now examines the explanation of the origin and nature of the universe from traditional African and modern science perspectives.

4.3.1 What is the Origin and Nature of the Universe?

In western science, there are quite some concerns about the explanation of the origin and nature of the universe. The same concerns have led to the question of: where does the universe comes from and where is it going? Did the universe have a beginning, and if so, what happened before then? What is the nature of time? Will it ever come to an end? Can we go back in time? The approach however or method employed in answering these myriads of questions is what makes the answers unique and distinct and it is the scientific method of induction from (observation and experimentation). To begin with, the scientific universe is not made by substances different from its materials. In other words, it wasn't mind over matter but matter

over mind meaning the scientific universe wasn't created or spoken into existence as Christians and other religions will believe.

The universe's origin is known in modern science through mathematical synthesis of observation and experimentation. Cosmology makes extensive use of what is called models of the universe. These are mathematical representations which try to describe the universe in terms of strictly determined rules. These rules are based on logic, and because of this symbolic form, it is considered to be an aspect of mathematics. Cosmology can use so many different models since none of them can be actually tested against observation. But the rigorous aspects of mathematics and logic are not perfect, or at least, they are not rigorous enough for everything as shown by Kurt Gödel. Mathematics and logic then seems a poor tool for describing reality, especially ultimate reality.

Beginning from Aristotle, Ptolemy, Copernicus, Kepler, Galileo, Newton through Hawking, there has been an effort to understand and explain the origin and nature of the universe. Hawking states that: "today Scientists describe the universe in terms of two basic partial theories-the general theory of relativity and quantum mechanics. They are the greatest intellectual achievements of the first half of this century… unfortunately, however, these two theories are known to be inconsistent with each other-they cannot both be correct. One of the major endeavours of physics today, is the search for a new theory that will incorporate them both-a quantum theory of gravity".[57]

The big bang is the most popular model of the origin of the universe in modern science. According to this model, the universe started out in a complete state of chaos or disorder, with everything inside it moving about in all directions completely at random. Because the big bang model is a closed system, if it is correct, then the second law of thermodynamics will be wrong.

This is because the law implies that, since the universe as described by the big bang model is a closed system, its disorder must increase with time. The second law of thermodynamics states that the disorder in a closed system must increase with time: that this increase in disorder, or chaos, is not time-reversible. Thus an egg cannot unscramble itself and a broken tea cup cannot put itself back again, because that would increase the amount of order.

The implication of the big bang model of the universe necessitated the question whether the universe came about in time or out of time. In mathematics, this is called zero and infinity and we find the two terms prevalent in much of the mathematics that deals with cosmology. Does the universe have a beginning (zero) or it did not (extends for an infinite period)? Unfortunately, neither of these two ideas can be treated entirely satisfactorily from a scientific realist point of view. Marcelo Gleiser asserts that:

> In 1917, soon after the original formulation of his theory, in an attempt to describe the geometry of the universe as a whole, Einstein had proposed the first model of modern cosmology. He assumed quite reasonably given the data at the time and very much consistently with his Platonic view of nature, that the universe was maximally symmetric (shaped as a three dimensional sphere) and static: in effect, a finite space without a boundary…Natural phenomena took place within this perfectly symmetric space, consistently with the locality of change and transformation.[58]

Beginning from the big bang model of the universe, physicists have been pushing their theories well beyond what is testable with current technology even though they keep sliding into the terrain of metaphysics. Thus experiments are ongoing at CERN (The European Organization for Nuclear Research) with the record-breaking energies achieved at the large Hadrons collider. What science has been doing is to extrapolate our theoretical models of particle physics to the extreme conditions of the very early universe, hoping to find possible clues of what went on. But whether this method can actually explain what happened at the beginning of time still remains a metaphysical speculation. Gleiser noted that "countless scenarios have been proposed, suggesting the existence of new symmetries such as 'supersymmetry' and 'topological defects',

cosmic strings, tubes of energy that lock extreme high-energy conditions in their interior, possible relics of earlier times when the universe was more symmetric than today".[59]

African thoughts on the other hand sees the explanation of the origin and nature of the universe quite differently as they do not believe in going back in time physically in other to know how the universe originated and what its nature is. The answer to how traditional Africans view the universe can only be found in its cosmological worldview. Archibong and Usoro assert that:

> African cosmology and worldview is nothing other than the web that ties the African people together cutting across her heritage, culture, tradition, belief, philosophy and myth. For the Africans, the world includes the earth, sun, moon, stars, and other planets. This permits the African cosmology to be described through myths. African thought recognizes a plurality of worlds and hierarchy of beings. However, the material world is just the first step towards understanding other worlds of which is the spiritual worlds…[60]

The origin of the universe for the Africans is from the force of the Supreme Being which is God. But how he created the universe is to be understood from mythology. Myth, derived from the Greek *mythos* meaning 'word" or "story" is "used to express the views of the people concerning the existence of man, gods, the universe, their fears and aspirations in life".[61] Africa is replete with a lot of myths about the origin and nature of the universe. The myths are as varied as the multiple ethnic and tribal groups in Africa. But one thing that unites these myths is the belief that the universe is not self caused nor is it eternal. The universe is a creation of the Supreme Being and its nature is dualistic. This is why force to the African is dynamic and essentially metaphysical. Myths to the Africans represent explanatory mechanics and organizing metaphors utilized by Africans to resolve puzzles of nature. Uduigwomen asserts that:

> Myth relates to primordial event that took place at the beginning of time. It is a special story about past happenings which are generally held to be real. The actors of the myth are in most cases gods or culture heroes, not human beings as such. There is the assumption that man cannot know his acts except they are revealed

> to him. The myth therefore is a recital of what the gods or the semi-divine beings did at the beginning of time.[62]

Accordingly, the origin of the universe and its nature for the African is not something to be known by physical observation and experimentation. This is because we can never really know for certain how our vast physical universe emerged and for how long it has endured. We can't also fully understand its nature except by divine revelation as enshrined in myths. The African will always return back to the hierarchy of forces in his understanding and explanation of the universe. By this, he is able to go through those explanations that meet a dead end because it is adopted only from the perspective of material reality such as we find in modern science. This commitment to mythical, religious and cultural explanation satisfies the African curiosity with respect to explanation of the origin and nature of the universe.

4.3.2. What is God's Relationship with the Universe?

In answering this question in relation to force, the search will be delineated to the African system of thought because it is the only worldview that accepts that the universe is a creation of the Supreme Being who is the Supreme Force. It is believed that God created the universe by setting it in motion and allowing it to continue in that order though still making contact with the universe. By this, God is both transcendent and immanent. He is not the universe but beyond it. He is the supreme force that created and placed the laws of the universe together. The universe is finite but God is infinite. The universe is God's handiwork, his imprint but we cannot see God himself in the universe because he is a spiritual substance who is the sustaining cause of the universe. Geisler and Feinberg explain the African understanding of God thus:

> In short, God's relation to the world is analogous with a painter's relation to his painting. The painter is beyond the painting, but he is also reflected in the painting and is the cause of it. However, the theist would protest that this analogy does not go far enough, for God is continually, personally, and intimately involved in sustaining the universe, whereas the painter can walk away from his painting once it is painted.[63]

Africans therefore do not hold on to the pantheistic view of God. God is not the universe and the universe is not God. The universe is the handiwork of God so that it is not self caused or self existing. Even the laws by which the universe operates are determined by God. This is why Anyanwu avers that "the force of a being is determined by the kind of being something is". [64] The force existing in the universe is not the same as the force of the Supreme Being. Because God is personally involved in the affairs of the universe, he can act supernaturally in the universe. The Africans do not believe that natural laws are fixed, immutable and inviolable. Instead, they are descriptions of the regular way God works in His creation, not prescriptions of how He must work. This is why God can intervene in the universe by suspending natural laws if He is requested to do so through His intermediaries or by His own will. Mbiti asserts that:

> …God created the heaven as He created the earth. Heaven is the counterpart of the earth, and it is considered by African people to be the dwelling place of God. There are stories told all over African, of how originally heaven and earth were either close together or joined by a rope or bridge, and how God was close to men. These myths go on to explain how the separation came about;…The physical and spiritual are but two distinctions of one and the same universe. These dimensions dove-tail into each other…[65]

The regular and special actions of God in African worldview are called "acts of the gods" or "divine providence". God it is believed didn't just create the universe and left it to its own whims and caprices. He supplies the needs of His creatures so that their existence can be maintained and continued. He provides life, fertility, rain, health, and a bumper harvest. His providence functions entirely independently of man though man may seek the help of God personally or as a community in crucial times of need. Nkemnkia posits that, "in all myths regarding the origin of the world one can clearly see that the world does not exist on its own. It is created by the will of God. The will of God is the answer to the doubts and mysteries created by the narration of these myths."[66]

Unlike African thought system, western science has no place for God or a Supreme Being outside space-time. For this reason, the universe is held to be entirely materialistic and has always existed following the first and second laws of thermodynamics. Science holds that 'nothing cannot produce something'. Therefore because there was something, the universe always was, always is and always will be a dynamic equilibrium eternally existing at the centre of time. Hence, quantum fluctuation is here seen as having more meaning than "God did it". Science holds the universe to be the cause of everything apart from itself because it always had existed. This statement is metaphysically worrisome because it beats the imagination to think of something that has always existed without a cause. This is the kind of position to be found in religious worldviews and not science.

4.4.3 What is the meaning of Time?

Since the influence of force takes place in space, then it will clearly take place in time too. Since space and time are not different neither are they independent entities in modern science, force is applied to objects in a space-time coordinate or continuum. Time has a philosophical and scientific dimension regardless and it is not an easy concept to define as expressed by St. Augustine. Is time real? Is this reality like that of a stone lying at a definite location? Can time be measured? Is time duration and succession only? Is it eternal? Einstein says that "space is what we measure with a measuring rod and time is what we measure with a clock… by this absolute time is abolished. Time is measured differently for person moving relative to one another".[67] With respect to the reality of time, Lacey observes that:

> A famous attack on the reality of time was made by (British philosopher) Mc Taggart, who distinguished two series of temporal positions. The A series contains notions like past, present, future, which apply to different events at different times. The B series contains notions like earlier than, simultaneous with, after, which permanently link whatever events they do link. He then argues that the B series by itself, without the A series, cannot account for change, and so for time, while the A series involves either a contradiction or a vicious regress.[68]

Time in the modern science is defined by its measurement especially what the clock reads. In Newtonian mechanics, time is a scalar quantity. Like mass, length and charge, it is usually described as a fundamental quantity. Time can be combined mathematically with other physical quantities to derive other concepts such as motion, kinetic energy and time-dependent fields. For Einstein, time as an item is independent of space and called three-dimensional space and one-dimensional time jointly as four-dimensional space-time i.e. Einstein did not acknowledge the inseparability between time and space.

Time is a concept in the scientific system derived from motion. In system relativity, it is considered that the nature of an object is energy. It has the properties of volume (i.e., three dimensional properties) and movement (i.e., the relative movement between objects). Modern science has it that the properties of energy and volume of an object exist independently without relying on the outside world. However, the movement property of an object relies on the external environment. Thus:

> The movability of an object is shown by the endless movement and evolution process of cosmic things, the process can be quantified into series of "events". During the observation on an event, the external periodical event (like sunrise or sunset) becomes a background for observation. The period of the background event naturally becomes a kind of gauge for us to measure the event being observed. The physical significance of the value acquired through the measurement on the event via the gauge is called time by us, the value magnitude indicates time span, the gauge is time gauge.[69]

Accordingly, the point being expressed here is that, space and time can be regarded as simple ways of looking at the spatial and temporal properties and relations of things and events. This is known "among philosophers as the relative theory of space and time".[70] However from the theory of Relativity, space-time is some weird kind of entities over and above the things and events. When it is physically impossible for a body to travel so as to be present at both events, we shall say that the interval between the two events is "space-like; when it is physically possible

for a body to be present at both events, we shall say that the interval between the two events is 'time-like'. When the interval is 'space-like', it is possible for a body to move in such a way that an observer on the body will judge the two events to be simultaneous. In that case, the 'interval' between the two events is what such an observer will judge to be the distance in space between them. When the interval is 'time-like', a body can be present at both events; in that case, the interval between the two events is what an observer on the body will judge to be the time between them, that is to say, it is the 'proper' time between the two events.[71]

Summarily then, time in the western science is a measured or measurable period, a continuum that lacks spatial dimensions. In other words, if we say that clock is what time is to the scientists, we would not be wrong. Clock is the measure of time and by its construct, existence is lived. Space-time continuum is just a way of describing events as they happened in the material world. Time for Africans is viewed differently from modern scientists. In African worldview time is held to be a part of its religious universe and it is in viewing time from that point of view that it will make sense. Time for Mbiti, "is simply a composition of events which have occurred, those which are taking place now and those which are immediately to occur".[72]

Time affects and influences the life and attitudes of African peoples and to a large extent determine their economic as well as religious lives. While the scientific concept of time is linear, i.e. three dimension of past, present and future, that of the African is two dimensional i.e. past and present, without a necessary future. Mbiti notes that "the future is virtually absent because events which lie in it have not taken place; they have not been realized and cannot, therefore constitute time".[73]

African time moves from present to past (i.e. from "*Sasa*" to "*Zamani*") while the scientific conception of time moves from past to future. "*Sasa*" stretches into the short future

with a dynamic present and an experienced past. "*Zamani*" is the unlimited past which also has its own past, present and future, but on a wider scale.[74] A very big difference between African time and scientific time is that, in scientific or technological society, time is a commodity which must be utilized, sold and bought, but in traditional African life, time has to be created or produced. Man is not a slave to time; instead, he makes as much time as he wants.[75] Etuk made a similar observation when he posits that "…while the Westerner feels himself controlled by time, and is literally enslaved by his chronometers, the Africans gives the impression that time was made for man".[76]

Time therefore for the African is something real because in it they carry out their farming activities of planting, weeding, fishing, harvest, burial and so on. But time is not a master to the African, but a slave. African understanding of time is founded upon her cultural worldview and is inseparable from it. It is also related to human life thus the rhythm of time is felt in birth, puberty, initiation, marriage, procreation, old age, death and entry into the community of the departed down to the company of spirits. Thus, "our understanding of it may help to pave the way for understanding the thinking, attitude and actions of the people, which is based on experience and observation of phenomena rather than a mechanical process like a clock".[77]

So in contrast, time for modern science is mathematical and this understanding has aided technological development about the knowledge of the laws governing the universe. The symbol of this time is the clock by which every event in nature is ordered, arranged and managed. However for the Africans, time is deduced from phenomena in nature and is integrated into their metaphysical worldview. Interestingly for the Africans, time is eternal and doesn't only terminate in the natural universe.

The scientific outlook of the universe is one replete with laws. These laws are arrived at through hypotheses and theories. A scientific law simply "means statement of universal facts which have been tested repeatedly and confirmed to reflect facts of the world. Laws are postulated working principles which help the scientists to work out an ordered and systematic method of scientific investigations".[78] Causality or causation on the other hand, "is the relation between two events that holds when given that one occurs, it produces, or bring forth, or determines, or necessitates the second".[79] Hence, time as a concept is at the centre of scientific investigations of facts, theories and postulations. Interestingly however, time has now become a Siamese twin with space giving us a space-time continuum. The study shall now examine the subject of causality more closely in relation to force in order to see how they correspond.

4.3.4 Do Laws and Causality Govern the Universe Absolutely?

It is a popular claim in modern science that laws are not created but discovered. This means that the laws regulating the universe are carefully observed and deduced using mathematical systemization, observations and experimentation. Science observes phenomena in the universe discovering how they behave and interact using special apparatus and in the process, they are able to connect certain regularity together. This of course necessary has a bearing with cause and effect. Hence, if an apple falls from a tree downwards to the ground, gravity may be deduced as the cause of it but gravity itself is metaphysical in nature. If a blue litmus paper changes to red, acid may be responsible; and acid is not just something but a conglomeration of several minute particles ontologically. There are so many laws which capture the ordered workings of the universe in science as well as their causes. But the focus for now is to examine the place of laws and causality in the governing of the universe.

Modern science describes the regular fixed way in which the universe and objects in it works. This orderly and harmonious way in which the universe works makes it easier for laws

and causal chain to be discovered. The issue is, while there is determinism in the Newtonian system, the same cannot be said in the quantum mechanical system as there are different laws that apply there. This law is called the uncertainty or indeterminacy principle. Mason observes accordingly that:

> This principle of uncertainty followed from the wave-particle duality of matter and radiation, and from the fact that the characteristics of objects were usually unavoidably altered during the course of experimentation. If the position of an electron were to be accurately measured, radiations of very small wavelengths would have to be used for the determination. But such radiations would possess quanta of high energy and would alter the momentum and energy of the electron by impact. Similarly to measure the momentum of an electron, quanta of low energy would have to be used: the wavelengths of such quanta being large, the position of the electron would be correspondingly indeterminate.[80]

Since different laws and by extension causes, operates at the three systems of modern science (Newtonian, Relativistic and Quantum Mechanics) we cannot say that the natural universe is governed by a unified scientific law. Einstein's quest was to be able to have a unified theory in science that will explain all the laws of physics, forces and their causes. It can then be said that there are numerous laws in science that seeks to explain phenomena in nature and their causes but these laws do not govern the universe absolutely but rather point to different aspect of the universe so that if there is a searching for a cause and effect situation, it must be understood first, which system of physics fits the picture.

The African belief or thought system on the other hand has a unified theory that explains all the laws governing the universe from causality. God who is at the apex of the hierarchy of being or force determines and puts in place all the laws governing the material and immaterial universe. God here is the uncaused cause and an uncaused being. Since it is only contingent beings that need a cause, causality fits into the description of created things. The Supreme Being is not a creature, and so does not need a cause either beyond or in Himself. Hence it is the

African belief that all the laws of the universe have a cause as the creator has ordained. Anyanwu explains this attitude further:

> The traditional African was not primarily concerned with cognitive problems, but with religious and mythical ones. He does not so much want to know as to satisfy his emotional needs. He is less interested in physical questions of causality (what caused this?) as in finding motives and motivating and motivated agents (who are held responsible for an event and why did they do it)?…even in a game of pure chance, nine Africans out of ten would attribute their luck or misfortune to a god or to the gods.[81]

Africans owe every explanation of events that borders on their destiny or existence to the will of the gods. They even see events in nature as the act of the gods. Events do not happen in a random fashion as we see in the law that guides quantum mechanical phenomena. Every occurrence or events to the Africans have a vital causality that is traceable to God. And God "… possesses (or, more exactly, He is) the supreme, complete, perfect force. He is the strong One, in and by Himself; He has his existential cause within himself. In relation to the beings whom he has created, God is regarded by the Bantu as the causative agent, the sustainer of these resultant forces, as being the creative cause".[82]

There are therefore laws and causality in the scientific universe as well as the African universe both at the material and the immaterial level of reality. However, the point of departure of the two is that, while laws and causality in the modern universe is fundamentally natural and then metaphysical, that of the Africans is fundamentally metaphysical, unified in God and afterwards, material. It has also been observed that the laws operational in modern science is fragmented and cannot explain every phenomena in nature while that of the African is unified. Causality in the scientific system will definitely lead to infinite regress as the universe itself from which the causes are deduced also need a cause which itself is not material. This is where science goes metaphysical because the scientific method and its apparatus cannot apprehend immaterial

reality or causes. How does all these relate to the subject of teleology? To that the study now turns.

4.4 The Teleological Question

The existence of the universe presupposes that it has an end in view or a purpose as whatever has a beginning should have an end. This truth can only be ontologically deduced with questions such as: why is the universe here and what is the purpose for its being here? Does it have a goal, if so what is it? Teleology is from two Greek words: *teleos* (end, goal, purpose) and *logos* (reason, discourse). Can it be said that the universe has an intrinsic purpose irrespective of human thought or opinion? Will it make sense to apply Aristotle's argument that an acorn's intrinsic *teleos* is to become a fully grown oak tree to the universe? The argument can actually apply, but there will be a problem in the outcome because scientifically, the natural universe is moving towards self destruction with everything in it. Since this is the case, how can it then make sense of the purpose or end of the universe? Mariska Leunissen's explain that "these teleological principles do, nevertheless, serve a purpose. They are employed when immediate, simple observation is unable to reveal the causally relevant features of a given phenomenon. They facilitate the identification of the causally relevant features, and it is these features alone that serve as premises in the phenomenon's ultimate explanation".[83]

Teleological questions are apt within modern science though a metaphysical study. Science may necessarily not investigate the ultimate end of the forces of the material universe, but it stumbles upon these truths from time to time. Even though teleological inquiry is widespread in the biological sciences, it still has a closer affinity with the physical science. Ernst Mayr asserts that, in the period prior to Darwin, three ways of looking at the world exists. One of it is:

> An eternal and either constant or cycling world, exhibiting no constant direction or goal. Everything in such a world, as asserted by Democritus and his followers, is due to chance or necessity, with chance by far the more important factor. There is no room for teleology in this worldview, everything being due to chance or causal mechanisms. It allows for change, but such change is not directional; it is not an evolution.[84]

The above description fits into the sub-atomic world of quantum mechanics in modern science. There the law of chance and probability hold sway, because particles of matter move in a random motion. But when there is a talk about teleology, the chief concern is on why things are the way they are and whether they serve any purpose or end intrinsically or extrinsically. For instance, does randomness in nature serve any purpose? Can we satisfactorily accept the explanation for the universe as either having an end or not? If man were not in the universe, will it still serve any purpose? If so what might it be? Some of this concerns led Allan Gotthelf to pose the question: "what, precisely, does Aristotle means when he asserts that the coming to be (or any stage in the coming to be) of a living organism is for the sake of the mature, functioning organism which results?"[85] Further insights into teleology in modern science and African worldview with respect to man and the universe will give a possible answer to the question.

4.4.1 Why do Man and the Universe Exist?

Beginning from modern science, man is held as a strict material substance that has no end, goal and ultimate purpose as he is just a composite of matter without an eternal soul or spirit. When he dies, it all seems like his once original state before becoming conscious of his existence. This view is deducible from the fact that modern science makes no direct provision for the evidence of God, soul, immortality or afterlife. Asouzu noted that all culture-related matters, including the basic assumptions of science and technology, and all matters of discourse, have an end that directs them. This end is philosophers search for truth and authenticity. This is that form of ontologism that takes charge of even the relative form of causal world immanent

pre-deterministic ontologism, which the new digital computer-inspired sciences claim is their proper domain.[86]

The universe as held exists therefore on its own and not really because of man's place in it. While man is here, he develops and grows, makes the most of his existence in order to live a fulfilled life; and when he dies, it is over for him. Death simply becomes annihilation. Simon Blackburn captures this attitude thus: "there is sufficient meaning for human beings in the human world, the world of familiar, and even humdrum, doings and experiences. In the immanent option, the smile of the baby, the grace of the dancer, the sound of voices, the movement of a lover, even the passing of light and shadow or the murmur of the sea, give meaning to life".[87]

Ultimately, man exists here and now and in time in modern science. He cannot have any purpose outside of the material universe. He does not need to find meaning for his life and the universe outside of this material plane. He is a bundle of energy which by the law of the conservation of energy is neither created nor destroyed. The scientific system does not make room for a metaphysical explanation of reality even if there is a dire need for it. This clearly explains why it has been accepted that "science is not a dogmatic enterprise that makes recourse to explanations that are non-empirical. The scientific attitude involves physical interpretation of physical phenomena not through some whimsical procedure".[88]

In western science, explanations of the observed phenomena based on natural causes are highly prized but it doesn't stop there. With the same procedure of inquiry, it can also know the end of the universe and man's place in it. This was the entire aim of Jose G. Funes who attempts to show that:

> According to our current comprehension of the universe, dark energy seems to be the driving force for the accelerated expansion of it. If this is the case and dark energy does not change with time and there are no other factors, in the very distant future the

> universe eventually will be shredded. This final stage of the universe is known as the Big Rip**.** Some cosmologists propose that the universe could not have a single final end but even multi-ends. Thus the universe is going toward a final state of cold and darkness, thermal death, which says that the universe will go toward a state of maximum entropy (Big Freeze). The long-term scenario, with everything in the universe gradually dying, is obviously hostile to life.[89]

From the African belief system, man and the universe exists as God's creation. God created the universe and placed man in it out of his own will or pleasure. Thus "man is not the first or creative cause of life but he sustains and adds to the life of the forces which he finds below him within his "ontological" hierarchy".[90] This suggests that the universe was created for man to aid his existence, which is why man co-habits with nature or the universe and this affects his activities in the environment in a positive way. Man does not see his physical life as all there is to his existence neither the physical universe. He is in this physical universe in order to prepare himself for the spiritual universe. Kanu declares that:

> Man's coming to the world cannot be understood within the western category which sees the human person in mechanistic terms. Man in African worldview has a purpose and mission to fulfill; he comes into the world as a force amidst forces and interacting with forces. Good status, good health and prosperity are signs of the wellbeing of a person's life-force, and man struggles to preserve it through an appropriate relationship with the spiritual forces around him.[91]

When a man has lived a good life here on earth, he goes into the world beyond, a spiritual universe of the living-dead where he continues his life as an ancestor. The physical universe came about as a result of God's benevolence and magnanimity expressed to man His prized possession. This suggests that the universe has a moral purpose which is for the good of man. Most works of African philosophy are silent about what the ultimate fate of the physical universe will be. This may be that way because there is a better spiritual universe which is more important and sustaining than this natural one which man should strive to get into. Hence the less concern of pursuing the knowledge of the end of the material universe.

4.4.2 Is there a Final End to Man and the Universe?

From the examination of the African and western scientific system of thought, both have a final end. But while the end of man and the universe for western science is final self destruction and annihilation, for the African, it is a cross over to another universe: a spiritual universe. There he exists as a spirit being with an immortal soul in a world which is both transcendental and immanent. The former goes beyond this temporal material universe while the latter begins and terminates here.

The final end of the universe from whichever way we look at it only seem to make meaning because man is involved. If the universe remains, it does so for man. If it eventually gets destroyed, it will carry with it unprecedented fatality for man's life leading to its end. This truth can hold a lot for man with regards to determining his behaviours. Though sadly, "scientific cosmology, unlike African cosmologies, does not attempt to link the history of the cosmos to how mankind ought to behave".[92] This point shall be discussed elaborately under social values and norms.

4.5 The Motion and Change Question of Reality

Motion and change are fundamentally the outcome of force. Where ever there is motion, force must be behind it. Where ever there is change, force can be attributed to it too. This is why in modern science motion is a change in position of an object over time. But the change to be examined here is as contrasted with permanence in metaphysics. The universe contains things that appeared to change; yet these very same things also possessed a certain endurance and permanence. In Western philosophy, Heraclius is regarded as the apostle of change. Parmenides on the other hand is so regarded as the apostle of permanence. However, it was Zeno of Elea, Parmenides student who devised some well known logical paradoxes that supposedly demonstrated the contradiction of motion.

Everything in the universe can be considered to be moving since motion applies to objects, bodies, matter particles, radiation, radiation fields, radiation particles, space, its curvature and space-time. This is a fact in science even though it may not appear so in actual experience. This is the more reason why motion is mathematically described in terms of displacement, distance, velocity, acceleration, time and speed. The universe is replete with forces as it has already been observed. These forces are constantly acting on matter creating motion and collision. Interestingly, the place of this random motion is the sub-atomic level of reality. And it is expected that if the fundamental laws operating at the level of reality is randomness, then we are supposed to experience the same effect in the macro world. Pagels notes that:

> Not only does quantum theory deny the standard idea of objectivity, but it has also destroyed the deterministic worldview. According to quantum theory, some events such as electrons jumping around atoms occur at random. There just isn't any physical law that will ever tell us when an electron is going to jump; the best we can do is to give the probability of a jump. The smallest wheels of the great clockwork, the atoms, do not obey deterministic laws.[93]

Granted that events in the universe do not move close to the speed of light to necessitate randomness on a wider atomic scale, it doesn't negate the fact that all objects in the universe are in constant motion. Even when a person is sitting still in a chair, the body is moving thousands of kilometers per second. The earth is spinning on its axis, carrying us with it. The planets orbits the sun, which is a star orbiting the center of the Milky Way Galaxy. There are normal everyday motions such as a rolling ball or a moving vehicle in the midst of other motion.

Since motion is defined as the change in position of any object, motion then is responsible for the changes seen in our universe. This presupposes that as long as motion is in place, things will continually change. And as long as things are changing, then we can explain the idea of decay. Force is responsible for decay, the weak nuclear force in particular. The

concept of force is also responsible for several of the familiar and unfamiliar features seen in the universe. But the interesting point is that, change of form is not the loss of energy as energy is neither created nor can be destroyed.

Africans similarly hold the belief that force is responsible for everything we experience in the universe. It is force that sets objects in motion by energizing them. Forces can be strengthened and it can be diminutive. Mbiti opines that "this state of the ultimate diminution of being is the fate of some of the dead. It is the condition into which those who have passed over fall if they have no means of renewal through those living on earth".[94] Everything then in the universe can be explained by the reality of force including motion, change and decay. But what is the ontological reality of force and change in the scientific and traditional Africa system of thought? To that the study now investigates.

4.5.1 Is Motion Real or Intuitive?

As a consequence of force, motion is real from the scientific perspective. This reality is held to be empirical because it can be observed and measured. The effect also of force is called motion and change and these are concepts in science that explains a lot of phenomena. But this scientific reality seems to be somewhat intuitive as philosophers have observed. Christian makes the point that: "we never see motion. All we see are objects that are moving. To account for what we perceive the objects doing, we create an abstraction in our minds that we call "motion". Motion, therefore, is a mental thing, not a real thing. Movement is real, we assume, but motion is created by an observing consciousness. And because moving objects follow mathematical patterns, we can symbolize those patterns; this symbolization process is also mental".[95]

Clearly then, motion has a reality that is perplexing. We think objects are moving because we observed a reference point and the distance travelled. But upon reflection as is the

case demonstrated by Zeno of Elea, we are faced with a puzzle with respect to the nature of motion. Ernest Hutten noted that, "to ask, what is real, modern philosophers have come to the conclusion that it presents a problem which, when formulated in these general terms, cannot be solved: it is not a genuine problem but a puzzle. For no possible answer can be imagined to such a general question".[96]

In order to answer the question of what is real, we would have to provide a catalogue of all the things and events that human beings have in the past, or do in the present, or will do in the future and accept it at face value. The problem and consequently its solution "does not fall into the realm of pure logic or belong to an alleged theory of knowledge, i.e. epistemology, as philosophers have always assumed".[97] To find reality has always been the aim of scientists as some suggests and we are continuously confronted in ordinary life with the problem of distinguishing what we call 'real" from what is not. The senses do deceive sometimes and theories designed to evaluate critically their evidence and to help avoid deception, are not always correct.

It appears then that the explanation of reality is switching from the not too successful logical and epistemological perspective to the psychological. This is where intuition comes into the picture as it is the direction in which explanation in science is moving. Helen Buss Mitchell wonders that: "if the world as it presents itself to us every day is as quantum mechanics suggest, largely constructed by our minds, what exactly is the difference between everyday reality and virtual reality? Isn't everything in a sense constructed? How would we go about testing what is real and distinguishing it from what we might label mere appearance? These are the fundamental questions of ontology, and they are as "alive" for us today as they were for Thales".[98]

The same problem encountered about knowing what force is in itself without an analogy is the same recurring decimal with regards to the reality of motion. Perhaps in modern science, motion has a dual nature of empirical reality and an intuitive (immaterial) one. Nonetheless, motion is taken as a "given" in modern science and what is made of this "given" is another matter entirely.

For Africans, motion is real just as force is real, but it is neither real nor intuitive in the sense of modern science but metaphysical. Traditional Africans do not approach the understanding of motion they way the scientists do because of the differences in thought systems. This point is elucidated thus:

> Force is not communicated or reduced primarily by some form of physical causality, because force does not belong to the physical order. It is metaphysical. It is therefore not accessible to scientific or empirical verification. It belong to the order of invisible entities which cannot be known but only believed in which cannot be rationally proved, but only revealed by tradition, which cannot be coaxed into action by exercising a direct causal influence on them, but only by a symbolic and ritual (quasi-sacramental) form of causality.[99]

It follows therefore that motion, velocity, speed, acceleration and the related concepts to force are nothing other than the mind ordering the categories of events in the universe. These concepts have no empirical reference frame. They can't be cognize them with the senses as their nature is bizarre and weird. The study goes a step further to examine more about the ontological dimension of motion.

4.5.2 Is there Permanence in Change?

Newtonian mechanics holds the view that the universe is deterministic and by that objects are localized so that we can predict its velocity and position simultaneously. For relativistic mechanics, light which is also a photon particle is constant in its speed. In quantum mechanics, there is no permanence as randomness is what is obtainable. If the study is reviewing

permanence and change as a predominant feature of the scientific universe, it will need to ask: which system of modern science is being referred to?

As it has been earlier observed, motion suggests some kind of movement and change is a feature of motion. Though everything in the universe appears to be permanent, change from motion is everywhere following naïve realism. Permanence and change are better exemplified in traditional African thought system because there is really no difference between both concepts as everything is linked with each other. In permanence is contained changed and vice versa. The reason for this is not far-fetched as force is being and being is force to traditional Africans. Hence everything as contained in force is 'what is' whether it is interpreted as change or permanence. How do all these have a bearing with social values, norms and behavior?

4.6 The Question of Social Values and Norms

The study reasoned that how force is conceived and perceived by a people from their thought or belief systems can to a larger extent determine what they hold to be societal norms and values. If a people perceive force that propels the universe as fundamentally material, it can affect the values they hold as well as their actions. If another set of people believe the force responsible for the universe is something metaphysical or supernatural, it can also determine how social values and norms are constructed, decided and embraced. Where a people subscribe to the material and immaterial aspect of force simultaneously, one aspect has a way of dominating the other. Social values and norms can be constructed and influenced oftentimes by the reality found in the universe thus:

> Our scientific journey to the end of the universe is also a spiritual one to the last frontier, to our existence in this cosmos. Looking at a not very bright perspective for life we may experience what Friedrich Nietzsche sums up effectively in few words: "when you look long into an abyss, the abyss looks into you", similarly we could feel emptiness in front of the vastness of the cold and dark universe in its final stage.[100]

Social values are human constructs which reveals the ideal way of thinking and acting within a society in other to achieve the "good society". One of the constitutive elements of a good society is the norms it holds. Norms are discussed within the branch of philosophy known as ethics. The term ethics is etymologically connected with the Greek *ethos,* meaning custom or conduct. It is equivalent in meaning to moral philosophy, which is similarly connected with the Latin *mores,* meaning customs or behavior.[101] Ethics can then be seen as the philosophical study of voluntary human action, with the purpose of determining what types of activities are good, right, and to be done, or bad, wrong and not to be done so that man may live well in the society.

Personal or moral norms are believed to originate in social norms or group norms, but they have become internalized and as such influences individual thoughts, feelings and behavior independently from the social context. This means that the society decides on what is best for everybody and this cannot be done outside a people's conviction for what beliefs matters most, hence morality is also a subset of a worldview occasioned by a thought system. Today as it were, the fascination and novelty of the force in the universe has made people to wonder if there is a divine providence behind it. Others have dismissed providence as responsible for the world. While some humans may act in a moral manner because of a consciousness of a Supreme Being that man is answerable to, others have taken to secular humanism with the argument that man naturally has empathy in his heart and therefore, he needs no God to be moral. These are the kind of issues that the reality of force can kick start and how we attend to them will determine the ontological leanings we are resting on. The study further moves to consolidate on the issue of whom or what decides societal norms and values.

4.6.1 Who or what determines what is Moral or Immoral?

From the inquiry of science, morality can only make sense if the universe has a purpose. This is because man is seen as a chemical and mechanical being that is made of material atoms, something in the region of Leibniz monads but without an eternal soul or purpose whatsoever. The same purported fact applies to "society" as well. The talk about moral code of action for man will be meaningless since man is one huge lump of matter or bundle of energy coming from the point of view of modern science. Thus "when we probe beyond a certain degree of depth and dilution, the familiar properties of our bodies certain degree of depth and dilution, the familiar properties of our bodies light, colour, warmth, impenetrability etc lose their meaning".[102]

Man creating a society and its rules following modern science is just out of his whims and caprices in order to live peaceable with other men and to preserve man's property as some of the social contractarians will advocate. Ethical decisions can be made by the individual but from the authoritarian and autonomous basis with the former emanating from a laid down rule "a given" while the latter arising from inside oneself. So an authority such as a deity or society can spell out rules for what is right from what is wrong[103] as well as the individual's trained conscience.

African system of thought holds that the Supreme Being who is the highest force makes known what is moral or immoral, right or wrong to humans. Hence man is not the ultimate judge of his deeds. He does not find the justification of his acts and omissions in himself. Transcending the free will of man is a higher force that knows, assesses and judges human acts".[104] Since man is a spiritual force on whom death is not an end but a beginning of a spiritual life, how he lives his life in this material universe will determine whether he will be granted entrance into the spiritual universe of the living-dead. Africans therefore by this worldview ought to be moral in a society that embraces morality as part of its makeup. For the scientific

system, if humans can accept empathy, compassion, love and kindness as fundamental to societal good in their relationship, then metaphysical issues can be ignored since what is given in science are factual and demonstrable realities. The challenge here nevertheless will be how science can demonstrate such metaphysical concepts as empathy and compassion.

4.6.2 How do we reckon Societal Values or Norms as Right?

The study has established the point that the scientific notion of force and by extension the universe and that of traditional Africa as a thought system can determine societal values and actions. This is grounded especially in the belief in the transcendental or the immanent. How then can it be reckoned which societal values or norms are right and which is wrong? The question can be answered from the formalist, the relativists and the contextualists point of view. For the formalist, the criteria to be used in making ethical decisions are universal laws that apply to all people. For the relativist, there are so many systems of customs and codes to be found in various societies, thus 'within any particular society, its own set of customs and codes is right for it since they perform the very pragmatic function of enabling the society to operate with a greater degree of internal harmony".[105]

The contextualists believe first that, moral laws of the kind held by the formalist do not exist; they also discountenance the relativist view. They hold that relevant criteria for making a meaningful ethical decision can be found only within the context of each concrete ethical problem. The three criteria may have their limitations, but if one were to select the good from each, it can give us a comprehensive whole. However, the values and norms society hold will to a large extent defines their most basic institutions. It will touch on their educational process, laws, religion, politics, customs, tradition and so on. At the end, it will determine if such a society is making moral progress or not despite its seeming material/economic progress. As the study moves into the concluding chapter, it shall tie all the discoveries made together so far as

expressed and examine how the preference for either the material or immaterial aspect of force from traditional Africa and modern science can lead to new knowledge.

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CHAPTER FIVE
EVALUATION AND CONCLUSION

5.1 Evaluation

The study evaluates some of the findings made in the course of the discourse arising from the implications of force and the convergence and divergence in traditional Africa and in modern scientific system of thought some of which are posed in a question form thus: Is reality relative to a people? Is reality culturally constructed? What agent is behind force? Do thought systems come before the knowledge of reality or reality before it? Is man wholly matter or a tripartite being with a body, spirit and an immortal soul? Does belief in God determine man's actions toward the right or wrong? Does a non-belief towards God affects man's moral actions? Has modern science given man economic emancipation but taken away his morality? Has the traditional Africa belief system given Africans morality and reverence for God but left them in poverty? Is secular humanism a religion without rituals? Which is desirable: modern science or traditional Africa system of thought? Can't modern science and African system of thought be fused together for humanity's greater good?

Man has always been on a quest to understand his existence and the universe in which he finds himself. He is fascinated as Kant opines, by the starry stars above and the moral law within. Man stands as a tiny insignificant jot before the vast expanse of the sky filled with wonders at how all these came about. Steiner captures this reality thus:

> The origin of things has always been a central concern for humanity: the origin of the stones, the animals, the plants, the planets, the stars and ourselves. Yet the most fundamental origin of them all would seem to be the origin of the universe as a whole of everything that exists, without which there could be none of the creatures and things mentioned above, including ourselves. Perhaps that is why the existence of the universe, it origin and nature, has been a subject of explanation in almost all civilizations and cultures.[1]

Since man (*Dasein*) following Heidegger is a contemplative and questioning being that is at the centre of the universe, he tries to make meaning of his existence by resolving the puzzles and mysteries of creation. *Dasein* therefore "is an entity which does not just occur among other entities. Rather, it is ontically distinguished by the fact that, in its very being, that being is an issue for it".[2] Man by his very existence, seeks to understand the complexities of the universe of force and his place in it. It is in the process that he begins to ask fundamental questions and to seek possible explanation or answers for them. A J. Ayer made the point lucidly that:

> The trend which is emerging now is that philosophy has to do with criteria. It is concerned with the standards which govern our use of concepts, our assessments of conduct, our methods of reasoning, our evaluations of evidence. One thing which it may do is to bring to light the criteria which we actually employ; another is to adjudicate if they are found to conflict; and another, perhaps, to criticize them and find better substitutes for them. One way to show what philosophy does is through its branches e.g metaphysics.[3]

It must be stressed that in seeking answers to the myriads of questions that bedevil**s** man, he creates his own cosmogony (a history of how the world began and continues, of how mankind was created and of what the gods expect of us). This is why there are several explanations as to the workings of the vast universe and man's place in it as well as their end in every civilization. But every civilization has its own explanation as clearly embedded in that thought system whether mythical, religious or scientific which clearly cannot be done outside the barrier of language.

Asouzu noted that our general outlook to the world is naturally influenced by the events happening around us, at all historical epochs. Such events influence more precisely our notion of Philosophy, human nature, society, science, law, politics etc. Again, the way we see events at all times is deeply inspired by the general ontology prevalent at any age. The spirit driving our time

can be characterized more properly as a digital computerized spirit, such that its ontological perspective can be seen also as significantly digital computer-inspired in outlook.[4]

Interestingly from historical findings, most of these civilizations seem to all begin with the acknowledging of a God or gods. It may be called primitive societies because of the perceived sophistication of science today but the fact cannot be denied that some strong rational convictions within the minds of the people may have necessitated such an acknowledgement from their contact with the vast universe environment. As Unah rightly asserts: "the first critical point here is that the question of Being and the question of nonbeing are intricately interwoven. The one could not go without the other because in the nature of human thought and in the nature of things, the question concerning something (i.e being) and the question concerning nothing (i.e nonbeing) always dovetail into each other". [5]

In scholarship today, it is common place to begin the history of thought from Western civilization particularly the Greeks. This may be as a result of contact and orientation and not that Greek civilization is of more importance and sophisticated than that of the Chinese or Aborigines. Another reason for this may be as a result of the discovery of the printing press and the availability of Western literatures in early circulation. However, the point without dispute is that every civilization where man is involved, have a thought system in which cherished beliefs are adumbrated in the form of religion, ideology or philosophy. Tsambassis elucidating on this point avers that:

> The Ionians sought to unravel the mysteries of nature; the Pythagoreans cultivated music and mathematics and formed a religious community in which the individual aimed at salvation. There were lone philosophers who expostulated oracular utterances, and there were founders of academics of learning and scientific researcher. Some philosophers were speculative, chiefly concerned with theory; others were mostly preoccupied with the practice of life-statesmanship, ethics, religion, and the arts.[6]

This fact is true with all men from whatever clime and from their history as well as their contemporary life. The meaning attached to reality is what informs culture in a thought system. And thought systems by extension determine human behaviours and actions. Modern science arose from the Ionians (Westerners) who were no longer satisfied with explanations that place the immaterial gods as the creator and sustainer of everything in the natural universe hence they sought for an alternate theoretical framework of explanation. The pre-mythological era they came to know did not satisfy their curiosity about material reality. They had to go a step further and Archibong and Usoro noted that: "the Ionians were known to be tacitly involved in proffering explanations to the 'why" question, about the cosmos. These questions are very much connected to the question of "being". They asked about the fundamental constituents of matter; they asked for the underlying substance of things; they asked from where all things emanates from. Thus, explanation still remains one of the cardinal goals of science alongside prediction and control".[7]

The history of modern science is not a very long one. Beginning from the renaissance, individual men started taking to independent private research and disseminating their ideas through the printing press occasioned by the industrial revolution. At this time too, men started investing in the production of instruments such as the telescope with which they could look into space. The individuality that permeated the renaissance era and the scientific revolution were part of the defining features for the modern era of science. Mason asserts that "science had its historical root in two primary sources, firstly the technical tradition, in which practical experiences and skills were handed on and developed from one generation to another; and secondly, the spiritual tradition in which human aspirations and ideas were passed on and augmented".[8] Ayer opines that we may begin by criticizing the metaphysical thesis that philosophy affords no knowledge of a reality transcending the world of science and common

sense. Later on, when we come to define metaphysics and account for its existence, we shall find that it is possible to be a metaphysician without believing in a transcendental reality.[9]

Western science has evolved a method that has recorded some level of progress with regards to understanding the laws governing the universe as well as the behavior of particles that constitutes this universe. There are several individuals from western extraction who contributed to the growth of science some of whom are Galileo, Kepler, Newton, Planck, Einstein, Bohr, Heisenberg and so on. They put in so great an effort both in observation and experimentation as well as mental exertion in other to come up with what is today known as the scientific method. To this end, "Western civilization is distinguished from all other civilizations by the fact that it has science. Science is a unique feature of that civilization, and we owe it to the Greeks".[10]

The scientific tradition has undoubtedly made meaningful contributions to human existence in diverse areas of needs. The union also between science and technology has seen to ground breaking feats that have added value to human life and existence. The gains of science and by extension technology are far reaching and have made the world and its culture more sophisticated though not undermining its negative effect. Economically, science and technology have led to the invention, creation and innovation of products that humans necessarily need. As these needs are met, so are the economic fortunes of the creators of such products. Countries are classified today as developed, underdeveloped or developing based on economic indices; countries with indigenous science and technology are predominantly developed countries. This is why the continuous development of science and technology is part of the policy framework of most developed or advanced countries.

But just as we can eulogies the many gains of science and its method, we can also speak sadly about its loss both materially and immaterially. Science has removed the supernatural

completely from its scheme of things even though it still gets around it somehow. Its chief concern about that which can be demonstrated empirically has left the enterprise with more philosophical problems than it can solve. Drawing the boundary that any claim that does not have a physical referent is not considered real raises more questions about the concept of observation and experimentation as a method. For instance, sound doesn't exist in nature but only sound waves. The brain creates and interprets what we call sound. This is how bizarre and fuzzy observational "facts" through the scientific method appears; yet "the scientific method emphasized the need to conduct tests and to make detailed observations of the results before having confidence in any claim".[11]

The new realization that reality and by extension truth is the observable, testable and demonstrable has led to the belief in atheism. Following the scientific method, it can be deduced that the mind is a bye product of the brain so that dreams are just the workings of the brain when the body is asleep. Death becomes annihilation, the universe has no creator and beginning as it has always existed. Morality is subjective and relative and there is no absolute truth; empathy is part of the human make-up of cells and hormonal activities and so on and so forth. These are all fundamental basic beliefs in the thought system of modern science and they determine its adherent's behaviour.

Another consequence of science is secular humanism. As an ideology or movement it revolves around the ingenuity of man, and what he makes of his existence here in this material universe without recourse to any reality external to himself. It is a system of belief which holds that life in this material universe is all there is and so it behoves on man to maximize this one life to the fullest. Man becomes the product of natural processes hence any talk about the immaterial, supernatural, Supreme Being and creator, Supreme force other than the four fundamental forces, sacred texts as a guide to truth and knowledge is scorned at as man is held as

the only reality there is and he should be able to think for himself and collectively with others in other to face or resolve his existential problems through reason, empirical research, compassion and empathy.

This kind of thinking actually has some plausibility the study concedes in all fairness for the material dimension of man only. It simply states that since supernatural or immaterial claims are outside the stretch of empirical investigation, then they be held as unreal. An adherent of the scientific method will ask by which other way might non-empirical reality be apprehended outside the senses especially when every aspect of man's experience have been reduced to natural processes? This is the kind of thinking that gave birth to science and technology.

But on the other hand, if there is actually no Supreme Being who is the creator and sustainer of the universe and man, if all the forces there are in the universe came as a result of blind chance, then it will be foolish or a waste of time to talk about what is moral, right or wrong, after life and eternal judgement. The reason being that there will be no purpose for living hence everything becomes permissible, the case of might makes right and justice is in the interest of the stronger. Wright argues that there are two forces that man had to deal with in his evolved consciousness and they are nature and gods: "one could say that humanism was born the moment when man started to reflect on his place in the world and on his possibilities of sovereign action in relation to nature and the gods. A condition of this self reflection was that the pressure exerted on him by the other two members of our triad became to some extent alleviated".[12]

Secular humanism has been accepted and is still being accepted by a large population of the earth because it satisfies the cravings and passion both emotionally and intellectually. The thriving idea is that God is a myth that is not real as far as empirical science has proven. Hence man is the only being that is real here on earth without any eternal purpose. All that man has is

this one life and when he dies, it is all over for him. This perhaps accounts for why people contemplate suicide as a way out of a permanent escape from misery and sorrow and suicide in African worldview is unacceptable as it is not an end to misery and sorrow but the beginning where the soul of the departed begins to wander about everywhere in restlessness because it is barred from entering into the ancestral world.

Udo Etuk felt that the doctrine of humanism is dangerous as it can destroy everything good and noble. From this backdrop, he came up with a re-modification of humanism called the *New Humanism*. Central to the thesis of the new humanism is that "man's dignity is not *sui generis*; man's dignity does not derive from man, nor can man confer inestimable value on another man… the dignity of man is conferred on man by the one who created man in His own image, and that to discount this factor is in fact, to devalue man"[13]. Etuk was making the point that the worth of man is tied to other modes of reality outside of himself and the universe and so are his morals, wisdom, knowledge or understanding. Etuk's version of humanism is thus theistic and is very much in tandem with African beliefs system.

African worldview makes no pretense in asserting that there is a hierarchy of force of which man and the material universe is a part. Man may be the wisest and most intelligent compared to plants, animals and mineral resources but not to the ancestors, divinities or God. Thus man is not just a composite of matter alone; he has an immortal soul that lives on after the body dies. As such, African thought system does not confer such loose freedom on man to live his life any how he deems fit. In African Philosophy, there is a holistic, theistic, panpsychic and animalistic reductionism in the sense that the furniture or categories of the universe are epistemologically and scientifically reduced to ontology. These categories, though highlighted very much in African culture have their semblances in other cultures. There are also senses in

which these panpsychic and animistic categories are emphasized indirectly in the special relativity theory of Albert Einstein and Isaac Newton laws of gravity. [14]

There has to be some regulations that will bring about order in the community of men. If man still chooses to live a reckless life, he will have to bear the consequences for such a choice. Etuk makes the point further that "the first thing that the new humanism affirms therefore, is that the environment is God's gift to man; secondly, the new humanism affirms that as important as science has been in human development, science is not everything".[15]

While western science makes room for man, the material universe and everything in it, African worldview makes room for man, the universe and God. This is the reason why force as a concept is materially inclined to the scientific tradition of the West. But modern science is now stretching its boundary as it is now moving towards the immaterial and non-observables like dark matter and dark energy. All the four fundamental forces in nature are all supposedly held as material and connected to the universe in modern science. But at the same time, they are all unobservable and metaphysically explained through causality or process theory.

Probing into what force is in itself, western science simply assert that it is a material property which causes object's motion. Whereas, in traditional Africa system of belief, force has a supernatural reality intermingling with the material. Traditional Africans who are privy to some privileged secrets can invoke a supernatural force that can suspend the laws of nature. The question is: is this feat only possible just by a mere belief system? What is the relationship between belief or a thought system and the outcome of an event?

Beliefs are held as being without substantive material evidence and it is different from knowledge as proof or evidenced based. Thus we cannot be said to believe what we already

know. Since traditional African claims are based on belief, it is usually discountenance by science because belief does not translate to knowledge as one can believe just anything without proof. However, for traditional Africa, beliefs are founded upon prior knowledge so that when the evidence cannot be repeated again or not immediately verifiable, belief would do in such a situation. For instance, if a certain people had a deity visits them who performed certain wonders which defies the laws of physics, after that encounter the event can be transmitted to a later generation who would then believe though without first hand evidence that such an event once happened. Beliefs also have some psychological satisfaction it gives to those who hold on to it and this is the same reason why modern science accept theories that do not have empirically falsifiable evidence as real such as the big bang, evolution, abiogenesis, superstring, quantum gravity and the four fundamental forces.

The reason for emphasizing this dimension of belief is because of the dichotomy between belief and knowledge is enshrined in the scientific method. Modern Science holds that knowledge is only gained from sense experience hence belief doesn't give demonstrable knowledge. Accordingly, knowledge is knowledge because there is evidence to prove that a thing is the case, some kind of correspondence with an actual state of affair or event. Since knowledge is divided into two types: basic and non-basic knowledge, Ozumba opines that 'the basic is different from the non-basic in being anchored on a justification that does not need further justification while the non-basic is anchored on justifications deriving their epistemic strength from other justifications culminating in a basic justification".[16]

Because beliefs are well enshrined in a system of thought, it can affect a people's outlook to life considering that actions held as right or wrong are part of a belief system. Belief or thought systems therefore becomes like a map that shows a people the way out of a difficult terrain. Clearly then, belief systems contain what has already been accepted to be morally right

or wrong; a sort of set of standards (what ought to be the norm) by which one evaluates human behavior and judges it to be morally right or wrong. Thought systems then ought to contain objective moral values seen as good and accepted as such by a people. Like Plato and Karl Popper, modern thinkers and scientists could not avoid depending on myths in their attempts to solving some natural problems. Among the present day scientific feats, the Albert Einstein's theory of relativity and unified theory can only be understood if and only if some propositions are regarded as self-evident that is, viewing them as myths.[17]

Looking very closely from this understanding, it will be clear that every thought system a people hold whether scientific or unscientific contains principles that can determine human behavior and the outcome of it. For example, since modern science holds the belief that man is just composite matter or a bundle of energy without an eternal soul, man then can 'eat and drink, get all the pleasure he can here and now so that as he dies someday, he goes into a state of annihilation where there is no remembrance, no reawakening and no eternal judgement by a God since there is no empirically falsified proof of a God anywhere. This perhaps accounts for why modern scientific logic is making a lot of atheists as earlier averred because of the philosophy that regulates the enterprise especially its denial of metaphysical realities.

Even though man is a thinking and contemplative being, one who raises the question of morality of his action and "by the raising of this question, it is indicative of the fact that there is something different about human that calls for morality"[16] yet his actions are heavily influenced by his knowledge findings or belief system. Modern science for instance has done quite a lot in unraveling what was once held to be a mystery about the universe of force and man. But there are still a lot of metaphysical questions it is yet to answer and may never be able to do satisfactorily because of its philosophy of "operationism" as stated by Mario Bunge. Despite that, modern science seems to disguise as having the answers to some fundamental questions of

reality through hypotheses and theories even though it doesn't have the technological apparatus to travel back in time or into the distant future.

The study's focus on western science is borne out of its perceived utility as a sophisticated knowledge yielding enterprise better than any other worldviews or thought system because of its practical achievement and gains that cuts across every nation, tribe and tongue. Following this, can man truly be said to be at the centre of the universe of force to which he contributed nothing in its formation or existence other than just a search or inquiry? Should man then argue that to know the universe and its operational laws is not as important as maximizing its potentials? Why hasn't man been able to develop yet a time travel machine that will enable him to go back into the distant past or the distant future? To attempt answering the last question, modern scientists will say it is because of the second law of thermodynamics which states that: the disorder in a closed system must increase with time and that this increase in disorder or chaos is not time-reversible. This is why a broken glass of coffee cannot be unbroken as things cannot be placed in a reverse motion in the material universe.

There are still myriads of questions yet unanswered by western science and there are still issues yet unresolved in Africa worldview with respect to force and its overall implications. The expositional analysis on force and its comparison from the western and African narrative has shown promised on one hand and despair on the other. It has revealed the strength and the weaknesses of man through his fundamental thought systems. If everything were at rest in the material universe perhaps the issue of force may not suffice. But because everything in the universe and in man is in constant motion, it becomes philosophically imperative to question and examine this thing called force identified as that which is the reason for motion and change in the material universe. That is what the study has been engaged in from the western scientific and

African worldview perspective with interesting implicational discoveries and new information. The study now moves towards a conclusion.

5.2 Conclusion

The study has so far been examining the concept of force as a basis upon which the material and immaterial realities can be meaningfully understood. The basic idea is that, since force is the reason behind the motion of objects in the universe as well as their change of state and shape, then by extrapolation, force can account for every feature we find in the material universe of man however strange they may seem. What force is and its interaction with object has an ontological basis even if it appears to be material. Thus the study contends that, how force is conceived by a people owes a lot to their most cherished beliefs or thought systems. This is why the study investigates western science and African perspectives on the basis of comparison, analytically exposing the internal logic or thinking on the subject matter of force alongside the varied implications that accrues.

Summarily, in other for the objectives of the study to be achieved, it was organized into five chapters. Chapter one examined the introduction with various outlines. There was a background of the study which traces the concept of force in the western and African worldview systems and presents the issues involved in understanding the concept of force while at the same time setting the stage ready for the discourse that ensues. The statement of the problem emanated around how western science and African system view force. This exposed the supposed superiority of thought systems (holding one belief or thought system as a paradigm for the other) and the problem of over-reliance on one aspect of reality without striking a balance i.e focusing on either the material or immaterial aspect of reality absolutely.

The purpose of study had eight points listed out one of which is to establish that the logic of every explanation of reality is first from a belief or cultural system. The scope of study followed showing the boundary of the work (both spatially and in content) some of which are: African philosophy, physics, philosophy of science, ethics, philosophy of religion and so on. The significance of study shows for whom the research will be beneficial and how. Some of the people identified are: researchers in comparative studies, philosophers of science, physicists, religious and ethical enthusiasts, psychologists, government institutions, agencies and so on. The method employed in the study, being a qualitative research is comparative analysis on the concept of force from the western and African worldviews. It focuses on the similarities and dissimilarities in both worldviews while inferring implications for human existential reality. After that, definition of terms followed such as: comparative analysis, force, Africa, science, worldview, culture and thought system.

Chapter two reviewed a wide pool of literatures that discusses the subject matter of force from a western and Africa worldviews. The essence was to do an *exposé* on previous and current discussions within the subject-matter in order to make subsequent discussions familiar on the concept of force and to show the knowledge gaps that the study intends to bridged. Chapter three examines in broad details, the framework of forces in western and African worldviews. The aim was to excavate the essence or underpinnings of forces within the discussion from both systems of thought. It left no stone unturned as the basic features or framework of forces were identified and widely discussed.

Chapter four was the defining moment of the study as the implications, divergence and convergence arising from the understanding of force from the western and African worldview system, was brought to the fore. Firstly, the logic of explanation from worldview systems was clearly identified and afterwards categorical questions such as: ontological, cosmological,

teleological, motion and change, social values and norms were posed and comparatively analyzed. The importance of this was that it afforded the opportunity to understand how a seemingly simple concept such as force could generate such profound philosophical implications for man and what becomes of his entire existence in the material and immaterial universe.

Chapter five evaluates the findings of the study in a clear and lucid manner and concludes. The comparative approach of the study enabled it to kill two birds using a stone. If the study had examined force from the basis of western science alone, it would still have been worth the while. But the study garnered advantage by examining force from the western and African worldviews. In the process it discovered that there is always something very plausible in every worldview system which complements or serves as a missing link to the other. In other words, the inadequacy in one worldview is made up in the other. This indicates that we know reality from a worldview perspective. No worldview system therefore holds the privileged position of being more superior to another. There might be conflict in worldviews but the best way to resolving it is to understand the internal logic that is prior to the belief whether it seems reasonable or not.

Accordingly, a concept such as force can be understood and interpreted in different ways from different thought systems even though it is still the same concept which science and metaphysics examine but from a different point of view and procedure. Science and metaphysics become the major systems of thought that is held by a people forming their cultural commitments. There really should be no hostility between scientific and metaphysical knowledge as they both complement each other from their diverse investigative standpoints in the determination of reality. One interesting finding in the study is that western science and African belief system with regards to the concept of force are two sides of the same coin. There are epistemic benefits that accrue from each with regards to the material and immaterial

dimension of reality. For instance, the western scientific system of thought has discovered the laws governing the material universe and from these laws, technological ingenuity is applied in producing instruments that have enabled man to lead a comfortable life thereby getting the best out of the material universe. African worldview system on the other hand has taken care of the spiritual dimension of man caring for his soul needs. The soul becomes very important to care for because it is immortal and answerable to the Supreme Being who is man's creator and sustainer.

To get the best out of this temporal life and universe is to invest heavily in western and African modes of knowing. The sophistication and advancement in western science by its method does not mean that man has no need of a God or that it doesn't also make projections that are non-observable and immaterial. The metaphysical and spiritual dimension of African belief system also doesn't mean it has no need of the western scientific method and its gains. Nothing stops an adherent of western science from being a good believer in God and nothing stops a good believer in God from being a good believer in the scientific method. Following Aristotle, there should be a mean between the two extremes so that the full benefit can be gained.

Where there is a proper engagement of any worldview system from its internal logic, it would be easier for adaptability than possible tensions or hostility as every belief and worldview system ought to be valuable upon reflection and understanding. Problem arises when a people's worldview and system of thought is disparaged because of bias judgment that the other is far reaching and superior. So far as humans have one common destiny and live in one common universe, there should be more of mutual cooperation rather than hostility.

To this end, the western and African treatment of force reaffirms the importance of the scientific method of investigation as well as the religious/metaphysical method. The former

complements the latter such that the limitation of the former is made up in the latter and vice versa. Force is then understood clearly as having a dual character which is the material and immaterial. The western scientific system takes care of the material aspect while the African system takes care of the immaterial aspect. In all, the meaningfulness of any concept whatsoever with regard to its understanding cannot be divulged of "the system of thought" that a people operates by and this is where even the method of science itself becomes a belief or thought system so that in the end, no method is sacrosanct in knowledge theorizing. It becomes a win-win situation for both worldview system (western scientific and African) with the advancement of human knowledge driving its prosperity and sustainability.

ENDNOTES

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