

***SCIENCE AND TECHNOLOGY IN SUSTAINABLE
DEVELOPMENT: AN ETHICAL PARADIGM***

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LAGOS, AKOKA, YABA.**

2007

DECLARATION

I declare that this thesis represents my original work in the Department of Philosophy,
University of Lagos.



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CERTIFICATION

This is to certify that the Thesis:

**SCIENCE AND TECHNOLOGY IN SUSTAINABLE
DEVELOPMENT: AN ETHICAL PARADIGM**

Submitted to the
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is a record of original research carried out

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DEDICATION

This work is dedicated to the Memory of my Late Father

Ihuah Aya Afotso -

and my beloved brother

Late Dr. T.A.T. Yagba,

and

my ever loving and caring Mother

Magdalene Ngusuen Ihuah

who invested all in her to have a son she will be proud of.

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ABSTRACT

Modern science and technology have enhanced man's power of manipulating and controlling nature, of reducing drudgery and improving the quality of human life, though, its uses unveils several difficult questions; it has generated many problems and has solved some as well. Today, the historical dialectics of science and technology are increasingly assuming paradoxical dimensions, more purposeful and purposeless, more meaningful and bizarre, and more useful and destructive. While the achievements in science and technology have served to prolong life, they have also served to provide resources for its brutal extermination. Science and technology provide the material ingredients which human development requires though, happiness, ethical values, spiritual well being and wholesomeness of the human person are no less needed as important elements of a humane society.

We argue in this thesis that, a pro-active ethical approach to scientific and technological endeavours guarantees a sustainable and more human friendly development which transforms the quality of human life on earth. Sustainable human development is not, and should not be a journey outward away from the essential human nature but the integral well being of man in his material and spiritual life. It involves shifting the balance of human development towards improving the quality of human life on earth. We argue further that, a civilization qualifies as development, if and only if increase in knowledge is accompanied with increase in wisdom. For, science without conscience is like a tool in the hand of a man without experience, he manipulates it at random, injures himself and destroys the environment more than he makes progress at work.

The work explicates the healing power of the science of human conduct (ethics) and recommends the morality of human integration (African humanism) as a catalyst that conducts humanity back into its essential nature on earth, to live a life that is in harmony with other members of the biotic community. This is an African communal ethic which views man, in his

existential quality, as the totality of the beauty of life, the beauty of all and the plenitude of cosmic life in whom exists the basic attribute of being externally and realised.

GENERAL INTRODUCTION

Who is man? is an interrogative that has always been posed in philosophy. Though apparently simple in as much as it regards ourselves and not some reality far from us, it is a difficult question because of the complexity of man's being. Man is physical and psychic, and at the same time, confined in the small space in a body but is able to contemplate the whole of the knowable universe. Karl Jung (1970:7ff) thus argues that, "the greatest cosmic secret and the closest to us, always remains man", whose essence remains a paradox in itself.

There is no complete agreement as to what it means to be human, and what the value of human life is i.e. of a life that is worthy of being lived by free beings, in a fruitful and serene peace. Today, man's ingenuity, and creative ideas, which find practical expression in scientific and technological revolutions, led to the invention of the machine but the disappearance of man. Indeed, the emergent world has been shaped by a metaphysics, which has in turn brought forth its science and technology, which tumble from crisis to crisis with visible signs of disaster and breakdown. Such is the scientific endeavour which proponents of western metaphysical tradition package as development.

Human creativity and ingenuity have since the industrial revolution of 1760s been increasingly applied with success to produce the most sophisticated scientific and technical civilization ever in the history of mankind. There are today tremendous breakthroughs in medical care, in agriculture, in communication, in genetic engineering, in information technology and industry among others. These unlimited creative powers of man exalt our generation as "the best of times".

However, the fallouts of these scientific and technological developments reveal that such a conclusion is but one chapter of our present day industrial society. Today, technology tends to develop by its own laws and principles different from the known system of nature. It recognises no self-limiting principle – in terms of size, speed, or violence. Thus, the turn of the 20th century has seen the dehumanization of the entire human and animal world. Today,

we are daily confronted with and affronted by the works of our hands which have failed to make the kind of common sense that could help the survival of life on earth become at least a decent possibility.

E. F. Schumacher corroborates this thinking when he stated that technology, and in particular, the super technology of the modern world, acts like a foreign body, and there are numerous signs of rejection. This according to him is because the modern world, shaped by modern technology, finds itself involved in three crises simultaneously;

First, human nature revolts against inhuman technological, organizational, and political patterns, which it experiences as suffocating and debilitating. Second, the living environment which supports human life aches and groans and gives signs of partial breakdown; and third, it is clear to anyone knowledgeable in the subject matter that the inroad being made into the world's non-renewable resources, particularly those of fossil fuels, are such that serious bottlenecks and virtual exhaustion loom ahead in the quite foreseeable future (Schumacher, 1979:143).

Additionally, modern technology has brought about the deterioration of our eco-system and the ever looming threat of nuclear war, and, or accidental detonations. What these crises indicate is the frightening level of human decline and widespread disillusionment which in turn has found expression in the high rate of suicide and drug addiction among the youth, wide-spread practice of abortion, advanced fee fraud and increasing rate of armed robbery among other vices. It remains to be known whether modern technology as we know and practise it today can really help us to alleviate poverty and unemployment in Africa. Judged against these threats, we may most appropriately describe our age as "the worst of times".

Such is the ambiguity of the modern scientific technology that one could say with some level of justification that the 20th century has seen the emergence of the machine, and the disappearance of the person; i.e. man is no longer the Imago Dei (image of God). This is nihilism, which in essence contradicts the locus of technological endeavour that is to serve man's enduring interest. As very succinctly echoed by Pope Paul VI.,

It is not sufficient to promote technology to render the world a more human place to live. The mistakes of their predecessors should warn those on the road to development of dangers to be avoided in this field. Tomorrow's technocracy can beget evils no less redoubtable than those due to liberalism-of yesterday. Economics and technology have no meaning except from man for whom they should serve. And man is only truly man in so far as he is master of his own acts and judge of their worth, he is author of his own advancement. (Pope Paul VI, 1964:7)

Progress and national development cannot ensue from an appreciation and application of the mathematical neatness of scientific theories. Events in the world, Africa, and Nigeria in particular have empirically demonstrated that theories of science that have failed to resolve the complex problems of human existence which derive from man's misunderstanding of the *raison d'être* of science and technology.

The crisis, which results from the clash of western scientific technology with traditional African humanism is more spiritual than material, more cultural than economic or political, but which affects the totality of the African, is real. Thus, Africans need a new set of values capable of turning the world around, and restoring our spiritual, social, and environmental equilibrium. This is the humanistic world-view on which to structure the discoveries of science, and on which basis technology is given a human face. There is an urgent need to create a humanised society in which development is measured in terms of human well-being not on prestigious buildings, scientific gadgets, cars, sophisticated chemical and thermonuclear weapons of mass destruction. Gabriel justly affirms that, "the new world must be constructed on the spiritual foundation of the most profound knowledge of the specific reality of man, constructed on a new foundation which must be elevated and put in the place of the old one when it fails and can no longer constitute the barrier which can repel the mountainous tide of ruin and dissolution, which mounts with an ever stronger and higher surge" (Gabriel, 1970:10).

Most fundamentally, our position rests on the principle of dynamic dialogue between western civilization and traditional African values. This, in our view, helps to situate the

problematics of man's true state in the universe, who in the words of Protagoras, is "the measure of all things that are, and things that are not that they are not". It is necessary to subject man's creative ideas to critical scrutiny to achieve adequate understanding of our actions, and particularly so, as it concerns good living. Understandably, such creative ideas expressed in practical terms or, better still in technical revolution which constitutes human development if, and only if it is given a human face. Genuine development takes place when the upward progression of scientific and technological endeavours are subjected to the dictates of reason targeted at promoting the good of man, every man and the whole man; i.e. human development anchored on ratio-ethical ideas in which skilful hands and creative brains of man serve production for the masses instead of mass production.

This work is divided into six chapters – with the attempt to satisfactorily evaluate the impact of science and technology on man and the environment as follows: Chapter one reviews the general background of the work and critiques the basic concepts that recur in the work. Chapter two discusses human creativity and the dialectics of science and technology and argues out the rationality of man as the functional basis of his being. Chapter three engages in a critical analysis of the ethical theories that underscore the impact of science and technology on man and environment. Chapter four deals with the paradoxes of science and technology in the society and argues that both enterprises have healed and killed humanity and thus conducted man outward away from his essence on earth. While chapter five acknowledges African indigenous knowledge system as a tonic that has the capacity to conduct the technologically dehumanised man back into essential human nature on earth. Chapter six concludes the work with a recommendation for a morality of human integration which consists in the true normative ethical system with principles of morality which promotes science and technology in so far as they promote the integral good of man. Such is the ethical paradigm that is here referred to as African humanism or African communal ethics which ensues

harmonious co-existence, co-operation, care and concern, and ensures sustainable human development.

CHAPTER ONE

1.0 BACKGROUND TO THE STUDY

1.1 Introduction

Man's creativity and ingenuity have been put to tremendous use in the last few centuries, giving rise to the most advanced technological civilization in the history of humankind. Today, science and technology have achieved stupendous breakthroughs in medical care, transport and communication, in agriculture and genetic engineering among many other areas of human endeavour. Scientific knowledge led to the discovery of the radio, television and telephone, which have connected people, ideas, goods and services. It is today possible by way of satellite communication to arrange a conference across the globe, moderated by a University of Lagos Professor and watched by some two billion people in several countries simultaneously. In the area of agriculture, sophisticated machines have been invented for use in irrigating arid lands and in planting and harvesting of crops. Through mechanical methods, one person can now successfully cultivate hundreds of hectares of land and similarly reap bountifully due to improved seeds and seedlings. Scientific knowledge has also availed humanity amazing knowledge of vitamins, proteins and the other bio-chemical components of food for global benefit. We have also witnessed in the twentieth century tremendous breakthroughs in medicine resulting in the near total conquest of many hitherto deadly diseases such as leprosy, small pox, malaria fever and tuberculosis, which humiliated previous generations of humanity. Today, we have a whole range of technical equipments and procedures available for keeping people alive: from anti-clotting drugs to cardiac perfusion devices, from intravenous feeding to electroshock therapy for heart, from respirators to nasal-gastric tubes, and from neurosurgery to effective antibiotics among others.

The computer is one other piece of machine in which human ingenuity has found practical expression. The super computer is said to be capable of performing two billion

calculations per second and this speed can be increased almost to infinity thus making accounting and actuary work cheap, easy and comfortable. Similarly, the digital library programme makes it possible for a researcher/student to trace any book or article in any part of the world in a computerized library within a minute.

It must thus be said that techno-scientific civilization has offered possibilities without which life would have been impossible for many; the weak would have become extremely vulnerable, since they are not equipped to deal with an otherwise hostile and unyielding nature. With this progress in knowledge humanity could be said to be experiencing the best of times. However, the stark realities of the unfulfilled basic needs of man; quality food, shelter and clothing and the rate of abuse of our biosphere, the threat of techno-scientific weapons of mass destruction, chemical and biological, on the very foundation of human life, our generation could also be described as the worst of times.

The practice of medicine for example has, through the application of scientific knowledge, unleashed unbearable considerable harm on humanity and human personality. Acts of abortion, euthanasia and infanticide and benign neglect (i.e killing or allowing to die, children born with congenital abnormalities) have attained official approval over the sanctity of human life. Progress in reproductive technology and genetic engineering promote practices like in-vitro fertilization, artificial insemination, surrogate motherhood and embryo transfer, which procedures seek to remove the mystique surrounding human generation, dignity, value and uniqueness of the human person. Similarly, the invention of sperm banks into which individuals are encouraged to donate their sperms for future use is demeaning to human life. This practice which has not only promoted market centers for commercialization of the womb for harvest and sale of foetal tissues for the purpose of experimentation, and for production of beauty products but has also offered the possibility of improving on the gene pool, has

rekindled the Nazi idea of suppressing the bad stock and propagating a race of thorough bred i.e sex selection.

Similarly, the application of scientific knowledge in the industrial sector has caused crisis in the biotic community; air, water and land have been variously abused with industrial waste to the extent that they are at present incapable of sustaining human and marine life respectively. One scientific report records that the by-products of gasoline operated cars and the generation of electricity, notably carbon and sulphur compounds, are poisoning the air the enormous increase in the production of carbon dioxide is affecting photosynthesis and the temperature of the earth. Mercury and other industrial by-products are also making fish unfit for human consumption. Non-organic materials such as discarded motor-cars and metal waste, plastic containers for beverages, and other consumer products, glass bottles, mountains of paper and the likes are potential threat to life (Friedman, 1959:521-522)

Two environmental effects may be typified here, namely, *Ozone Layer* depletion and *Green House* effect. The *Ozone Layer* described a sphere whose chemical, the Ozone gas with chemical formular, O_3 , found in great quantity is a protective layer against the sun's ultra-violet radiation which excessive quantity is harmful to human, animal and plant. The environmental pollution arising essentially from industrial concerns causes the release of such pollutants like chlorofluorocarbons (CFCs), hydrocarbons, carbon monoxide, methyl etc. These pollutants punctures the Ozone layer by creating holes through which the sun's ultra-violet rays pass, thus causing skin cancer, ageing and wrinkling and eye malfunctions in humans and slow plant growth. It also destroys marine algae and fish larvae and breakdown the chemical structures and harms DNA. It increases the incidence of cataracts and immune deficiencies and harms crops and aquatic ecosystems. (Ogundowale 2002:209).

World institute report (1997:3) observes rightly that since the Earth summit in 1992, human numbers have grown by roughly 450 million with annual emissions of carbon, which

produced carbon dioxide, the leading greenhouse gas climbing to a new height, altering the very composition of the atmosphere and the earth's heat balance.

It may be added also that the application of scientific technique has solved the food crisis and the ever-increasing demand for industrial consumables, though, it is not without adverse consequences. Bertrand Rusesell (1961:717) puts it point blank that "food production in the present can be increased at the cost of food production in the future". Prophetic in tune and content, humanity is today, using last reserves of possible extraction of fertility by artificial scientific means in such a way that we deprive the next generation of humanity, the minutest opportunity to grow its own food. Here, scientific technology is directed at promoting only the material aspect of human life though, it does that to the neglect of the spiritual sphere, which is equally important for sustainable living.

It is here instructive to acknowledge the misuse of scientific technology, which activity results in agricultural pollution with its unfriendly social and environmental consequences. We are here referring to the environmental damage resulting from excess fertilizers and agro-chemicals carried to our bodies of water such as earth dams streams and rivers by surface drainage, and in the body tissues of animals and plants. Onuobia (1991:162) has adumbrated the problems associated with this excessive application of fertilizers thus:

... the presence of larger than normal quantities of plant nutrients like phosphorus, can cause algal bloom and eutrophication of waters... (which decreases aesthetic appeal and causes a loss of recreational potential... Nitrates (on the other hand) can cause a blood disease termed methemoglobinemia in infants up to 6 weeks of age... The same process can occur in the stomach of ruminants so that livestock can also be affected by nitrate poisoning.

It is to be noted that, chemical fertilizers are now required in large amount to sustain high crop yields though, they also represent appreciable source of environmental problems which not only dove tail into these areas of social problems, but also carries into these areas, problems that have today threatened the entire human race.

Similar environmental effects could be said of agro-chemicals. Largely applied to battle a myriad of fungi insects and other pests to reap the benefits of high food production, its uncontrolled, and or indiscriminate use has brought about incalculable disaster on humankind. For example, the chlorinated hydrocarbon pesticides said to be persistent in the environment have decomposition half-lives of ten to fifteen years, meaning then that they will be present in the biosphere in appreciable amount for nearly a century. As argued by Onuobia (p. 164).

Persistence pesticides often find their way into the aquatic environment. Surface run-off after rain or irrigation carries the pesticides to nearby lakes and streams where they are incorporated into algac and plankton, these are eaten by small fish, aquatic insects and other invertebrates in which the pesticides further accumulates. Finally, these concentrates agricultural positions end up at the end of the food chain in the bodies of predatory animals, large fish and birds of prey, which are likely to find their way into the human body system.

This means for us, a vicious cycle which implication points to a bleak future for a humankind that patronizes scientific techniques without question and caution. Man, it is argued, must act within the principles of the ethics of right appetite which itself is the conformity of man's desires to his rational nature. This is to say then that, man's choice, which results in disaster or self-destruction, is at best irrational.

In the area of Ammunition industry, techno-scientific knowledge has so empowered humanity that it now lives in dread of the hour. The Hiroshima and Nagasaki experience of 1945 still haunts humankind presently. Scientists and technologist have perfected and developed bio-weapons agents that could be used by terrorists as tools of warfare to cause mass death and disease. Bio-warfare comprise bacterial agents, viral agents and toxins. The most dangerous ones include Anthrax, Batulimum Toxins, Brucellosis, Cholera, Clostridium perfigens Toxins; Congo Crimean Haemorrhagic fever, Ebola Hacmorrhagic fever, Ricin, Rift valley fever; saxitoxin, Small Pox; Staphylococcal; Enterotoxin B, Trichothecene Mycotoxins, Tularemia; and Venezuelan Eguine Encephalities (Kanwal, 2005:4). Indeed Acquired Immune Deficiency Syndrom (AIDs) is said, to have been developed as a biological weapon and used

as Polio vaccine in Zaire. (Ogundowole, 2003:63-65). Today too, the atom that hitherto served to meet the energy requirement of the world population has since been used as instruments of self-destruction as witnessed in the aftermath of accidents at nuclear facilities in the United States of America, Britain, India and Ukrain.

In the Chernobyl nuclear accident alone, large amounts of uranium and other radioactive material were released into the environment. The International Atomic Energy Agency (IAEA, 1996:7) reports the effects of such radioactive elements from a human health and environmental angle that, a total of 237 occupationally exposed people were admitted to hospitals, and 134 were diagnosed with actual radiation syndrome. Of these, 28 died within the first three months, while at least 14 additional patients died ten years later. Scientific studies conducted thereafter reports that there had been a sharp increase in thyroid cancer among children from the affected areas. By the end of 1995, Oyeshola (1998:52) reports, about 800 cases in children under 15 years of age had been diagnosed, mainly in the northern part of Ukraine and Belarus. Similarly, the radioactive contamination of the vast areas has impeded normal industrial and agricultural production, created anxiety among the population, irritability and general feeling of hopelessness, fear about the future and inability to adjust thus impacting negatively on the economy and on resources for health care.

Similarly, informatics and communication have opened new chances for humanity though it involves new challenges and dangers. In the television industry for instance there is constant drift towards more screen violence greater use of obscene language and ever more explicit depictions of intimate sexual activity. Furthermore, an American Journal of Medicine is reported to have given a clean bill of health to cellular phones though, a scientific study by Joseph Kallol has established a relationship between the use of cellular phones and brain damage, and that in children, cells and bones tissues are affected most due to radiation (science report, V.O.A (January 27, 2004) Information and communication has no doubt

integrated the world and has made it a truly global village, it has also rubbished human dignity. The western media for example impose its own problems, its own world view, its own system of values, its own ethical and religious approaches to the Africans to whom it is all totally alien by and large. The inflow of show business and mass culture from the west breaks the earlier ideals, distorts population system of values and life orientation. It implants the consumer ideology, sexual licentiousness, violence, and material success at whatever price. The Internet is typical in this regard. One can wander into a virtual Neo-Nazi beer hall or pornographer's library and no one is there to stop or direct you. One could wander alone in singles site to be tutored in the latest sex styles, and how to make and use homemade bombs.

It is thus reasonable to say that the horrifying truth is that, so far as much technology is concerned, no one is in charge, thus creating the feeling in today's global neighbourhood that life has lost its significance. The chariot of human development has gained momentum and it seems to be running amok without a charioteer. That the forces of science and technology have created and are creating unheard of material bounties for humanity, they are improved means to an unimproved end. Today, humanity is through the discovery and use of the tremendous hidden world of energy and potency of the atom, on the threshold of utter self-destruction. The misuse of modern science and technology has posed the greatest threat to humanity by carrying it away from its essential nature. In this work, we establish that genuine human development is premised on human activities geared towards the promotion of life on earth. It is a conscious endeavour to: *act in such a way that the effect of our action will be compatible with the permanence of an authentically human life on earth.* Devendra Kumar (2001:2) makes the same point thus:

We could learn from the bees the manner we serve nature and get its sustenance simultaneously. The more the honey it collects from flowers, the more it serves in the propagation of the plants by helping in their fertilization. We could emulate the bees by fulfilling our needs through a similar symbiotic relationship with nature.

Such is the philosophy of sustainable human development that must guide the biotic community. It is informed by a nonviolent and gentle attitude towards nature. It is a consciousness of the limits in which we must live in order not to degrade our environment and ourselves. This represents the spirit of the *African humanistic heritage*, an African moral philosophy that ensures care, concern, co-existence and communal responsibility that ensures a harmonious relationship with other members of the biotic community.

1.2 The Thesis

We argue in this thesis that, a pro-active ethical approach to scientific and technological endeavours guarantees a more human friendly development, which transforms the quality of human life on earth. Sustainable human development is not, and should not be a journey outward away from the essential human nature. Techno-scientific forces should lead to a qualitative balance of body and soul. African humanism is argued in this work as the ethical paradigm for sustainable development, it entails the integral well being of man in both his material and spiritual life. As humanity develops economically and technologically, it involves the balance of short-term thinking and immediate gratifications with long-term thinking for future generations, by shifting the balance towards improving the quality of life on earth.

1.3 Statement of Problem

Science and technology are two interrelated endeavours of man. Modern science and technology have enhanced man's power of manipulating and controlling nature, of reducing drudgery and increasing the quantity of goods and services for humankind. In particular, it has made tremendous positive contributions in the area of agriculture, information and communication, electricity and electronics among others. In the area of medical technology, tremendous contribution has been made towards the generation of human life through such state-of-the-arts techniques as embryo transfer, laser surgeries, low tuber ovum transfer,

genetic surgeries, ultra sound, amniocentesis among others. Most recently, science is close to one of the most terrifying innovations in human history: the possibility of cloned or getting engineered human beings. Such application of human creativity may qualify as development through, which the material and temporal needs of man are met.

However, the use of scientific technology unveils several difficult questions; it has generated many problems and has solved some as well. In the face of this paradox, man's continued existence is not only threatened, humanity and its environment is at the threshold of utter disaster due to the negative effects of science and technology. Today, the historical dialectics of science and technology are increasingly assuming paradoxical dimensions, more purposeful and purposeless, more meaningful and bizarre, and more useful and destructive. While the achievements in science and technology have served to prolong life, they have also served to provide resources for its brutal extermination. What this means is that increase in scientific knowledge and technological know-how itself is not enough to guarantee human development. Science and technology provide the material ingredients which human development requires though, happiness, ethical values, spiritual well being and wholesomeness of man are no less needed as important elements of a humane society.

In this connection, it is germane to raise again the question of what constitutes development in the first place, and what constitutes the role of normative science of human conduct in the endeavours of science and technology in the enterprise of a sustainable human development.

Our study is a humanistic interpretation of the question of the implications of science and technology in human development. The epoch of modern technology poses the gravest danger because it is the epoch whose characteristics is to conduct humanity out of its own essence. If a scientific civilization is to qualify as development, it is necessary that increase in knowledge must be accompanied by increase in wisdom, the definitive norms of right conduct.

1.4 Aims and Objectives of the Study

Any culture or society or age that does not submit its sciences to the critical leadership of philosophy heads to confusion and low rationality. This statement underscores the purpose of this study. Thus, the study sets out to evolve an ethical paradigm for evaluating the impact of science and technology on man and society in sustainable human development.

Using African humanistic heritage i.e. wholeness of the human person, the work further aims at *elevating scientific* and technological endeavours to accord with the good of the integral human person. For, science without conscience is like a tool in the hand of a man without experience, he manipulates it at random and injures himself more than he makes progress at work.

In specific terms, the research aims at achieving the following objectives:

- i. To reinterpret and contextualise the rationale of contemporary science and technology
- ii. To expose the true essence of science as distinguished from the modern physical science on the one hand, and to link the true essential nature of technology on the other.
- iii. To espouse the problem (or dangers) of modern technology as a revealing of phenomena, often far removed from anything that resembles "life and nature" in which human intrusion not only diverts nature but also fundamentally changes it, in the direction of domination of nature.
- iv. To examine critically the dialectics of western scientific civilization and locate the increasingly paradoxical dimensions of this civilization; more purposeful and purposeless, more meaningful and bizarre etc.
- v. To bring to sharp focus elements of ethical values, spiritual, well being, wholeness and contentedness in our appraisal of science and technology.
- vi. To evolve an ethical approach for sustainable human development through the African humanistic heritage.

1.5 Research Questions

Our research is focused on the central issue of the functional role of ethical values in the endeavours of science and technology for sustainable human development. The research tackles the following questions:

- i. What are the limits of human scientific knowledge about nature that should encourage prudence and caution from both those who want to reshape it and those who want to preserve it?

- ii. What is the role and limit of morality in the enterprise of science and technology?
- iii. What does the good life for man, one of the many members of the biotic community consist in this era of the threatening forces of techno-scientific civilization?
- iv. How ought the theoretical and practical knowledge of man be used in setting him properly on the road to his dignity and destiny; of sustainable living in the biotic community?
- v. What is the relationship between African indigenous knowledge system and the common good of man?

1.6 The Significance of the Study

Our study highlights the fact that the historical dialectics of science and technology are increasingly assuming paradoxical dimensions. While the achievements in science and technology have served to prolong and heal human life and the environment, they have also become means for the dehumanization and destruction of both human and non-human life. The findings of this study constitute a critique of science and technology in man's increasing quest for sustainable development.

The study would improve the knowledge of what is entailed by one-sided development of the material dimensions of the universe, which leads to the relegating of ethical and spiritual knowledge to the back burner.

The point of significance here is that science and technology will always be deeply permeated by value commitments. Hence, a scientific and technological culture requires for its substance an adequate knowledge of the role of value orientation and ethical consciousness in the development process. Our study contributes to the on going debate on the future of man in a technology-driven industrialized world from the perspective of African humanism which philosophy advances the integral good of every person as an interdependent part of the biotic community.

1.7 Operational Definitions

In furtherance of our critical evaluation of the impact of science and technology on humanity and the environment, we shall endeavour to clarify the following concepts:

(i) Science (ii) Technology (iii) African Humanism/Ethics (iv) Sustainable Development (v) Human person (vi) Essence

(i) Science:

Science means "knowledge", used in a wide sense, science is the systematic study of anything according to laid down intrinsic principles (i.e scientific methods). Thus, any study carried out using this model is a scientific study. The knowledge derived from such a study is scientific knowledge. In the narrow sense of the word, science is restricted to the positive or empirical sciences such as physics, chemistry, biology among other areas of the physical sciences. Our work adopts its wide sense of usage in the tradition of Aristotle through the medieval to contemporary scholars who as it were used the term to mean *episteme* i.e theoretical knowledge

Etymologically, the word science is derived from the Latin word *scientia*, i.e. "knowledge". Understood as a human activity, science seen as "knowledge" is a human undertaking to learn about the world around us through a special method called "scientific method". Suffice it to say, however, that, there is no univocal definition of science. This is partly because the standpoint from which authors look at science differs. In his book *What is Science?* (1952) Norman Campbell writes that science can be looked at from two aspects: firstly; science is a body of knowledge and a method of obtaining it. Secondly, science is a pure intellectual study, and so in this regard akin to painting, sculpture or literature rather than the technical arts. Understood in this light, science aims only at satisfying the needs of the mind and not those of the body. It appeals to nothing but the disinterested curiosity of mankind.

We may say perhaps that though limited in scope, the second definition of science is closely linked with the first. Both project science as a whole body of knowledge, logically interconnected and directed at achieving some desired goal; spiritual or material. Such an endeavour requires systematic coherence, objectivity and standardised method as its important ingredients. This conception of science may have informed Amadi's definitions of science, that it could also mean (i) knowledge, especially of facts or principles gained by systematic study. (ii) a particular branch of knowledge especially one dealing with body of facts or truth systematically arranged and showing the operations of general laws as the science of mathematics. (iii) systematised knowledge especially of the laws and facts of the physical or material world. He thus sums up science as,

the pursuit of knowledge and understanding of the natural and social dimensions of our world of observations, formulating descriptive systems by controlled experiments to determine the degree to which these systems represent the phenomenal world etc. (Amadi, 1991:185).

Understood as such, science is concerned with both man and his ways as much as everything that is foreign and external to man. It is a branch of pure learning which is concerned with the properties of the external world of nature; its business is to find out accurately what those properties are, to interpret them, and to make them intelligible to man. The intellectual satisfaction at which its aims would be secured completely if this external world could be reduced to order and be shown to be directed by principles which are in harmony with our intellectual and moral desires. As an intellectual endeavour, science arose ultimately from man's desire to understand the world. Perhaps it is this understanding of science that the complex adjectival form of the world "science", namely "scientific" i.e. *knowledge – making* has today come to be accepted as the real province of science which in the early beginnings was the original enterprise of natural philosophy. No wonder, therefore, that science has come to be accepted as "the making of knowledge i.e. research instead of knowledge as such. Thus, science described as such is the systematic process of making

knowledge; of building knowledge.

It is this quality of science that Ogbinaka (1998:178) writes that the intellectual frontiers of science have ever been expanding, with very little of its contents being dropped. Quoting from the *Encyclopaedia Britannica* vol. 6, he argues further that, this conception of science has provided very strong basis for the following concepts of science;

- (a) Science can be taken to be a mood in which the world is considered. Being a mood, we should accommodate its changing states. Just as no man is always in the same mood, and no man of science remains permanently in the same scientific mood.
- (b) Science is always developing. It is not a static body of knowledge.
- (c) Science is more of the making of "knowledge" (i.e. in contradistinction with a claim that it is "knowledge itself", so it is close to be called a research; a method employed in pursuit of a goal which involves "the acquisition of systematic generalised knowledge concerning the natural world; knowledge which helps man to understand nature, to predict natural events and to control natural forces."

This again involves the use of previously accumulated knowledge to construct general theories or systems from which testable hypotheses can be derived, and the testing of such hypotheses is carried out quantified observations under controlled conditions.

One may ask whether such a conception of science, as argued above is adequate for the analysis of the impact of science on human development, but in particular African development. We argue that such a conception of science reduced to a "method" employed in pursuit of a goal is inadequate on the following grounds:

- (a) As the acquisition of "systematic" generalised knowledge concerning the natural world, science is made to be a scarce commodity reserved only for the west to the exclusion of the developing world. But this is clearly fallacious, for science is a widely distributed commodity, found in every culture and tradition.
- (b) Science as a whole is a process, which transcends particular scientists, research teams, and institutes. Hence, to argue that scientific goals encompass outcomes toward which movement occurs is to miss the point. Put in proper perspective, a "goal" as usually understood is an outcome toward which people strive, or more generally toward which the internal functioning of a system is directed. Suffice it to say, then, that the meaning of a statement attributing a "goal" to such a process would require clarification. No doubt, science produces certain outcomes, and some of these outcomes are goals of individual scientists and research teams; but it does not necessarily follow that science must be defined in terms of movement towards that goal. As rightly confirmed by

Richter:

It is entirely possible that the most significant aspects of science involve movement, over a long time span, in directions which have not been intended or recognised by scientists generally, and which have emerged accidentally, even if there has also been movement in directions, which may be identified as corresponding to a "goal" of science (Richter, 1972:4).

- (c) Even if science is defined as a process of moving toward a goal, it does not follow that science thereby becomes equivalent to a "method". Rightly defined, a method is a process employed deliberately in pursuit of a goal. It refers to the specification of steps, which must be taken in a given order, to achieve a given end. As a function in scientific inquiry, "methods are used within scientific inquiries. "However, the concept of method cannot reasonably be applied to some important types of events through which the findings of different inquiries are interpreted and integrated by the scientific community as a whole." This is because the nature of the steps and the details of their specification depend on the end sought and the variety of ways of achieving it.

We may thus argue here that the concepts of goal and method used as a quality of any scientific endeavour can only be recognised as applicable at relatively microscopic levels. As Maurice Richter (ibid.) concludes on this matter, that, when we seek instead to analyse science macroscopically, taking into account not merely what happens within particular research projects but also the integration of findings of many such projects in different disciplines over centuries, the concepts of goal and method appear to lose their relevance. The method of science therefore vary according to whether its end is taken to be the conquest of nature or the discovery of truth and in the light different theories about the relation between those ends and man's primitive condition of impotence and ignorance.

The conceptions of science as a social institution, as an occupation and, lastly, as a profession are also inadequate insofar as they imply a comparatively stable relationship between science and society, with science performing certain functions or services on a relatively consistent basis. The way ahead here is the conception of science as a cultural process which alternative avoids the difficulties and shortcomings of the above conceptions. Science as a cultural process is associated with a distinct view of nature as operating according to general laws which remain largely hidden under ordinary observational circumstances but

which can be uncovered through systematically controlled observation and experimentation as for example Isaac Newton's one set of proposed laws; the law of gravitation; the principle of calculus and the compound nature of light; and his three laws of motion (Richter 1972:16). Such scientific laws, as they are many, provided an overwhelmingly impressive demonstration of potentialities of this approach, thus reasonably and clearly differentiated from such related phenomena as philosophy, religion, technology and magic, among others.

Understood as such, science involves observational procedures, patterns of arguments, methods of representation and calculations, and the evaluation of the grounds of their validity from the point of view of formal logic, practical methodology and metaphysics. Certain basic characteristics distinguish scientific knowledge from other sorts of knowledge. They include, among others, observation of facts, collection of data, experimentation, and research; a sort of a self-contained logical relationship empirically demonstrated as valid under given conditions.

We may index our clarification by arguing further that science has its aim (*locus*) and end (*telos*) in man, and must be so defined not only in terms of its relevance to the society in general but to man in particular. Hence the *locus* and *telos* of science can be more properly understood when we analyse its "two-factor theory" i.e. the realist theory of Galileo, and the instrumentalist theory of Bellarmine. According to the realist theory, science aims at telling the literal truth about the world. It aims at knowledge of how the world really is, in its intrinsic sense. The instrumentalist on the other hand sees science as aiming to provide useful aid to thought about everyday world, which is in turn directed toward organizing and improving our lives within this world. On the other hand, the intrinsic value of science undertakes the expanded grasp of the interrelatedness of all reality and, thus, situates science in the context of its inherent value to humanity. Hence science is for the ultimate good of man the whole man. St. Thomas Aquinas very lucidly captures the true scientific endeavour thus: "Any culture or society that does not submit the sciences to the critical leadership of

philosophy (science of the ultimate good conduct) heads to confusion and low rationality” (Nwoko, 1992:12).

While not arguing against the instrumental value of science, we hasten to say that this form of scientific endeavour is a one sided intellectual knowledge which in itself distorts one’s view of life and exaggerates scientific form and method to the detriment of its solid content. In itself, such a scientific world-view is based on individualism, dry rationality and therefore inadequate for human development. Science in its solid form and content involves a moral issue. It is tailored towards enlightenment and mastery of nature for the service of mankind. But its unguided endeavour (instrumental value) can lead us to ruin; hence Sophie Oluwale emphatically warns that “if we allow ourselves to be carried away by the innumerable physical successes of science, we may invite our own doom too” (Oluwale, 1991:21).

(ii) Technology

Technology is rooted in the Greek word *techne* meaning “art” (from the Latin *ars*) and *Logos* meaning “word” or “speech”. Thus understood, *techne* and *Logos* combined to give “technology”, means a systematic study of techniques or principles or method in the achievement of a rational end. From this etymology emerges several definitions of technology which include:

- (a) Technology is any application of the discoveries of science, or any scientific method, to the problems of man and his environment in peace and war (Barry 1983:625). It refers to all ways man uses his investigation and discoveries to satisfy his needs and desires.
- (b) Technology is the methodical utilization of natural resources and forces (on the basis of the knowledge of nature) in order to take care of man’s needs (Brugger 1974:411)

Technology entails the right reason for the application of “skill” or the discoveries of science; “art” or “technique(s)” in medicine, agriculture, industry, information and communication, engineering etc for the integral, sustainable development of the human person.

Truly, technology has a philosophico-scientific basis. This involves the art of questioning principles, which in the long run guides us in utilizing the ideas of science and the instruments made with human hands. Here, the value of human existence forms the central issue in our technological endeavours. The real role of reason in technology is in determining what to produce, how to produce and for what purpose. It is only in this way that humanity knows when to heal and when to kill.

Admittedly, reason is the basic instrument for the foundation and growth of technology. It is this rational element in man that assists him in his understanding of his environment. Man's rational element assists him to arrive at concepts which give an answer to the question about the nature of things and which show the proper relationship between nature, man and the whole of reality, including the absolute.

This is a philosophy of technology, which gives man the fundamental knowledge of nature, answering the question about the nature of things in order to generate workable techniques to tap resources and forces of nature. It also controls, directs and orients man towards the proper *telos* of nature with reference to the whole reality, the good of man himself and in reference to the ultimate Being. The issue in question here is that the relevance of technology can only be found in its rationality; that, technology is of man, from man and for man. As more correctly averred, it is based on man's knowledge of himself, his nature, and his needs, and the judgement of the work of man must be based in turn on philosophical knowledge of man. Perhaps, it is in this spirit which is particularly African, that Nwoko qualifies technology as "the total knowledge and skill available to any human society, for industry, arts, and science" (1992:15). This clarification is deliberately put forward to accommodate the spirit of the developing worlds in contradistinction to the western intellectual tradition that accords linguistic and positivist analysis, an epistemological credit of utmost importance. Western civilization is founded on dry metaphysics whose intellectual

culture is characterised by a separatist, analytic, subject – object ontologico-epistemological foundation, individualistic written tradition and a metaphysical structure that subordinate spirit to mother and man to things.

It can be seen from what has been said above that technology involves creating new tools and products of tools” and that the capacity for constructing such artefact is a human characteristic. But, the capacity to create things is not instinctual but epistemological. It results from the capacity to think systematically and creatively about techniques i.e. the art of doing things. This attribute does distinguish man from several other species of living things that make artefacts which are the result of patterns of instinctive behaviour and which cannot be varied to suit rapidly changing circumstances. Man, unlike other hominids, uses rationality as a guide in making tools which thus confers on him the title of a technologist i.e. man; the tool-maker (homo-faber).

As a technologist, man uses his rational faculties to devise techniques to change his environment for the better (though, his irrational faculties may spell doom as well). R. A. Bu captures this forcefully thus:

In using his rational faculties to devise techniques and modify his environment, man has attacked problems other than those of survival and the production of wealth with which the term technology is usually associated today (Britanica vol. 28:441).

Beginning with the Stone Age technology down to the 20th century, man has traversed every area of human endeavour thus impacting on agriculture, medicine, information processing and information systems, transportation, electronics, genetic engineering and military technology among others. Clearly, the history of technology reveals a profound interaction between the incentives and opportunities of technological innovation on the one hand and the socio cultural conditions of the human group within which they occur on the other.

(iii) African Humanism/Ethics

Ethics is derived from the Greek word *ethos*, which means "character", and in plural "manners". The synonym moral is derived from the Latin *moralis* which Cicero used to render the Greek *ethikos*, meaning "character", "manners" or "customs". Such etymologies suggest that the ethical refers to one's own relationship to his and others' manners or customs.

Ethics is the branch of philosophy, which studies the norms of human behaviour. It is a systematic study of the fundamental principles of the moral law (Omoregbe, 2003:4). Used in this work, African ethics is a normative science of human conduct concerned with the way Africans, in all their endeavours, ought to behave; it is the norms of conduct to which the actions of Africans ought to conform. It is here referred to as African humanism and covers the communal ethics or norms of the indigenous African populations in their interactive behaviour.

Humanism refers to a philosophical system of thought that makes man its point of focus. Its origin dates back to the renaissance period (15th and 16th C). Understood initially as an intellectual movement for the appreciation of the classical culture bequeathed by antiquity humanism (and the humanists) promoted liberal education in form of *studi humanitis* which sought to express concern with the problems and values of human living.

As a *being* from whom all things come, and for who things are meant, and with whom things are and will be, man has an absolute value, and hence an absolute dignity. The issues in contention here therefore concern the ontology of man; what is man? What is his origin? What is his destiny? What are the instruments of the realization of his destiny? etc. In seeking to answer these questions, one does not resort to intellectualism that bears little or no relevance to real existential life. Rather, it is a pragmatic unveiling of life in its experiential outlook in relation to oneself, to others and to one's creator. Thus, humanistic philosophy seeks to understand man as the measure of all things. In the proper context therefore, he is the

one who defines himself, knowing who and what he is, and is able to judge why he is and where he is, and where he should be going. This understanding similarly determines how he should live his life, how he should appraise reality around him in relation to what he is and what his destiny is. Ultimately, this philosophy crystallizes what he (man) considers to be the basis of being (ontology); the kernel of his relationship with his origin or creator (religion).

When this philosophy is related to Africa, it is referred to as Afro-humanism i.e. embracing the elements of the African man expressing himself, in his society, in his religion, in his economy and in his entire culture. For the African, therefore, the "development" resulting from science and technology has relevance only as far as it promotes the integral well-being of the human person; his totality. The defining principle of this philosophy is *communionism*. The African man is a communion-man, the microcosm of reality or *being* made perceptible to itself, a complementarity *being*. Understood in this light, Afro-humanism is more than a philosophy of life that brings values and meaning into life in the here-and-now. It represents a living worldview in which human life is understood in relation to reality in the following ways:

- Man as a question to himself (the person).
- Man in relation to the world of *the other* (other realities).
- Man in relation to his God.

This epitom-stance of man in the existential progress find explication in the etymological analysis of the concept of man in African thought. The concept of *Mmadu*; that is, the beauty of life among the Igbo more appropriately reflect the *being* of man.

In contradistinction to other forms of humanism, African humanism harbours a peculiar vision of man and society, that is, to care for what is noble, for what is beautiful and for what is gentle for humanity. Man in Africa is thus understood as the totality of all that is good. Such is why the Igbo call him *mma* (beauty) and *ndu* (life) i.e. the beauty of life, the

beauty of all (material and spiritual). This philosophy of life is further passionately expressed in Igbo names thus;

- (i) Mmaduka (The human person supersedes wealth)
- (ii) Ndubuisi (Human life is first or supreme)
- (iii) Ndubueze (Human life is king)

The Tiv similarly reflect this basic principle in names like;

- (i) Orhemba (Man is supreme or human life is supreme)
- (ii) Orngu (Man is the totality of existence – material and spiritual)
- (iii) Uma (Human life transcends material things)

Expressed as such, African humanism advocates a vision of society centered on the human person and his inalienable rights, on the values of justice and peace, on a correct relationship between individuals, society and the state, and on the logic of solidarity. It is a humanism capable of giving a soul to economic progress itself so that it may be directed to “the promotion of each individual and of the whole person”. Unarguably the centre of the universe, man, to the philosopher, is an explorer who finds himself on a strange island, without a knowledge of his origin, his mission and the nature of his environment. His ship is the world itself, its propeller time. Both carry him along in an irreversible manner. And there is no going back. But man is not chained to one spot on the ship even if his movements are limited by its size. He has the freedom to move within it. Given this strange and constricted environment, Oluwole argues in agreement that, man needs as much knowledge of the nature of his environment as possible. She says:

He needs to know its physics and geometry; the contours and all the available routes for his journey within that ship. He must therefore understand the nature and relationships of the different features, their effects on each other and himself as well... He can make reasonable choices on if he is aware of the possible utility of what he chooses. This then is the invaluable sense in which the discoveries of science provide a fundamental guide to human existence (Oluwole, 1991:42).

This is an argument to the effect that man's knowledge of himself and his environment is essential to the question of existence and development. This has to do with the question of his personal needs, desires, and wants to be satisfied. It traverses the attitude of objects and features around him and argues out which of these desires, needs and wants, as well as the attitude of objects and features around him, which alone or together act in the promotion of his essential interest. In particular, how does he relate with other beings in the universe and how do their existence and choices affect his own? Such fundamental questions are connected to the question of human existence, and answers to which affect man positively or negatively. When it affects him positively, it is said to be human development – science and technology with a human face. When he is affected negatively, it is undoubtedly evidence of poor level of scientific and technological development founded on dry rationality and the manipulation of nature by technology, and the culture of excessive consumption patterns and materialism.

The concept of humanism argues that man is the centre of the universe, and as such it is through him, with him and in him that science and technology has meaning. Revealed as “the attitude of mind which attaches primary importance to man and to his faculties, affairs, temporal aspirations and well-being, the concept (humanism) itself is derived from Latin *humanus*, “human”; derived from *homo*, “man”, *homines*, “mankind”, often regarded as the characteristic attitude of the renaissance in western Europe. Essentially the Renaissance asserted the intrinsic value of man's life before death and the greatness of his potentialities.

In the 20th century the concept assumed additional quality. F. C. S. Schiller packaged it as the special name of his own version of pragmatism maintaining that all philosophical understandings stem from human activity, thus reaffirming Protagoras' contention that “man is the measure” against what he called the “intellectualist” philosophies, whether represented by Plato, by Hume or by the idealists of his own time. In its broad sense, the concept is “a philosophical outlook centred on the autonomy of the human being as a dignified, rational

being, possessing the source of truth and right" (Schiller, 1993:353). The central issue in humanism is human reason, which acts as the final court of appeal, and its goal is the greatest good in this finite existence, which may or may not be linked with religion, science, or any specific social system. However, in the late 19th and the 20th centuries, and in response to the dominant role of science, and in reaction against the growth of naturalism, humanism reappeared as an articulate movement in a bewildering variety of forms namely scientific humanism and religious humanism among others.

Scientific humanism on the other hand aims to supplant religion and make scientific knowledge the instrument of freeing man and enhancing his life. Religious humanism on the other hand argues for man's innate ethical sense i.e. the higher will, thus making reference to a spiritual order beyond man, from whom all things come, and to whom existence has meaning. Heretical though, they argue that ultimate reality, is to be found within human beings, and expresses itself in a Christ-like dedication to their total well-being. (*Encyclopaedia Americana* vol. 14:553).

We state here that humanism, whether scientific, atheistic, religious or any other, is one in regarding man as the measure of all things. We may argue in summation that humanism in all its expression is one in regarding education as man's single and most important enterprise through which the living tradition of human knowledge and wisdom give direction to scientific development and prepare people for the forces of change. To this end, science and technology must be humanised and socialised, and man educated to respond positively to rapid change.

More clearly, the concept of humanism find expression in the Catholic Vatican II document when it urges everyone to look upon his or her neighbour (without any exception), with dignity, and come to the aid of all who are in need, whether he or she is an aged person, a refugee, an illegitimate child, a sick or economically disadvantaged person. It states:

All offences against life, such as murder, genocide, abortion, euthanasia and wilful suicide; all violations of the integrity of the human person, such as mutilation, physical and mental torture, undue psychological pressures; all offences against human dignity, such as sub-human living conditions, arbitrary imprisonment, deportation, slavery, prostitution, the selling of women and children, degrading working conditions where men are treated as mere tools for profit rather than free and responsible persons (Flanery, 1975:928).

Such understanding of humanism argues for a people-centred development, in which economic and technological development must put the good of the human person at the centre, "since the order of things must be subordinate to the order of persons and not the other way round". Perhaps the concept of humanism can be further enriched by adding a transcendental flavour. The human person, it is argued here, reaches beyond himself or herself. Better captured, "man surpasses man". Such philosophical reflections on man, instigated by Karl Rahner and John Macquaire set out to argue that, the human person exist simultaneously in nature and super-nature. Anchoring his argument on the fact that the human being has dignity in his or her essential structure (wesensstruktur) and also as a task (Aufgegebenes) to be accomplished. Karl Rahner posited syllogistically that,

In his or her personal nature, the human person is spirit, freedom, an individual (that is, unique, never to be totally deduced). Since the human being is unique with an eternal destination and destiny, "the individual person who is now, may never be forcibly sacrificed, in a manner which destroys him for the sake of humanity, or for the others who come after him. The present is never just the material for a utopian intramundane future (Rahner, 1963:239).

Ensuing from this conception is the inherent and intrinsic value of humanity which not only surpasses all other consideration, but cannot be destroyed for any other consideration. In so far as the human person is a being who possesses himself or herself knowingly, and in freedom, he or she does not ontologically have the character of a means, but an end. He or she has an absolute value and hence an absolute dignity. Such is what nature of man the Pythagoreans had in mind when they say "man is something intermediate between God and the brutes... compared with the gods he is a mere man, subject to error and death; compared

with the animals he is capable of civilization, of rising to greater heights (cf. Lewis 1962:24).

John Macquaire, like Karl Rahner, believed to be influenced by Heidegger's existentialism and Marechal's transcendental method argues that the human being is more than that which he is. He is, says Macquaire, "a becoming more" – a qualitative more, a deepening and enriching of life, or a fuller, truer humanizing of life. The human reality, he argued further, points beyond itself, or seeks to pass beyond itself. It contains intimations of the transcendent:

...the immense potentials of each one is (or should be) in itself enough to generate that profound respect for the individual, his worth and dignity, that have to be defended against every attempt to transform him into a mere unit in some impersonal system, be it economic or even metaphysical (Macquaire, 1963:85).

Without being too immodest to the two conceptions of humanism highlighted above (i.e. anthropocentric conception and theocentric conception), we may venture to say that both conceptions have embedded in their explications notable fallacies. The anthropocentric conception suffers from the fallacy of *negatio spiritualis* (denial of the spiritual) by which stroke it is a total preoccupation with the human being (the physical body) to the total neglect of the divine (the spiritual self). The theocentric conception on the other hand commits the fallacy *totum divinitas* (entirely on the divine) which here assumes exclusive emphasis on the divine to the exclusion of the human. Both fallacies are forms of *hasty particularization*. The situation thus creates a *lacuna* which begs for a delicate balance between the two extremes. Such balance in meaning is provided by John Paul II, the Philosopher-Pope whose foundation in Thomas Aquinas' metaphysics of the human person is an asset.

True humanism which according to the Pope means "self-completion" (*samo-spelnaine sie*) can only be resolved if the human being is treated in his or her integrity, which includes the human (*humanum*) and the divine (*divinum*). He thus argues that the main reason for the process of dehumanization in contemporary society is in an inadequate view of man, and in

treating the *humanum* without relating him to the divine. Fundamentally, he argues "the human person is a creature who has the responsibility of fulfilling himself or herself (and thus completing the '*opus creationis*' by his or her action of constant loving) which is the principle of self-realization (Redemptor Hominis, 16). This principle finds expression in traditional African society, a society which Nkrumah argues, is humanistic as opposed to the Christian idea of original sin which, according to him, is a denigration of the human being. He says, "the human being is regarded in Africa as primarily a spiritual being, a being endowed with certain inward dignity, and value" (Nkrumah, 1970:68). Understood as such, African humanism used in this work is synonymous to African communal ethics, which concerns itself with the science of human conduct of the indigenous African population. Used in this work, African humanism or communal ethics is a philosophy of human development which promotes the good of people, every person, and the whole person. This is an African ethical paradigm that is anchored on traditional communal expression of justice within and among the human species and the entire realities in the cosmos. It defines relationship between the "whole" and its "parts" and between the "parts" as individual entities. Its grounding philosophy is "I am because we are, and since we are, therefore I am". Its existential elements are, co-existence, acceptance, care and concern. It institutes a society where individuals grow freely and where hate and greed and envy die because there is nothing to nourish them.

This meaning of humanism forms the basis of any progressive process of man, any science, any technology and any development. What is in question, in this philosophy of life, is the advancement of persons, not just the multiplication of things that people can use. It is a matter not so much of "having more" as of "being more". For the African therefore, science and technology and its instruments are appreciated not only as extensions of man's physical faculties but as participating in his intellectual insight with its spiritual values. Unlike other forms of humanism, African humanism does not give answers to the questions of the origin

and destiny of man simply in an intellectualistic outlook that bears little or no relevance to real existentialist life. It is rather a socio-philosophical culture – a life, an assimilated view of human life and its destiny. This is an African philosophy of life which enwisdomise the African, to define himself, knowing who and what he is. He is able to judge why he is and where he is and where he should be going. Essentially, this understanding determines how he, man should live his life, how he should appraise reality around him in relation to what he is and his destiny. That is, the basis of his *being* (ontology), the Kernel of his relationship with his fellow man (Sociology, Ethics and Politics), and his relationship with his origin or creator (religion); it is to be a human being, to be truly what one is and to be true to what one is, as the Igbo would say, *Ezi Okwu Bu Ndu* (truth is life) (Otakpor, 2006:16).

(iv) Sustainable Development

Development is a concept which is often times misunderstood by even the most sophisticated minds. Usually development is conceived as a process of growing larger, fuller, more mature or becoming organised; thereby getting better results through better methods. In common usage, development has been taken to mean economic growth, and includes industrialization, progress of technology and Gross National Product (GNP) or Gross Domestic Product (GDP) or per capita income. Thus, development is no development, when the rights of man to existence are not respected. It is a situation under which the individual citizen is aware of his/her responsibility to the society while the leadership of a given nation/community is alive to its responsibilities to the governed.

Development understood in this light, connotes change, which occurs within a process i.e. a positive change consciously arrived at in a temporal succession. Such a process argues Evandro Agazzi, is “a set of interconnected changes, which are goal-oriented and produce a certain global result that is positive. He writes

when a process is originated or promoted by man, a consideration of the intended goal becomes entirely obvious, and in this case it seems that with a positive connotation only if a process promoted is expected to lead to "good" results (Agazzi, 1993:31).

It follows, from the above, that, "development" as a concept contains an implicit teleological flavour. As a set of interconnected changes which are goal-oriented, and which produce a certain result, which is good, "development" is said to have a value-side added to its general idea. It refers to a harmonious growth of a multi-dimensional complex structure, which realize an intrinsic dynamism, a plan, a kind of ought to be. Understandably, every development has some structure of growth but not every structure of growth is development. This means that we must be conscious of the different significations that the growth of each one of the numbers of values under considerations reveals.

It is very clear that the concept of development includes purpose and meaning in life, which means the possibility of displaying man's potentialities at the different levels of self-realization. It means fellow-feeling and respect for other human beings within the totality of their beings. Paragraph 7 of chapter 3 of the guidelines for the 4th National Development Plan (1981–1985) reveal to us more importantly the essential qualities of the concept.

True development must mean the development of man, the unfolding and realization of his creative potentialities, enabling him to improve his material conditions of living through the use of resources available to him. It is a process by which man's personality is enhanced; and it is that personality – creative, organised and disciplined, which is the moving force behind the socio-economic transformation of any society (Bello, and Nasidi, 1991:38).

Consequently the development of a country means helping it (i.e. its people) to reach the highest possible realization of its material, spiritual, social and political well-being which may conform to the specificity of its historical heritage, of its traditions, customs, beliefs and values, thus making it to be something global and harmonious, and which must increase the human capacity to give meaning to life and to make it more happier.

Far from meaning economic prosperity, development is deeply connected with the promotion of certain basic human rights, which are in turn connected with survival, and decent human material conditions. It should be pointed out briefly that such a promotion, must not occur at the expense of other human rights, political autonomy or of cultural identity or of respect for certain traditions, or simply of preservation of a sense of dignity without any complex of inferiority from the side of those who receive the benefits of this development.

Development, must have as its fundamental goal, the promotion of human dignity which carries with it the freedom to fulfil for itself economic and socio-cultural needs, which encompasses economic, political, religious, intellectual and sexual needs among others.

It thus appears, from this understanding that the concept of development which limits it to economic factors serve the greater interest of the western technologically advanced first and second worlds. From our analysis of development thus far, there is no one nation in the world that is fully developed in the context of the true sense of the word. North America, European countries, and a few Asian nations which today appear to have the highest technological capacity with a strong economic base to sustain it can indeed be said to be the nearest to technological, economic, and or political development. But when it comes to race, culture, spirituality, social relations and sex, they fall below expectation. Professor Oruka argues in this direction and recommends that nations should test their development and or underdevelopment indices thus

All countries will have to detect the degree of their development or underdevelopment by finding out what degree of social freedoms they have. And these freedoms depend on the extent to which the economic and socio-cultural needs of the people are satisfied (Oruka, 1993:31).

The concept of 'development' argued for in terms of quantitative changes taking place in society with special attention given to statistical indices of economic growth such as Gross National Product (GNP) and or Gross Domestic Product (GDP) or per capita income is grossly inadequate. Such indices, at best, indicate "growth without development".

Development is wholistic; in addition to its quantitative character, it has a qualitative index, which for us means, a process through which the material conditions of members of a given society improve. It is a progressive eradication or at least reduction in poverty, unemployment social inequality and cultural dependence in society. It is a qualitative change in the sense of positively affecting the quality of life index which increases its capability to manipulate and control the forces of nature for the enhancement of the quality of life of members in a given society. Genuine development means the progressive unfolding and realization of the creative potentials of individuals enabling them to improve their material condition of living through the use of resources available to them without transforming themselves into slaves. This truly is what we call sustainable development which has its shortcomings though, is acceptable in our situation. Quoting United Nations Conference on Environment and Development (UNCED), Sands writes:

Sustainable development means the progressive economic and social development of human society through maintaining the security of livelihood for all peoples and by enabling them to meet their present needs, together with a quality of life in accordance with their dignity and well-being, without compromising the ability of future generations to do likewise (Sands, 1993:102).

Therefore a developed society (or human being) is one that is capable of borrowing from other societies without becoming imitative and thereby losing its/his soul. It is definitely not one which uses the knowledge of its inhabitants and its instruments to fuel the engine of environmental destruction.

It, thus, become clear to us that there can be no model or patterns of development of universal validity. Each society has to evolve its own life-style, consonant with its cultural heritage and tradition. Hence in Africa, "development" is patterned in the context of African Cultural heritage which find expression in co-existence of life, caring and concern here referred to as African humanism or communalism.

Development is not a scarce commodity, which any single nation can claim monopoly of even when it is used exclusively in the economic sense. Every continent or society can point at a period in which it had economic development i.e. a period in which it independently participated in the early epochs of the extension of man's control over his environment. Walter Rodney argues correctly that Africa was developed before Europeans colonised and or underdeveloped her. It suffices to say here that "development" is all about the human person in a given social milieu; of his rights, his essential desires; how much of them have been satisfied, of his entire quality of life, his entire security of livelihood etc. It is all about humanism, a concept which in itself needs clarification. Scientific and technological development of any given nation, which indices is translated as progressive economic and social development must measured in terms of how it impact positively on humanity.

(v) The Human Person

The human person here refers to "the human being". It is also used to reference "humanity" or "man". Whichever way it is used, "the human person" signifies the totality, which the human being, man represents as constituted of body and soul and who, in this respect, requires his integral development.

(vi) Essence

Essence signifies that which makes a thing to be what it is. It carries with its meaning a qualitative value which signifies the intrinsic foundation of things in contrast to their extrinsic value. Also, essence means the reality, or true existence of things, which their external appearance manifests, supports and make intelligible. For our research purposes, the term "essence refers to the intrinsic essential foundation of science and technology in contrast to their instrumental and external appearance. The first promotes the integral and sustainable development while the later threatens humanity and its environment with annihilation.

1.8 Theoretical Framework

The complex connections in ecosystems attest to the fact that humanity is one among many members of the biotic community that rely on the environment for sustenance. This entails that humanity must not only be rationally guided in its use of the environment, it must act rightly in such a way that the effects of its action will be compatible with the sustenance of an authentically human life on earth.

In our world today however, the forces of the techno-scientific economy are threatening the very foundation of human life, even while they create unheard-of material comforts for a minority of humanity. Today too, old ideas and institutions that had served humanity so well over the past several centuries in the tasks of survival and flourishing seem increasingly irrelevant, unimportant or even counter-productive. It thus appear that the twentieth century is an era of "decomposition and uncertainty and ecological crisis" (Hobsbawm 1996:6). It is an age in which humanity is gradually but systematically empowering itself to provide resources for its brutal extermination.

In a sense, therefore, humanity is on the wrong course of development. Maintaining and enhancing the symbiotic relationship between humanity and other members of the biotic community; animals and plants etc is an essential component of sustainable development. This is the central idea of humanism, ecologism or environmentalism which have found relevant and practical expression in the Club of Rome Report. The report warns that, "If the present growth trend in world population, industrialization, pollution, food production and resource depletion continue unchanged, the limits to the growth on this planet will be reached sometime within the next one hundred years" (Meadow, 1972:2). Sustainable development is oiled by the philosophy of humanism which acknowledges the centrality of man and points to a consciousness of the limits in which he must live in order not to degrade his environment and himself. The International institute of Applied Systems Analysis, the World Model Institute,

the Russian Institute of Systems Studies and the Batelle institute among others have reinterpreted this thinking in terms of human life based on values, simple in means but reach in ends; a life in which all its diversity brings delight to the heart and a deeper and more durable fulfilment for human beings.

These attempts, as it were, are directed at evolving global principles that support human centered development by creating a state of harmony between man and the environment. The clearest example that defines this approach more comprehensively is Agenda 21, the Rio Declaration on Environment and Development. Our research takes a cue from this historic approach which produced not only concrete conventions on climate change and biodiversity, but principles to guide international action on the human environment. It states inter alia, that;

- Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.
- Scientific uncertainty should not delay measures to prevent environmental degradation where there are threats of serious or irreversible damage
- States have a sovereign right to exploit their own resources but not to damage the environment of other states.
- Eradicating poverty and reducing disparities in worldwide standards of living are "indispensable" for sustainable development.
- Full participation of women is essential for achieving sustainable development.
- Developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place in the global environment and technologies and financial resources they command.
- Developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development.

Environmentalism is another theory/approach that has a bearing on sustainable development. In a broad sense, it is used to describe widely diverse ideas about preserving the earth's natural environment. Viewed from the conservative stand point, nature is a renewable resource for human consumption. Better management of nature ensures its future availability

for humans. Moderate environmentalists on their part add that resources should not only be protected for human use but they view nature with an aesthetic and spiritual appreciation that values nature beyond its material benefits for humans. The utilitarian approach on the other hand sees the environment as a warehouse of goods for consumption without intrinsic value. The environment is valuable only for the material happiness it can create for human consumers.

This work critiques the utilitarian penchant for viewing nature as a "standing reserve". The thoughts of Hegel of the late 18th and early 19th century,, the anti consumer naturalism of the American thinker Henry David Thoreau in his *Life in the Woods* (1854) is legendary. Both made valuable contributions. Nature he says, has a sacredness and value not reducible to monetary units. Our research is premised on *land ethics* theory which states that humans must see themselves as part of the total environmental package of the biotic community. They must recognize that they are co-habitants on earth, not conquerors of nature. The ownership of land must entail a nurturing of the flora, fauna, and soil of the land. It must not include the right to kill the land; a system of regulating the environment based solely on economic interest is here argued as hopelessly lopsided. It ignores and or eliminates many elements in the land community that lack commercial value, but that are (as far as we know) essential to its healthy functioning. Land ethics suffices here as a tool of sustainable development. This is an argument in support of a holistic stand from which has developed two approaches, namely, the *biocentric* and *ecocentric* approaches. The *biocentric* approach emphasises the moral character of all living things and argue the conviction that all living species of living organisms whether sentient or vegetative, rational or irrational form part of a system of interdependence and are so treated as equal members of the biotic community. However outstanding this approach seems, it failed to pass the adequacy test of some environmentalist thinkers, hence the emergence of an *ecocentric* ethics. This approach concerns itself mainly with the relationships

between the parts and the whole, and with the dynamics of change that holds the whole together. It examines the intricate relationships that exist within the species and its entire environment.

It is pertinent to note from the foregoing that the ecocentric thinkers claim that ecosystems have independent existence beyond the existence of their individual elements. That is that the whole exists apart from or is real in its parts – *Metaphysical holism* and that our knowledge of the ecosystem is incomplete, until we are able to understand the interdependence of the whole. The argued conclusion therefore is that the ecosystems should be so recognised in their individual wholes – *ethical holism*. Thus, to mistreat any species or obstruct the interdependence of species amounts to an affront against environmental tranquillity and against the integral well-being of man.

Given the above, we argue that the burden of techno-scientific civilization which has in many ways rubbished humanity and the environment has threatened to conduct humanity outward away from its essential human life on earth. Sustainable human development is here argued as a new cultural synthesis of ideas and values; a morality of human integration, a morality of the full development of the human person in his material and spiritual spheres. It is here referred to as African humanism i.e a philosophy of human development which promotes the good of people, every person, and the whole person. It restores meaning and wholeness not just in human community, but in the entire cosmos. Thus, a scientific civilization qualifies as development when it promotes progress in human personality. The view of nature as accessible through casual mechanistic law has enabled humanity to control nature and provide for itself the good life on earth. The same view has also contributed to the destruction of the natural environment and alienation of human beings. Humanity must seek a balance such that human beings can maintain a sustainable harmonious relationship between the human species and nature.

Essentially, the "conqueror" role of *Homo Sapiens* that allows humankind the capability to destroy the earth calls for a change to plain member and citizen who has respect for his fellow- members and also respect for the world community as such. Consequently, we posit that,

- i. science and technology dominates all the essential compartments of our life, and so have opened to man the possibility to control nature and make life better in this world.
- ii. although, science and technology are not enough to guarantee development, though they provide one of the essential ingredients of development. Sustainable scientific civilization which carries with it the possibility of human development suggests that increase in knowledge i.e knowledge of science, should be combined with increase in wisdom, i.e scientific consciousness pursued for man's benefit.
- iii. science and technology, with its exaggerated materialism in certain quarters, poisoned by consumerism, seek to master an environment, perceived as being exclusively a material order, unmoved by the spirit. They are totally mistaken about what constitutes sustainable human development. Human development is both "having more" and "being more".
- iv. the claim that science explains natural phenomena in the most systematic where rental manner and that technology is a complex of contrivances put forth and developed by man as means to his end need to be complemented with the idea that the true essence of technology reveals itself as something neither neutral nor merely an instrument of human control
- v. technological progress does not necessarily have progressive effects on human life. That scientific knowledge and the techniques which it gives rise to often have negative effects. And that, men who decide what use shall be made of the new scientific discoveries and techniques are not necessarily possessed of any exceptional degree of wisdom, hence new powers are often placed in the hands of reckless men who may use it to kill rather than heal humanity.

All these indicate that the pretensions of exaggerated scientism are untenable. Progress in modern science itself is no longer to be regarded as unequivocal source of benefits to humanity. In a sense, it is the cause of new evils; in degradation of the environment, the dehumanizing and robotizing of society, and the deepening of social inequalities. Indeed, science and technology have conferred on man the power to destroy himself and his environment. Our research critically analyses this negative dimension of science, and

explicates the healing power of the science of human conduct which conducts humanity back into its essential nature on earth; a life lived in harmony with other members of the biotic community.

1.9 Methodology

We undertake, in this research a critical appraisal of the impact of modern science and technology on man and society. And as an exercise in philosophical analysis, we adopt expository and analytic methods of investigation. Using the expository method, recourse is made to historical developments in science and technology. The major notions of technology, science and human nature as they have evolved with time are critically examined. Using the works of experts in this area, we show that the concepts in use have changed from time to time. Thomas Kuhn's works, *The Structure of Scientific Revolutions* (1970) which has made outstanding inroad in philosophical science is legendary in this regard. His use of this method provides for us today a detailed historico-philosophical analysis of the origin, nature and constraints inherent in science as a human activity. Through this method, a better and more informed understanding of the issue(s) under consideration is enhanced. With the analytical method, we reopen the question of what genuinely constitutes human development and the place of scientific and technological development in it. As an exercise in critical rationalism, it proceeds by forming and giving a judgment or opinion on somebody's work or theory in order to accept same when its strengths are shown on the hand, and to reject or eliminate it when the work or theory shows elements of weakness. Socrates used the method in pursuit of clarity of thought, of truth and goodness, and is called Socratic irony. Russell developed it as logical atomism, and there is evidence that David Hume, Immanuel Kant and Martin Heidegger among others used this method which suggests a form of cross-examination, a process of sieving ideas through critical analysis, reflecting different perspectives before an idea becomes clear and truth, knowledge and goodness, exemplified. The method is exegetical in nature. These

methods of investigation bring into sharp focus the nature of man and the true essence of technological science as a revealing which leads humanity to a purposive arrangement of nature's elements in the world.

1.10 Summary of Findings

- (1) The forces of techno-scientific economy are threatening the very foundation of human life even while they create unheard of material bounties for a minority humanity.
- (2) Technology in its true essence is not merely industrial machinery, space-age refrigerators, and computer directed guidance systems, science itself must assume intrinsic quality far more than the quantitative meaning of the modern physical science which revealing robotizes and dehumanizes man
- (3) The decomposition, uncertainty and the crisis of values resulting from the revealing of techno-scientific endeavours requires more than entrenching ourselves in traditional values of the west. It requires a transformation of western values, a process of placing western civilization on a whole new course akin to Nietzsche's "transvaluation of all values".
- (4) Modern science and technology has evolved a *Home technos* who has become progressively more involved as the orders of a reality conceived as standing reserve, but which they too become standing reserves at a higher level of organization. This, our research poists demands a new *calling-forth* of human consciousness. It demands that humans come to presence in the world in a new way more fitting to their nature- a homecoming, the is, discovering the essence of ourselves on earth and within our environment in the world.
- (5) Scientific and technological civilization is a disaster when it is far developed materially than spiritually. A scientific civilization qualifies as development when increase in knowledge is accompanied with increase in wisdom

- (6) African humanism which encapsulates a communal philosophy of life serves as a tonic to conduct the technologically dehumanized man back into his essential human nature on earth. Man cannot close himself in the reassuring myth of ascetic science, indifferent to the search for meaning. The real questions facing modern science are not technical but existential (spiritual); they reveal a desperate demand for meaning, outside of which all science is an instrument and never a destination.
- (7) Sustainable development ensues when science and technology are consciously nurtured and guided in the spirit of the science of human conduct (i.e ethics); for science (and technology) without conscience is but ruin of the soul. In addition to material advancement, development has to embrace the soul and spirit of the human person and the physical environment in which he/she lives.

It is deduced from these findings that

- (i) Nature is a finite quantity. Humanity must therefore learn to organize techno-scientific forces to sustain the complexity and stability of nature while at the same time manage nature for sustainable development.
- (ii) Human desires are insatiable though, humanity must be rationally guided to accommodate its desires to the limits nature sets, not to push the limits of nature beyond its capacity for future generation.
- (iii) Although humanity needs to develop economically and technologically in order to deal with the problem of poverty in which a great majority of human beings still live, humanity, in so doing, must learn to balance short term thinking and immediate gratification with long term thinking for future generations by shifting the balance towards quality rather than quantity.

1.11 Conclusion

Science and technology, whatever unpleasant consequences they may have, are by their very nature liberators from the weight of destructive passions. Fraught with problems so momentous though, it is to them that we must look for happy issue says Bertrand Russell (1962:725). The dialectics of science has proved that it has acted in the promotion of the instrumental value. To this extent, science and technology are important instruments of development. This is justified when reference is made to the stupendous achievements of science and technology in the 20th century and beyond in virtually all areas of human endeavour. Similarly, 20th century history is also the bloodiest of all centuries. Modern science and technology, has given man the capacity for unrivalled powers of transformation of the world has at the same time conferred on him an unrivalled potential of destruction of the planet.

This reveals one paradoxical fact about scientific knowledge i.e whenever we make progress in science and technology we see that it raises other problems, meaning then that scientific knowledge and technological know – how has a mixed blessing. The question that arises therefore, is whether in this danger, grows also the saving power. As Karl Marx once said, man poses but only problems it can solve. This research demonstrates that there is the saving power, and it is in understanding the *genus* and *essentia* of technology as a destining that promotes the totality of the whole person; the material and the spiritual constituents of man.

Development is not, and should not be a product of exaggerated materialism and rabid consumerism. It is not only having more but also being more. Our conclusion is that the growth of knowledge, which increases human power, must positively impact on humanity: It must balance quantity with quality and promote man's ability to improve welfare. Development thus means an ongoing commitment to advance from the less human conditions

of disease, hatred, crime, war, racism, poverty, oppression, injustice, corruption, faithlessness, etc, to the more human conditions of health, love, peaceful co-existence, equity, justice, community fellow-feeling, faith and hope. For the African, development finds its bearing in the collective and individual knowledge and spirit of the people.

We thus conclude that, any progressive human endeavour that fails to promote the good (the dualistic character; human and divine) of man is unworthy of the human person. Growth in economy and immense progress in the material order are mere means to an end; human development is development, and remains development (human) if, and only if it is matched by spiritual growth. The conquest of nature through science and technology, and economic development that does not include everyone (in his or her essential value as a human person) will end up suffocating itself. Man cannot relinquish himself or the place in the visible world that belongs to him; he cannot become the slave of things, the slave of production, the slave of his own products. Every thing that there is find meaning only in so far as it is positively related to man's essential good.

CHAPTER TWO

2.0 Literature Review

Ogundowole (1998:268-269) argues that, it is not an easy task to systematize the attempts to define man's place in nature. This, he says is because the complexity and philosophic interest of the problem generate views on it from varied standpoints. For our special purpose however, two trends are discernable. The first is man's special nature compared with the whole organic world, as a social creature. The second is that homo sapiens is a fundamentally new phenomenon in the history of the planet earth through whose activity was brought into being thought, language, social relations, and thus exerting an active influence on surrounding nature in that, as the creator of civilization and all its attributes.

This means that the destiny of man is in man's hands. Unlike a stone, man is a product of consciousness. As a conscious subject, man stands constantly before a future. It means then that, the responsibility for each man's existence rests squarely on each man. On the other hand is the positivistic character of science and technology which has conferred on man an unrivalled power to mould his physical environment, his social milieu and himself into the forms which he chooses. On the other hand, there is the view that humanity is delivered over to science and technology in the worst possible way when it regards them as neutral instruments of human control. Perhaps science and technology in their essential meaning and value are autonomous self-organizing activities about which humans themselves are organized. It follows that, an ethic of strict accountability based on social responsibility is the index of sustainable human development.

On the very nature of science and technology opinions are divided on what constitutes the true meaning of science and technology, and their place in the affairs of man and society.

This explains our choice of elucidation of generic concepts of science, technology, sustainable development ethics, human person, and essence.

Looked at from its Latin root *scientia*, science means “knowledge” which aim and end is not only defined in terms of its relevance to the society in general, but also a reflection of the essential being of the human person. Science is truly *scientia liberationem populorum* (knowledge for the liberation of man). This quality of science is what truly represents sustainable development.

Far from being an object or complex of objects and techniques that are passive and activated by us only, technology in its Greek roots is an expression of inward thought, or knowledge or reason or discourse. This is the view posited by Martin Heidegger in “*The Question Concerning Technology and Others Essays*” (1977); “*Existence and Being*” (1979). These works critically undertakes an expository approach of the relationship between science and human development. The problem of technology, he argues, is not just the problem of how we come into being through technology, it is the problem of whether we come “home” to ourselves through technology or we still journey outward away from “home”.

In *Are Science and technology neutral?* Joan Lipscombe and Bill Williams (eds) (1979) generate a Controversy on the question of whether Science and technology can be considered neutral tools in the hands of rational beings. The authors justifiably sustains the thesis of scientific neutrality in the context of science as a body of knowledge thus, *science as long as it limits itself to the descriptive study of the laws of nature, has no moral or ethical quality, and this applies to the physical as well as the biological sciences* (p.6). This suggestion which elevates the scientist to the role of high priest expounding its truths oversteps the issue. Science itself is not and cannot be a self contained endeavour. It expounds and propounds great, immutable truths though, it is more changing more fallible and more socially

bound. The authors argue the conclusion that scientific or technological neutrality compromises human rationality and impedes human sustainable development.

Notwithstanding the critical attitude of the authors, basic issues are left unattended to, namely, the question of how the issue of neutrality affects a further issue; that of whether scientists have a social responsibility. This work critically examines the social responsibility of as a basis for advancing a philosophy of human integration.

One of the points argued in this work is that neither science nor technology is neutral in the hands of a rational being. Although science is a move towards the unknown, it is neither a blind nor goalless move. Scientific research worthy of the name must be a planned venture. The scientist may not foresee the remote consequences of his venture though, the planned structure of his work carries or must carry an ultimate intention to of discovery for the good of man. Thus, the vocation of the scientist is to lay bare the richness of nature for the good of man. The same principle applies to the technologist. This is the rationality of scientific inquiry, which our work explores.

Dokun Oyeshola (1998) in his *Politics of International Environmental Regulations* chronicles in five chapters a global view of the environmental state of the world in Post Scientific technology age. Citing examples of the most celebrated environmental disasters; Chernobyl, the Gulf war, deforestation of the Amazon, Oyeshola, argues point blank that such unfortunate predicaments are bound to have serious negative effects on Africa. The author's penetrating discourse on the matters of environmental degradation with its attendant emotional, and life threatening dimensions diminishes the quality and content of science and technology as a product of human mind and hands. An excellent effort the book lacks the very special ethical content (i.e science of human conduct) to jumpstart the debate towards sustainable humanity. It emphasizes the mindset of the author, of the natural scientists who prioritizes materialism to the total exclusion of humanism, which calls for a human value

conversion of the materialist world system on the one hand and a human need approach to the integral human living which entails easing the problems of inequality poverty and sustainable livelihood on the other.

Modern science and technology conducts humanity outward away from its essence on earth. This fact is evident in the dialectic of science and technology, which have become more purposeful as much as purposeless, more meaningful as well as meaningless etc. Ehusani, in *Afro-Christian Vision; OZOVEHE: Towards a Humanized World* (1993) A.F. Uduigwomen (ed), in *"A Textbook on the History and Philosophy of Science* (1996) and Unah's *"Philosophical Science for General Studies* (1998) among other works, posit this thinking as distinguished from the corpus of traditional thought in which science and technology have their ultimate end in the development of the whole man. Here understood, the instrumental value of science and technology is emphasized over and above its intrinsic function.

Science and technology must be understood and pursued in their true essence as an art of bringing-forth, an enterprise, which helps man to actualize his essence on earth. Sands (1993), reflects this idea of development as a progressive change in the critical areas of human security, human friendly environment, and a conscious redirection of our energies and material resources to the improvement of the social conditions of humanity. It may be thus said that any *progressive* human endeavor that fails to promote the whole good (human and divine) of man is of the human person.

The human person, is the totality which the self achieves in the individual entity, in the unity of his spiritual and physical aspects. He is the basis of judgment of science and technology. He is a wholeness and unity possessing absolute and eternal worth. This, in our view, is the basis of our practical judgment of the good, the basis of scientific and technological endeavours. Schumacher (1979) find this moral element in *appropriate*

technology, Husserl (1965) sees it in intersubjectivity, while Heidegger (1979) locates it in existentialism.

Schumacher (1979) in *Small is Beautiful* beautifully goes further to record the fascinating impact of science and technology on man. It is thus not an overstatement to describe this thought provoking and important book as a wake-up call to a muddled world from one of its members who sees clearly the dangers of uncontrolled technology. The author here proposes a dramatically new perspective on economics and goes deeper and further to examine man's relationship not just with his immediate environment but with his own evolution and his profoundest beliefs about the universe. This new philosophy, Schumacher summarizes as *technology with a human face*, a technology that is regulated by nature, which nature, always so to speak, knows where and when to stop, a technology, a science that is self balancing, self adjusting, self- cleansing (p.142). Such intellectual pontification of Schumacher is revealing and directional though, lacks focus when measured on the scale of sustainable development. It mistakes size with sustainable human living. Human nature revolts against inhuman technological organizational and political patterns which it experiences as suffocating and debilitating, whether they are big or small. Secondly, the living environment, which support human life aches and groans and gives signs of partial breakdown. Thirdly, it is clear that inroads being made into the world's nonrenewable resources on land and sea, particularly those of fossil fuels, are such that serious bottlenecks and virtual exhaustion loam ahead in the quite foreseeable future. The devastations being experienced in South East Asia may have been the direct result of these unfriendly activities of man on earth.

The work argues for an ethical approach, which enjoins humanity to respect, protect, and restore nature in a sustainable manner. This is the true character of the man of science who as it were, emphasises inwardness, subjectivity and above all ethical foundation. Eric Fromm (1968) presents the correct position of a man of science without self-knowledge and ethical

foundation. He says, "Whereas his power over matter increases, he witnesses his powerlessness on the twofold level of personal and social life... Becoming master of nature, he has become slave of the machine he has made with his hands. His knowledge about matter is great, but his knowledge about himself is nil" (p28). This work typifies the African mind though, it is anchored on western metaphysical tradition which runs short of advancing a global-solution to the dehumanizing effects of scientific technology. In particular, it ignores the African contribution towards a morality of human integration. This is the shortcoming which our work attempt to fill.

In *Evandro Agazzi: Right, wrong and science*, Craig Dilworth (2004) attempts an philosophical appraisal of the ethical dimensions of the Techno-scientific enterprise. The greatest challenge of our time according to the author is in advancing a solution to the problem of the negative impact of science and technology on society and the environment. Modern science and technology are viewed here as each, constituting system. Viewed as such, the author provides a penetrating analysis of science, technology and ethics and their interrelations. The solution to the problem according to the author lies in the moral sphere.

Dilworth is no doubt one those who not only exposed the interrelations between science, technology and ethics, and what has also seriously gone wrong in the world, but more importantly all that can still go right. He is an awakener of the highest order though, his analysis is wholly eurocentric. African culture and value system, which underpin existence, are roundly omitted. This work fills this lacuna and argues on this score that African humanistic heritage is architectonic to sustainable human development. The way to the brighter and sustainable future is in wholesomeness of humanity and in advancing a science and technology that promotes the totality of the whole person; the material and the spiritual constituents of man.

Karl Popper (1959, 1963) and Thomas Kuhn (1970), have similarly provided critical insights into the nature and methodology of science which throws light on the human nature of science itself. In the process, these philosophers have debunked the exaggerated positivist cum rationalist account of science, which thoroughly neglected the social context in which scientific knowledge is created. Thomas Kuhn's work (1970) is exemplary in this regard, for it contains a detailed historico-philosophical analysis of the origin, nature and constraint inherent in science as a human activity.

Some positivists philosophers of science have tended to ignore or outrightly reject the spiritual dimension in their analysis of the reality investigated by science. Rudolf Carnap, a leading positivist, for instance, has argued the thesis of physicalism which exaggerates matter (body) to the exclusion of the spirit (soul, form). While most authors pitch their discussion on this divide we argue the position that the two interpenetrate each other; the spirit is ordained to inform matter. This for us is the spirit of Africa, the African humanistic heritage which provides a penetrating analysis of science, technology and ethics, and their interrelations. This consists in the priority of ethics over technology, the primacy of the person over things, and the superiority of spirit over matter. In this engaging discourse, Ehusani undertakes in a provocative dialogue between the naked Christian Gospel and the Soul of traditional African texts. The human person he argues in the book is the irreplaceable and irreducible convergence of life grounded in the supreme grounds of grounds that grounds that absolute significance of life. Such vision he further and deeply avers should subsist the scientific and technological man. A human being, he says is intellectual, spiritual, social, moral etc. To single out one aspect of a persons life for emphasis, as is done in the industrialized world, is to truncate, dehumanize and make a mockery of that person (p.x). We are inclined to associate ourselves with this conclusion though, the author confuses Christian spirituality with African humanism. This distinctive understanding accounts for our invitation to adopt African

humanistic heritage as a panacea for world peace and justice, development and abundance, which is summed up in this work as sustainable livelihood. The good life is not mechanical ingenuity, not scientific breakthroughs, and easy and cheap productivity in itself but a sharing in the creativity of nature in which the human person, in his totality; body and soul is ultimate.

Furthermore, an ethical evaluation of the role of science and technology in human sustainable development has been critically undertaken in Mathew Nwoko's (1992) *Philosophy of technology for Nigeria*. The book is an attempt at an interdisciplinary approach to the subject matter of technology. The author has successfully handled such problems as the relationship between philosophy and technology, the early emergence of technological spirit; the relationship between technology and development; the problem of technological development in Nigeria; Education or the acquisition of technology. Similarly, an elucidating appraisal of the interrelations of ethics and technology as well as the rationality of technology are considered. Man, the author concludes, is the *locus* of technology. As he argues in the introduction to the work, "Pure Pragmatism and efficacy is not enough; nor should mere hedonism and consumerism be the determining factor. Technology aims at enhancing the whole man, in his bodily spiritual composition, i.e in his rationality and spirituality" (pp.1x-x). Embellished with western philosophical paradigms though, Nwoko's analysis and conclusion supports our thesis namely, science (knowledge) and technology are for the liberation of humanity. The value of technology is not in its being independent of man, but in the wisdom of man to employ it to advance his good, for a value-rich humanity presupposes a value-wise humanity.

Humanity has the task of ensuring that the instrumental values which technological goods provide do not override the human person who is the prime value. Such is the position that engages the mind of Yersu Kim (1999) in his *A Common Framework for the Ethics of the 21st Century*. Humanity, in his words, *stands at this century's end in a situation of extra*

ordinary challenge and openness. Scientific and technological advances are creating new opportunities on a scale previously unimagined, even as they threaten to destroy the very foundation of human life. The way out, he says, is a conversation of humankind through dialogue, mutual learning and good will. This approach in our understanding will no doubt engender sustainable human development. It is a holistic approach to human development that sustains the complexity and stability of nature. This, to us is an attempt at a common ethical vision factored by harmonious relationships between the human species and nature, openness and dialogue with the cultural space that surrounds every individual, centrality of the human person as the *Locus* of both rights and responsibilities and a regime of equality and social justice. These for us is what qualifies as sustainable human living which accommodates the insatiable desires of man though, within the limits nature sets.

In their edited work *The Basic Writings of Bertrand Russell, 1903-1959*, Egner and Dennon (eds) (1961) capture succinctly in chapters *sixty-nine* (69) and *seventy-eight* (78) Bertrand Russell's controversial but thought provoking ideas about science. In chapter sixty-nine; an engaging discussion on the conflict between science and values is made. Science, he argues, can diminish bad things as well as increase good things. It can abolish poverty and excessive hours of labour. Russell argues in chapter seventy-eight that *the good things brought about by science and technology are not without problems*. He says, *the new techniques to which it gives rise to often have totally unexpected effects. The men who decide what use are not necessarily possessed of any exceptional degree of wisdom. They are mainly politicians whose professional skill consist in knowing how to play upon the emotions of the masses of men.* (p. 721). What this invariably means is that the scientist finds that he has unintentionally placed new powers in the hands of reckless men who as it were could use it to conduct humanity outward away from its essence on earth. He argues that new knowledge and skills are sometimes harmful in their effects, scientists possibly take account of this fact since some

of the effects are impossible to foresee.

Russell's critical opinions on science are fundamental. He records the true spirit of science from the dawn of history as intimately associated with war; from the advent of our ancestors from the trees to the times of Archimedes, to Leonardo, to Galileo down to Einstein's manufacture of Atomic and Hydrogen bombs. However, to argue as if limits cannot be placed on the scientist is to abdicate humankind's responsibility to meet the excesses of scienticism. Science is no doubt a liberator of bondage to physical nature, but such can be done with restraints. This is the central position advanced in this work as an ethical approach that engenders harmonious relationship between humanity and nature. This is the African metaphysical spirit which Russell omits but which our work seeks to augment as a guiding philosophy of human development.

Thom Hartman's work *The Last Hours of Ancient Sunlight: Walking up to Person and Global transformation* (1999), offers a lucid, thought provoking and impressive analysis of how profoundly our global civilization is off course. To regain our sanity, he prescribes reconnecting with ancient tribal wisdom, altering our most fundamental habits and acting as if we are an integral part of life's sacred circle. After all, the anthropological records shows us that psychologist Abraham Maslow was right when he hypothesized that human nature is good and instinctively seeks the divine and that humans, only become dysfunctional when they grew up in a sick culture which produces violent and damaged humans (pp.302-203).

Notwithstanding the remarkable contributions of the development of literature in this area of study, it has fallen short of our set aims and objectives i.e. the humanization of science and technology through African communal ethics. Hartman in the work under consideration ignores the African contribution to global humanism, which African brand is holistic homocentric and communalistic. It is this African Communal philosophy that we argue as an ethical paradigm for sustainable human development.

Pantaleon Iroegbu and Anthony Echekwube in their edited work titled, *Kpim of Morality: ETHICS; General, Special and Professional* (2005) present a refreshingly new insight into the ethical basis of science and technology. It is a gigantic work on the science of human conduct intended for all students, scholars and professionals as they prod on in life so that they have a light to shine in the dark corners of the moral world.

The book is divided into three parts, namely, the general introduction to ethics as art and science, then on special ethics which presents some of the major ethical problems like the central issue of life itself in relationship to life negating practices like abortion, euthanasia and suicide among others. The book also undertakes a critical appraisal of the code of conduct of professionals; education, business, medicine and geneticists. Under education ethics, the book treats the responsibilities of teaching, leadership, law and the demands of justice, culture and development. In the area of business ethics, the work considers the moral minimums of business organizations and individuals, scientists and technologists. Similarly, the book outlines the code of conduct that guides medical profession; doctors and others who work with them in relation to their patients. An analysis of the content of gene ethics is also undertaken in this work. Argued in this book, the study is about the use of the human gene (and the gene of any *being* for that matter) to manipulate or in some positive cases to improve on our lives as human beings (Iroegbu and Echekwube, 2005:584-667).

Argued on these terms, the book provides an enlightened and reasoned insight on ethical issues. It proves itself on this score as a compass to the scientists and technologists in their endeavours to advance the general good. It may thus be said that this book gives a commendable insight into the science of doing good and avoiding evil. It is on this count, the salt and light that will help sweeten our moral resolve to achieve the good life as well as give light unto our steps for authentic human existence. However the contribution of the authors in advancing ethics as the basis of science and technology, the work has failed to ground itself in

the African soil of humanism. Its wholesale grounding on western metaphysical and euro-Christian tradition stands out as a shortcoming which this work aims to accomplish

Another engaging-discourse on the impact of science and technology on man and the environment is found in an edited work by Princewill I. Alozie titled, *Technology, Science and Environment* (2006). The book is a collection of critical essays from twelve distinguished scholars spanning the fields of philosophy, science and education. The essays in question painstakingly examines the impact of science and technology on man and his environment from philosophical, social and economic angles. It avers that scientific technology has positively changed man though, it has similarly and progressively dehumanized and descended him into the junk heap of destruction.

The book records the stupendous achievements of science and technology in the areas of healthcare (p. 210-232), agriculture, energy (p. 106-111), communication and information technology (p. 134-145) among others and argues further that such feats can easily pass as the many benefits of science though, science and technology has through its misapplication caused sorrow and tears. Mention is made of global warming which results from depletion of ozone layer, (p. 72-84) radioactivity, toxicology (p. 146-164), air and water pollution and other environmental crisis (p. 165-209) which results from the activities of science and technology as the negative effects of technological activities.

The book is no doubt a balanced discourse on the impact of scientific technology on man and the environment having looked at the good, the bad and the ugly angles of scientific technology. The book in particular is not at lose in identifying the wrong direction of science and technology though, it stops short of advancing a sustainable way forward for human development. It argues for example, for more science and technology as a solution for the inherent problems of scientific technology (Alozie, 2006: 260-261).

This, in our view is a counter productive formula akin to removing blood to cure high blood pressure. Such is the limitation that accounts for our humble attempt to advance an African brand of a solution to the many problems of scientific technology. This African brand of solution is founded on a relevant metaphysical tradition which rests on the interrelationship and interaction of life forces in nature as against the western metaphysical tradition that bestows an attitude of dominance, vengeance and belligerence.

It is thus argued on account of this limitation that, ravaged humanity and its environment can only be conducted back into its essence by re-learning the lessons our ancient African ancestors knew, i.e. those which allowed them to live sustainably for hundred of thousands of years- but which we have abandoned. It rests upon the idea that every person and everything is related to every person and everything. This communal philosophy is omitted from all the books examined above. This philosophy is anchored to the common worldview and understanding of being as force. It exemplifies itself in shared values, mutual aid and reciprocal solidarity. It is the African communal philosophy that has been advanced in this work as an ethical paradigm for sustainable development.

CHAPTER THREE

3.0 HUMAN CREATIVITY AND THE DIALECTICS OF WESTERN SCIENCE AND TECHNOLOGY

3.1 Introduction

Man by nature is *homo-ratio* (rational being). He seeks rational answers to satisfy his insatiable desires. This, in turn, gives him the fundamental knowledge to generate techniques, to tap resources and forces of nature for his essential needs. Subsumed under what could be called ontologico-ratio, philosophy controls, directs and orients man toward the proper *telos* (end) of nature, with reference to the whole of reality, the good of man himself and in reference to the ultimate Being. It is this functional role of philosophy that elicits Epicurean charge that,

-Let no one when young delay to study philosophy, nor when he is old grow weary of his study. For no one can come too early or too late to secure the health of his soul. – Epicurus.

The above proposition expresses the sentiments that philosophy is not only fundamental and foundational to human existence, but that, it also precedes human activity. It means only by extension that philosophy is the catalyst for scientific and technological evolution.

We shall argue in this chapter that, the revolutions in science and technology result from man's desire to translate the systems of thought; rationalism and idealism i.e. pure knowledge, into practice – technology.

3.2 The Philosophic Enterprise in Science and Technology

Professor S. B. Oluwole (1991:40) once argued that, "one of the fundamental problems of the philosophic enterprise today is that philosophers themselves are not fully agreed on the definition of the main tasks, goals, and the challenges of philosophy". Suffice it to say that,

the suggestion by R. J. Hirst (1968:8) that, "philosophy is the rational investigation of certain fundamental problems about the nature of man and the world he lives in" gives us cause to argue that philosophy attempts to provide rational solutions to such problems. How this is done or can be done, is what we shall soon undertake; most obviously by going back to the traditional claim that the philosopher possesses a special intuition which enables him to draw peculiarly philosophical conclusions from everyday experience. In venturing into this undertaking, we are not unmindful of our mission; to argue out a necessary link between philosophy (rationalism, idealism) and technology (the art of doing things) by which implication we shall conclude that technology involves the application of *reason* to techniques.

We shall begin our investigation of the nature of the philosophical enterprise by attempting a clarification of three characteristics of philosophy as follows:

- (i) The epistemological concerns of philosophy.
- (ii) The metaphysical concerns of philosophy.
- (iii) Rational dialogue; of questions and answers, and the re-evaluation.

(A) Epistemological Character

Philosophy is a critical analysis of all human knowledge with the view to establishing its scope and limits. As a *critical analysis*, philosophy examines, estimates, and judges the claims made on behalf of different points of view regarding principles, concepts and decisions etc. This means that philosophy is very much concerned with the evaluation of human knowledge and the quest for truth with the view to establishing its scope and limits, even though philosophers are divided on the extent of human knowledge.

(B) Metaphysical Character

Philosophy is a body of knowledge methodically acquired and ordered, which undertakes to give the fundamental explanation of all things". Understood as a "body of

natural knowledge, philosophy is here distinguished from theology and ranks it as dealing with rational knowledge. Further more, philosophy is seen as a "methodically acquired and ordered knowledge". This view of philosophy put it as proceeding from observation and experience, to a reasoned explanation of both of them. Lastly, philosophy understood as an exercise that "undertakes to give the fundamental explanation of all things", distinguishes philosophy as a natural form of inquiry and puts it above other everyday activities. It is fundamental and foundation to scientific endeavours. It is a search for ultimate reality; the source of all things in their ultimate causes as known through the natural light of reason.

(C) Rational Dialogue

This is a rational process of asking questions and questioning answers until we come to answers that are unquestionable and questions that are unanswerable. It is a conscious and rigorous pursuit of truth without which there are no answers, but which answers, when found, are further subjected to critical scrutiny so as to obtain clarity, change or reject beliefs or positions formerly held to tenaciously. Such an approach, Bertrand Russell (1959: ii) says, is a scientific spirit of a prudent man who according to him will not claim that his present beliefs are wholly true, though he may console himself with the thought that his earlier beliefs were perhaps not wholly false.

Basic to the above conceptions of philosophy is the common-thread notion of philosophy as a process of generating ideas, which are further processed and put into practice through the art of doing things – techniques. Thus understood, philosophy is meta-science – conceiving rational ideas which, when translated into science, is conceived as a means of getting to know the world. For Russell therefore, the question whether objective truth belongs to human thinking is not a question of theory, but a practical question. The truth i.e. the reality and power of thought, must be demonstrated in practice. The contest as to the reality or non-reality of a thought, which is isolated from practice, is a purely scholastic question. Karl Marx

voiced a similar view when he says philosophers have only interpreted the world in various ways, but the real task is to alter it (Egner and Dennon 1959:636).

Philosophy is both fundamental and foundational to science and technology. Being an endeavour whose knowledge encompasses the whole, and which seeks to explain the interconnecting link between things and events of the universe, philosophy (which is complete knowledge) thus guards, and guides both science and technology rationally toward a people-centred development. This, is the real enterprise of philosophy in science, and technology.

We may, therefore outline the main tasks or goals of philosophy in relation to science and technology, starting with a discussion of the very basic descriptions of philosophy as:

(i) A Rational Basis to Life

Socrates stated long ago that “the un-examined life is not worth living”. Similarly, Thoreau maintained that “to be a philosopher is not merely to have subtle thoughts... but to love wisdom so as to live according to its dictates, a life of simplicity, independence, magnanimity and trust”. Thus philosophy is not a sterile discussion of abstract notions lying outside experience but a resolute and rational attempt at understanding life in all its immensity, variety but above all, its totality. For life has meaning; to find its meaning is what man’s activities is all about. It is a *rational basis to life*.

(ii) A Method of Reflective Thinking and Reasoned Inquiry

The second description of philosophy which has implication for science and technology is its conception as a method of reflective thinking and reasoned enquiry. Described as a reflective endeavour, philosophy proceeds by way of argument and criticism, and not by experimental verification. It supposes experience and experiment, but goes beyond the empirical (experience) while it reflects on it.

Secondly, philosophy is general in its method. That is, it inquires into the general

nature of things or the meaning of general concepts e.g. knowledge, value etc.

Thirdly, philosophy is definitional. It concerns itself with typical questions with a view to discovering the essence or definition or at least the description of concepts and things e.g. What is progress? What constitutes development? What constitute a good science, or technology? are usually a request for definition.

Fourthly, philosophical method is reflective. By this we mean philosophy is concerned with the meaning and relations between various concepts. It presents a way of "seeing" the world; a distinctive approach or insight on things.

(iii) An Attempt to Gain a View of the Whole

Philosophy is an attempt to gain a view of the whole. This is an invocation of the traditional view of philosophy; as a search – an activity through which man reaches the unknown, into that which is hidden from him, but which he already has at least some initial notion of what he is looking for. The drive behind the search is exactly the desire to verify and elucidate our knowledge of reality. Thus, philosophy does not introduce to man a new world of knowledge, but to a new knowledge of a world he or she knew.

The point at issue here is that the philosophical search goes far beyond the values and events of everyday life. It opens a new horizon, which though strange, is all the same fascinating, revealing and beneficial. It is a search for reality.

(iv) Logical Analysis of Language and the Clarification of the Meaning of Concepts

Philosophy is also described as the logical analysis of language and the clarification of the meanings of concepts. G.E. Moore (1903) writes in his book *Principia Ethica* that: "in philosophical studies, the difficulties and disagreement of which its history is full, are mainly due to a very simple cause; namely to attempt to answer questions without first discovering precisely what questions it is which you desire to answer" (Moore, 1906:30). Perhaps a careful study of how language is actually used, taught and developed in everyday discourse can

illuminate, and even transform or dissolve, time-honoured philosophical problems. These problems are seen as arising, often if not invariably, because thinkers, misled by superficial grammatical similarities or their own fondness for uniformity have ignored relevant differences in the function of terms and hence misused them. The result being that they have drawn wrong conclusions based on a misunderstanding of the function of language. We may thus argue, like Wittgenstein, that whenever there exists a perennial and irresolvable dispute concerning so-called philosophical problems, it is language that has gone on holiday.

(v) A Group of Problems as Well as Theories about the Solutions

As an endeavour that concentrates on the wide range of problems, philosophy attempts through analysis and criticism to raise theories that find solutions to these problems. Thus character of philosophy oiled the great machine of the early centuries to engineer to the fore, our present day scientific endeavours. It is fashionable today, to ask "what (if anything) to expect from today's philosopher". Such was the title of a remarkable article that appeared in the *Time Magazine* on January 7th, 1966. A similar title appears in one of the chapters of Kwesi Wiredu's recent book, *Philosophy and an African Culture* (1980). The chapter in question is "What can philosophy do for Africa?" Such titles, provocative though, seem to suggest that there is some doubt as to what philosophers (or philosophy) have (has) to offer to the world today. There may even be the suspicion that it has nothing to offer. Perhaps such question are not asked or may not be asked of engineers, doctors or bankers because it appears to be quite obvious that they have something to offer and what they have to offer is obvious to the society.

Now, the philosophical enterprise, in science and technology yesterday and today has ever remained the same. That is, the meta-scientific enterprise, which made philosophy fundamental and foundational to all human endeavours. Perhaps a retrospection of three centuries ago argues for the reinvention of the philosophical spirit of the antiquity. Although,

at that point in time, there was confusion in the air, the importance of philosophy was not seriously in question. We discover in particular that philosophy was held in high esteem, even though some of its practitioners may have been severely criticised. In antiquity, philosophy was understood as the science of life which enables people "to think well, to reason practically – neither too much nor too little because it is the means of living well as circumstances permit us to live. To see clearly into the causes of things, to analyse our own acts and motives, and to try to understand those of others" which perhaps is the best way to approach knowledge.

Admittedly, such rational behaviour of man provided a base for what came to be later delineated as science which found practical reality in technical application in the quest to fulfil man's essential needs. This, according to Abraham Kaplan, is the essential business of philosophy, which he says, "is to articulate principles by which man can live; not just as a scientist, citizen, religious Being or whatever, but as the whole man that he is" (Kaplan, 1961:4). It means for us, then, that philosophy is a technical discipline, that intertwines all areas of human knowledge, and which in pursuit, helps men to think more clearly and more truly about themselves and the world in which they inhabit. Drawing inspiration from John Wild in this direction of thought, K. C. Anyanwu argues that "any man who thinks, speaks, and lives necessarily needs philosophy, and true philosophy, is a therapy for the common intellect of common men, and true therapy does not try to destroy what it is trying to heal or perfect" (Anyanwu, 1983:40).

Informed by this thinking, Plotinus (d. 270 A.D.) says philosophy was a dear delight. On the other hand, Plato would place philosophers over the affairs of men. He died because of this conviction. Protagoras of Abdera (d. 411 B.C.) made the human mind the measure of all things and philosophising itself was the greatest activity of that mind. Marcus Aurelius (d. 180 A.D.) loved philosophy more than his throne. Boethius (d. 524 A.D.) consoled himself and even wrote a book while in prison entitled *The Consolation of Philosophy* (Green, 1962).

Little wonder then that the *Time Magazine* article chronicles what at best remains the outstanding legacy of philosophy:

The world has both favoured and feared the philosophers' answers. Thomas Aquinas was a saint, Aristotle was tutor to Alexander the Great, and Voltaire was a confidant of Kings. But Socrates was put to death, and Giordano Bruno was burned at the stake. (Green, 1962:8)

Thus, the power of philosophy, the burning desire to ask questions and question answers, found proper relevance in the 6th century B.C. when the men from the coast of Asia Minor began asking questions that had never been asked. They began to ask what the world was made of, and how it originated. Such questions, which are scientific in content, elicited scientific answers, which activities today can heal, or kill. Suffice it to say however, that the question about the origins and nature of things were questions that might be resolved by rational discussion. Precisely, such questions, philosophical in nature though but scientific in content assisted not only to enrich man's consciousness, but ultimately led to man's control over the forces of nature. Essentially, such questions led to the emergence of science as presently understood. Perhaps we may reserve such discussion for the later part of this thesis but argue here briefly that the search for the ultimate reality jointly carried out by the natural philosophers (c 600. c 300 B.C.) started not only for information but also for understanding. Thus, the method of examination and critical analysis took the centre stage. This means that, appeals to tradition and authority were replaced with appeals before the court of human reason.

Such was philosophy in relation to science in Greek antiquity that philosophy (then called philosophy of nature) and science (then called natural science) were one and the same discipline- *Philosophy of Nature*. It is on record that Aristotle considered as a single science what is now called philosophy of nature, cosmology, chemistry and biology. V. E. Smith in the *New Catholic Encyclopaedia* (NCE) (Vol. II:317), acknowledges succinctly that, "such a unified view of philosophy and science survives in the title of Isaac Newton's work, *The*

Mathematical Principles of Natural Philosophy (1687), and more than a century later in John Dalton's *A New System of Chemical Philosophy* (3 v. 1808-10-27). This is in addition to another title under the caption, *Experimental Philosophy*, which philosophies, are today considered as science, a term that, with the foundation of The British Academy of Science in 1831, came into vogue to designate modern physics, chemistry, biology, and related disciplines (ibid.). Notwithstanding the subject matter of natural science in present day organised society, which province is the study of the material world, philosophy still functions as a lubricant to all human learning.

Though still taken as an endeavour which object is to explain material realities in terms of the four causes: matter, form, agent and end, the physical sciences are still largely carried out under the rules of reasoning long formulated by philosophy, of asking questions and questioning answers, of examination and critical analysis of the basic constitution of the particular beings that enter the world of human experience. In particular, what is the nature of the physical universe? How are scientific laws established and validated? etc are some of the interrogatives which provoke scientific research. Understood in this light, philosophy, thus, becomes the science of all things in their ultimate causes as known through the natural light of reason.

Such is what is called science in the Aristotelian – Thomistic tradition, which designate a type of perfect knowing (*scire simpliciter*). Knowledge of any object, argues Aristotle, is obtained when one knows its cause, when one knows that cause is what makes the object be what it is, and when one knows that the object could not be otherwise than it is (NCE Vol 12:1190). Following from Aristotle's reduction, St. Thomas Aquinas similarly taught that science is knowledge of something through its proper cause. It is a purely intellectual act as opposed to sense knowledge; mediate intellectual knowledge as opposed to immediate knowledge of concepts and first principles in so far as it is acquired through the prior

knowledge of principles or causes (ibid.).

It may be said, thus, that science in the spirit of Newton and his successors was left as the only legitimate body of speculative knowledge concerning existing things. Science stood alone as a study of things, whereas philosophy, with respect to science, was purely critical and epistemological, thus acting as a catalyst to the scientific endeavours of our twentieth century world. Such new philosophical currents which were put in motion to raise science and technology to its present height include among others, idealism, positivism, realism, and pragmatism. We shall single out positivism, pragmatism and realism for discussion in this chapter.

(i) Positivism

This philosophical current was begun by Auguste Comte. Unlike Aristotle whose concern was with causes or origins of things, Comte on the other hand was concerned with their invariable relations of succession and resemblance. Thus, scientific methodology is according to this school, apparently descriptive as opposed to being explanatory. No wonder then that Spencer, a later positivist, assigned to philosophy the role of synthesizing scientific results. However, most positivists conceived the main burden of speculative philosophy as one of accounting for the apparent necessity and universality in the laws discovered by the sciences (Smith 1967:317).

Before then Kant had argued that valid knowledge come through phenomena, The phenomenal world, he argues, could not give rise to the universality and necessity found in physical laws, and that such universality and necessity had therefore to come from *a priori* structures in the human mind (ibid.). Perhaps this attack motivated Comte who posited three stages in the development of the human mind:

- (a) a theological stage, wherein the world is explained by an appeal to supernatural deities.
- (b) a Metaphysical stage wherein things are explained by abstract essences

- (c) and a positivistic stage, wherein reality is accounted for by sciences like that of Sir Isaac Newton.

This historical syllogism argues out properly a position of a self-contained logical relationship empirically verified as valid under given conditions, in contrast to the dogmas of theology and unobservable facts of metaphysics. As argued by Galileo in his *Dialogues Concerning Two New Sciences*,

Anyone may invent any arbitrary type of motion and discuss its properties, but we have decided to consider the phenomenon of bodies falling with an acceleration such as actually occurs in nature... And this at least, after repeated efforts we trust we have succeeded in doing. In this belief we are confirmed mainly by the consideration that experimental results are seen to agree with and exactly correspond with those properties which have been, one after another, demonstrated by us (Smith, 1967:160)

Such is the positivists' contribution to science that Ernst Mach regarded scientific laws as economies of thought that make it psychologically easier for man to study nature. Helpful in its character though, to argue for an ordering of philosophy after science is to miss the point, for philosophy is not only fundamental to science, it is also foundational to technology.

(ii) Pragmatism

This philosophical outlook owes its origin to Charles Sanders Peirce, who held that ideas could be made clear only by looking to their effects. Somewhat almost like Aristotle's postulations, but in complete contrast to positivism, Peirce regarded man's first questions about nature as being "the most general and abstract ones". For him therefore philosophy comes before science, meaning then that rationalism breeds science, and complements science.

Perhaps it is this complimentary role of philosophy that made William James and John Dewey, compatriots of Peirce in the pragmatists' camp to step down distinctions of any importance between philosophy and science. They insisted, however, that experience extends beyond the phenomena of Kant or the sense data of British empiricism. There is personal experience, religious experience, experience of values etc. Such an enlargement of the Kantian and positivist notion of experience, while important in itself, prepared the way for

philosophies of science like Whitehead's. If we have only empirical facts, only individual things, only one thing after another, then we can find no general laws but only summaries of events, lists of observed regularities. As Whitehead writes "we must not ascribe, we must not expect, one step beyond our direct knowledge. The (empiricist) has no foothold on which to rely for specification beyond the region of direct observation. There is no probability beyond the region of direct observation" (cf. Lewis 1962:126). John Stuart Mill, himself an empiricist, failed in his attempt to justify the validity of inductive logic, which arrives at general laws from particular instances. Such scientific mind may have influenced other scholars like David Hume and Immanuel Kant who in their wisdom argue forcefully that a regular succession is not a sufficient reason for believing in the inevitability of that succession continuing, it only accounts for our expectation.

(iii) Realism

Scholars under this philosophical current are common in their opposition to positivism and to idealism. Prominent among these scholars are Emile Meyerson, Henri Bergson, and Alfred North Whitehead. Meyerson is of the view that there was ontology in all science, as shown by the scientist's commitment to the existence of abiding identities in a changing world. Another philosopher of science, Henri Bergson, maintained that science as such presents a geometricised, hence, static view of a world in motion, and that motion can be grasped only by an intuition that lies beyond the techniques of science. Whitehead on his part proposed that the scientist in advance of his science commits himself to "half truths", to which the philosopher *must* examine (ibid. p. 319).

This commentary on science by these philosophers of science argues for us an interesting point in the relationship between science and philosophy, that what today is referred to as the physical science or the modern sciences known by the general name empiriology from which we have empirioschematic and empiriometric was one and the same.

In particular, it is argued in this same spirit that empirioschematic knowledge i.e. science which uses qualitative models, is not a distinct science, but a continuation of the philosophy of nature – (cosmology and the science of nature).

Generally taken to be an intuitive endeavour, philosophy assists science to investigate into the constitution of the physical universe. Perhaps we may say here that, both philosophy and the physical sciences are two complementary old friends, which acting in concert could make nature a *completion*. Such a thought is more cryptically captured in Smith's *The General Science of Nature* (1958) that, since the 19th century, efforts to construct *a priori* philosophies of nature such as idealism, or to deny a philosophy of nature, as with positivism, important 20th century western philosophers seem to have rediscovered the need for a realistic evaluation of nature, one that considers *mobile being* at a level more general than the specialised natural sciences and at a level more natural than mathematical physics. Such is the philosophy we seek to advance in this thesis; a philosophy of human sustainable development. That, though dualistic in matter and form, there is directionality in the cosmos, which Whitehead describes as the causality of the end; by which all our physical causes are in more or less a conscious way.

Furthermore, a better understanding of the essential connection between philosophy and science can be located in Bertrand Russell's conception of philosophy as a field of study which seeks to explain the relationship that man shares with the universe.

He posits:

Philosophy as I shall understand the word, is something intermediate between theology and science. Like theology, it consists of speculation on matters as to which definite knowledge has so far been unascertainable; but like science it appeals to human reason rather than to authority... All definite knowledge, so I should contend - belong to science; all dogma as to what surpass definite knowledge belongs to theology. But between theology and science, there is a No Man's land exposed to attack from both sides; this no man's land is philosophy (Russell 1962:35).

The relationship between philosophy and science is in its joint appeal to human reason

rather than to authority. While “a better philosopher” is not made through knowing mere scientific facts, he all the same learns from its principles and methods and general conceptions. Philosophy, Russell argues then, should be piecemeal and provisional like science. He stated the essential relationship of the two disciplines thus:

Philosophical knowledge... does not differ essentially from scientific knowledge. There is no special source of wisdom which is open to philosophy but not to science and the result obtained by philosophy are not radically different from those obtained from science. The essential characteristic of philosophy, which makes it a study distinct from science is criticism (Russell, 1927:2-3).

The implication here is that both philosophy and science are in agreement on the question of method, which, according to Russell, is the logical analytic method according to which objective knowledge is possible. This kind of knowledge gives unity and system to the body of the sciences, the kind of knowledge which results from a critical examination of grounds of our convictions, prejudices and beliefs. Philosophy fulfils an intellectual role for the sciences, and as soon as definite knowledge concerning any subject becomes possible, this subject ceases to be called philosophy and becomes a separate science (Ogbinaka, 2000:38).

It, thus, appears that science and philosophy are two distinctive, unrelated disciplines. Russell himself had seemingly implied this when he distinguished science as “what you know” from philosophy as “what you don’t know”. But such conception of the two disciplines, dangerous though, has turned out to be valuable on epistemic grounds. This is because, the dialectical spirit of philosophy, its critical comparative analysis and synthesis argues for further and better interior reconstruction of fundamental scientific facts, the end of which is the institution of exact scientific knowledge. Such is what should be the epistemological attitude of the philosopher who should be critical of scientific knowledge not from a point of view which is ultimately different from that of science, but from a point of view concerned with the harmony of the whole body of special sciences.

True, science has been able to solve certain problems that philosophy could not solve but to argue from this and assert that the philosopher has no business in the conclusions of the scientist is fundamentally fallacious. For even after science has solved certain problems, there remains the need to understand, interpret and evaluate the body of facts accumulated by science. The human quest for a rational and fulfilling destiny, thus, imposes on philosophy the double role of clarifying and analysing scientific concepts and theories which aim at making their scientific usage clear, and secondly, functioning as a second order discipline that attempts to answer the following questions: What characteristics distinguish scientific inquiry from other types of investigation? What procedures should scientists follow in investigating nature? What conditions must be fulfilled for a scientific explanation to be correct? What is the cognitive status of scientific laws and principles?

Such interrogatives while not taking away the function of the scientist as the one who judges one theory to be superior to another, all the same stamps the philosopher's feet as one who evaluates the criteria of acceptability implied in the judgement of the scientist. Most obviously, the two disciplines are indispensable to each other. Hence, the convinced words of John Losee:

The scientist who is ignorant of precedents in the evaluation of theories is not likely to do an adequate job of evaluation himself. And the philosopher of science who is ignorant of scientific practice is not likely to make perceptive pronouncements on scientific method. (Losee, 1972:2)

This informing drive of the men from the coast of Asia Minor in the 6th century marked the advent of modern science, to which we shall now turn – the evolutions in science. We shall endeavour to discuss this subject as a philosophico-scientific endeavour to unravel the secrets of being, a vision of a single, undivided universe, of unrealised potentialities of the human mind and heart, of an ideal order lurking behind the manifold appearances of things.

3.3 The Emergence of Science and Technology: The Greek Heritage

It is the argued conviction of the Greeks that religious ideas are what they actually are – creations of an artistic imagination. Informed by this reasoned discovery, the Greeks, led by the Milesians had to put aside all the supernatural or mystical explanations of the world and had endeavoured to give a strictly natural account of it. It was in this that they made decisive step towards a scientific approach to the interpretation of nature. In their observed world, the Greeks had perceived the constant process of change, of transition from life to death, and from death to life, which they argued must have something permanent. They argued on this score that, the change is from something into something else. There must be something, which is primary, which persists, which takes various forms and undergoes this process of change. Copleston (1962:36) captures the exact thinking when he says that the change cannot be merely a conflict of opposites; thoughtful men were convinced that there was something behind these opposites, something that was primary. It was such urge that compelled the Ionians; the pathfinders of science, to ask for such a primitive element or *Urstoff* of all things.

(i) The School of Miletos

Modern science, as is presently understood was developed by the Greeks, the first of whom were citizens of Miletos, a highly prosperous city on the west coast of what is now Turkey. They sought to differ from the traditional way of seeking for origins and nature of things in which appeals to tradition and authority were replaced by appeals before the court of reason. They were interested in discovering the principle of change and stability in the world. So, they asked, what is the ultimate nature of reality? The Miletians who attempted to establish the primary element (or *Urstoff*) include among others, Thales, Anaxamander, and Anaximenes.

(a) **Thales:** *Thales* is the figure traditionally associated with the beginning of science in Greece. As Aristophanes (Lewis 1962:20) put it, "Vortex has driven out Zeus and reigns in

his stead". The implication here is that, 'Vortex' i.e. the whirling atomic forces of nature are explainable by nature itself, that nature is a self sufficing orderly universe, which is developed on impersonal lines, undisturbed by the arbitrary volitions of supernatural beings. For Thales, therefore, the primary element was *Water*. That which is behind everything that changes and moves was *water* which itself is unmoved, unchanging.

He is credited with many accomplishments among which include, recognition of electrification and magnetism, the broadening of geometric facts learned in Egypt into general propositions about similar triangles, the prediction of an eclipse of the sun (in 585 BC) and a belief that the moon shines by reflected light. He is an example of a clear transition from myth to science and philosophy, and retains this traditional character as initiator of Greek philosophy. He is the figure traditionally associated with the beginning of science among the Greeks. This obviously argues out a clear cut thesis that Thales and or his Greek contemporaries succeeded in generalizing mathematical concepts which made it possible for other discoveries in mathematics.

(b) **Anaxamander:** *Anaxamander* is associated with making the first map and he also suggested that land, animals including man, were originally developed from fish. He therefore, thought of the *Urstoff* in terms of the strange indeterminate "something" without limit in space or time, in constant change. Frederick Copleston (1962:40) finely writes that, he sought, like Thales, for the primary and ultimate element of all things; but he decided that it could not be any one particular kind of matter, such as water, since water or the moist was itself one of the "opposites", the conflicts and encroachments of which had to be explained". He argues thus; if change, birth and death, growth and decay, are due to conflict, to the encroachment of one element at the expense of another, then – on the supposition that everything is in reality water – it is hard to see why the other element have not long ago been absorbed in water. Anaxamander, therefore, arrived at the idea, the primary element, the

Urstoff, is indeterminate. By comparison, it is more primitive than the opposites, "being that out of which they come and that into which they pass away" (Copleston, 1962:41).

The point that has been very clearly made by Anaxamander's adventure into science and of scientific importance too is that, nothing is ever finally annihilated and nothing ever comes into existence out of nothing. The findings herein show an advance, then on that of Thales. He precedes beyond the assignation of anyone determinate element as primary to the conception of an indeterminate infinite, out of which all things come. But this is in addition to the fact that he made a lead into the origin of the world and man out of this primary element.

(c) *Anaximenes* is recorded in history as the third philosopher of the Milesian school. He was said to be an associate of Anaxamander, but more like Thales in assigning a determinate as the *Urstoff*. Man, he says, lives so long as he breathes and so he argued, *air* is the principle of life (and so it is the primary element.) Drawing a parallel between man and nature in general, Anaximenes reasons, "just as our soul, being *air*, holds us together, so do breath and air encompass the whole world. He argues in conclusion, *air* then is the *urstoff* of the world, from which the things that are and have been and shall be, the gods and things divine, arose, while other things come from its offspring (Copleston, 1962:42).

Thus far, we may say of these Milesian pathfinders of science, that their main importance is more in the fact that they raised the question as to the ultimate nature of things, rather than in any particular answer, which they gave to the question, raised. Suffice it to say here that four basic principles emerge from this scientific zest and they hold even today.

- (i) Consistency: There is a single, natural basis for everything. There is no double standard of explanation – partly naturalistic and partly supernaturalistic.
- (ii) Simplicity: The simple explanation is always to be preferred to the complex – a single force is better than a variety of separate spirits.

- (iii) *Ex nihilo nihil fit*: Nothing is made out of nothing; and, correspondingly, what is real cannot disappear.
- (iv) **Evolution**: one thing turns into another; out of simpler elements the more complex is made; even the world is built up out of some basic substances. Change is everywhere.
- (d) **Heraclitus**: Heraclitus similarly argued that change was the eternal law of things. Largely encased in his theory of unity in diversity, difference in unity; he says, the conflict of opposites, so far from being a blot on the unity of the one, is essential to the being of the one. In fact, the one only exists in the tension of the opposites: this tension is essential to the unity of the one. Quoting Heraclitus from the fragments (Frag 50), Copleston (1962:56) writes; it is wise to hearken, not to me, but to my word, and to confess that all things are one". While water, air and the indeterminate had been advanced as the underlying reality, for Heraclitus, fire was the absolute, the eternally self-existent reality, underlying all appearance. Yet it is fire that is both ever living and alternately kindled and quenched. Though apparently contradictory in term, this, it is argued, is the central fact of existence, the spring that makes the wheel of the universe go round. Through strife all things arise and pass away. This conflict says, Lewis (1962:27) is not between completely desperate things, but always between the opposites that themselves constitute a unity. Perhaps this legacy may have well informed today's scientific breakthrough in genetic engineering. It is a known fact today that within every living cell the opposite process of building up and breaking down go on continuously, thus alluding to the Heraclitian theory that existence is a perpetual change which obviously account for today's evolutionary theory.

Apart from developing the principle of relativity in science, a theory which knowledge argues against absolutism in scientific knowledge and or theory, Heraclitus laid a solid foundation for today's elaborate scientific endeavours. We may, thus, go further and suggest with Heraclitus that the conflict of opposite – change is necessary to the existence of the

material world as enunciated lucidly by Copleston (1962:62):

- (i) As far as inorganic matter is concerned, change – at the very least in the sense of locomotion – is necessarily involved, at any rate if modern theories of the composition of matter, the theory of light, etc, are to be accepted.
- (ii) That, if there is to be finite, materially conditioned life, then change is essential. The life of a bodily organism must be sustained by respiration, assimilation, etc., all of which process involve change and so the “conflict of opposites”. Similarly, the preservation of specific life on the planet involves reproduction, and birth and death may well be termed opposites.
- (iii) A material universe is possible if and only if there was conflict of opposites. There could be no life in a changeless universe, for embodied life, as we have seen involves change. Perhaps this accounts for today’s scientific interpretation of matter in terms of energy which essential character is change and motion which in itself means diversity on the one hand, for there must be a terminus, *a quo* and *a terminus ad quem* of the change, and stability on the other hand, for there must be something which changes.

No doubt, this rational articulation and indeed, a genuine philosophic notion can pass as rudiments of science and hence the basis for technological advancement, such that for Hegel “if we wish to consider fate so just as always to preserve to posterity what is best, we must at least say of what we have of Heraclitus, that it is worthy of this preservation of the advent of science.

(e) *Anaxagoras* was similarly burdened with the question of what constitute the ultimate reality of the universe. His most controversial scientific statements were those which describe the sun as a red hot stone bigger than Greece and that the moon is made of earth which shines by reflected light. He expanded the idea of change first put forward by his predecessors and introduced an important conception, i.e. of *nous* into philosophy.

Anaxagoras argues that, basic to existence we find an infinite number of first principles, or fundamental qualities, which are irreducible, such as colours, smell, temperature and the like. Change, he says, is constantly at work in nature combining and recombining these basic elements. Copleston writes in this respect that, "all thing were together, infinite both in number and in smallness; for the small too was infinite. And, when all things were together, none of them could be distinguished for their smallness" (p. 85). By definition, all things are in the whole, and are generated by the *nous* which according to Lewis (1962:23) is a force producing stuff, which introduces order in the universe and dominated the interaction of the basic elements. He thus argued in conclusion that "in everything there is a position of everything" and "the things that are in our world are not divided nor cut off from one another".

But this position, analysed in simple literal terms, posits an extreme ideal, which reduces our understanding and interpretation to suppose for example "that there must be minute particles in bread and water which were like the particles of blood, flesh and bones". What perhaps finds meaning at first instance in this proposition, is its capacity for falsification, and so rejection, or its proof and acceptance. It, thus, stands out as a scientific proposition or hypothesis which inherent quality came to be further exposed by the atomists. Suffice to say then that, with the advent of Anaxagoras, a "scientific light", if still a weak one, begins to dawn, because the understanding is now recognised as the principle i.e. the principle of *Nous* which as very rightly recast by Copleston

has power over all things that have life ...Nous had power over revolution, so that it began to revolve at the start... And Nous set in order all things that were to be, and all things that were and are now, and that will be; and this revolution in which now revolve the stars and the sun and the moon and the air and the aether which are separated off (Copleston, 1962:86-87).

Thus, *Nous*, which according to Anaxagoras is synonymous with mind, is present in all things, men, animals and plants, and is the same in all. Aristotle, thus, acknowledges in the

Metaphysics that Anaxagoras “stood out like a sober man from the random talkers that preceded him. Says he in justification, “Anaxagoras uses mind as a *deus ex Machina* to account for the formation of the world; and whenever he is at a loss to explain why anything necessarily is, he drags it in” (ibid. p. 88). Although he dashed the extravagant expectations of people like Socrates (ibid.) especially as he failed to make the full use of the principle (mind), he must be credited with the introduction into Greek philosophy of a principle possessed of the greatest importance that was to bear splendid fruit in the area of science and technology.

Arguably, a foundation for further scientific inquiry was laid. Subsequent thinking was no doubt going to modify and enlarge these simple concepts to qualify and develop them into something more complex. Our next investigation shall endeavour to explore this possibility. But it must be annexed here that, Thales and his successors had put aside all supernatural or mystical explanations of the world and had endeavoured to give a strictly natural account of it. It was in this direction that they made the decisive step towards a scientific approach to the interpretation of nature, and bequeathed to today's world a scientific cultural process.

(ii) The Pythagorean Society

Pythagoreans were members of a religious community, which was founded by Pythagoras, a Samian, at Koroton in South Italy in the second half of the sixth century BC. Pythagoras himself was an Ionian. Notably, the society represents the spirit of the revival of the mystery religions, but combined with it a strongly marked scientific flavour. Our interest here is with the later. The society had Architas, Philolaus and Eurytus among others. It was the Pythagoreans who gave to the world “mathematics” – which first means simply “learning” – its special relation to number.

Pythagoras is credited to have discovered that the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides. He is also said to be

the scientist, who discovered that the earth was a sphere. Following his mathematical knowledge, he discovered that the proportionate lengths of the vibrating strings determine the pitch of notes, so that a string of half the length of another one gives a note exactly an octave higher (Lewis, p. 24). Most obviously therefore, the Pythagoreans devoted themselves to mathematics, they were the first to advance this study, and having been brought up in it, they thought its principles were the principles of all things.

They declared that things are numbers; that the cosmos was a harmony of divine perfection exemplified by the relation between numbers. The Pythagoreans were, thus, led to suggest a solution to the problem of the "conflict" through the concept of number. Copleston records correctly Aristotle's views in this regard when he writes:

Since they saw the attributes and the ratios of the musical scales were expressible in numbers; since then all other things seemed in their whole nature to be modelled after numbers, and numbers seemed to be the first things in the whole of nature, and the whole heaven to be a musical scale and a number (Copleston, 12962:49).

Concerning the nature of the earth, they say, not only was the earth spherical, but it was not the centre of the universe. The Pythagoreans are in agreement that the planets revolve – along with the sun – round the central fire or "hearth of the universe" (which is identified with the number one). They, argue like Anaximenes, that the world inhales *air* from the boundless mass outside it, and the air is spoken of as the unlimited.

Needless to say here that the Pythagoreans made a mark on the scientific atmosphere of Greece, which has largely dovetailed into today's scientific thinking. Thus R. W. Buchanan chronicles the contribution of the Pythagoreans in this way:

"their conception of numbers as the elements of all things and of the heavens as the numerical and musical scale gave to science the important conclusion that there is a correspondence between the working of the human mind and the working of nature; and their doctrine of the relation of the four elements of matter to the four "humours" composing the human body was the first attempt to trace the rules of the external, world to the working of man's body" (Burhanan, R.W. (1973) "Pythagorean Society" in Encyclopaedia Britannica Vol. 28)..

Thenceforth this bold scientific attempt begun by Pythagoras grew, developed and blossomed by the middle of the 5th century B.C in Athens into the specialisation of the characteristic of science, in the form of recognition of the independence of mathematics and medicine. Perhaps, we may say of him like Heraclitus, an Ephesian noble says this of him that, he practised scientific inquiry beyond all other men. There are indeed no suitable words to aptly describe the contributions of the Pythagoreans than the words of Sir Dampier who says:

In our own day, Aston with his integral atomic weights, Mosley with his atomic numbers, Planck with his quantum theory. Einstein with his claim that physical facts such as gravitation are exhibitions of local space time properties, are reviving ideas that, in older crude forms appear in Pythagorean philosophy (Dampier. 1966:120)

Pythagoreans were not left out in the area of the development of Astronomy. The cosmos, argue the Pythagoreans was thought of as living and, therefore, was generated like other living beings. From this cosmology argues Matthew Nwoko (p. 42), two cosmological schemes could be deduced, namely, the geocentric one i.e. a hypothesis that there is fire at the centre of earth perhaps responsible for cosmological movement, and the philolaus conception that the earth is a planet. This singular contribution may have forced renowned scientists like Copernicus to acknowledge that Pythagorean doctrine gave him courage to consider explaining heavenly motions on the basis of a moving earth. Evidently recast by M. I. Nwoko (ibid), Copernicus meant to theorise that the philolaus conception in particular provides that the cosmos as a complete order; a harmony, made up of the perfect number ten (perfection of order as shown in the tetractys where $1 + 2 + 3 + 4 = 10$) the cosmos, the Pythagoreans argue further, must be made up of ten bodies: the earth, the sun, the moon, five planets, the heaven of fix stars, and the counter earth sphere (moving parallel to the earth) – all revolve around the centre of the cosmos occupied by fire.

Such introductory insight engineered by the Pythagoreans, has today opened up the heavenly bodies, which has made it possible for the study of the relationships, movements, compositions, sizes and distances of the heavenly bodies within and beyond the solar system. It is today possible through careful observations with the telescope to plot the orbit of planets and comets, and through astrophysics, for instance, we can derive certain physical and chemical properties of heavenly bodies including such factors as composition, temperature and motion. Bertrand Russell was to later confirm this fact several years after when he says, "mathematics is, I believe, the chief source of the belief in eternal and exact truth, as well as the super sensible world" (Lewis, 1977:24).

Another remarkable contribution to the development of science were those of the geometer Hippocrates of Chios (460 BC) and Hippocrates of Cos (460/380 BC), the undisputed father of western scientific medicine. He made outstanding contributions to medical science and technology in two major ways:

- (i) In the elevation of medical techniques from its mythical, mystical – religious and magical levels to the empirical and scientific levels. He it was, who separated scientific medicine from superstition and primitive religion.
- (ii) The establishment of a strong foundation for medical ethics.

It must be noted here that, prior to the advent of the Pythagoreans, mythical and mystico-religious beliefs rule the practice of medicine and this hindered extensively the development of medicine and medical techniques. Consequently, anatomy then was shrouded in mysteries and unproved beliefs. With the advent of Pythagoras, practical observation and careful interpretation of symptom was introduced as a method of true knowledge and acquisition of techniques. Practical experiment replaced reliance on chance. This era became the era of scientific medicine, and then the age of practical knowledge was an age of great understanding of the entire anatomy of the human body system. Nwoko (p. 43) argues rightly

that, "he was able to distinguish types of diseases unlike before when all diseases were reckoned as one, and hence disease had natural causes not religious causes or caused by deities." It seems to hold therefore that, since the body react only to natural causes, answers therefore must be natural.

The argued position here seems to be more cryptically captured by Plato who told us that Hippocrates built his concept of human anatomy from the doctrine that the nature of a thing is based on the unity of the totality of that thing not on its parts, hence the nature of a human body can only be understood as based on the unity which the totality holds (cf. Plato, Phaedrus # 270A.) Further and better discussion in this regard shall be found under the heading Genetics and eugenics in our subsequent consideration of the impact of science and technology.

Suffice to say however that, such fundamental ignition of science has today blossomed into the different areas of human biology with the possibility of recreating the entire human race asexually and with the possibility of complete mastery of the entire human physiology via recent break-through recorded by the Human Genome Project (HGP) an international research consortium in deciphering the human genetic book of life" gives to science more than what many imagined it could do for humanity. Such stupendous scientific breakthroughs have opened up the doors of social life and security in that the analysis of the DNA molecule has made it possible to construct the genetic imprint of a human being; a signature, as unique and exclusive as finger prints (cf CODESRIA Bulletin 1, 2000 p. 62). Such impact is overwhelming more so that the biomedical applications of these breakthroughs – both curative and destructive, which have been only tangentially understood now reveal once again, the many chapters of scientific activity. But such shall be given a detailed discussion in our subsequent chapters. It, thus, means that the empirical turn given to medicine by Hippocrates and his followers satisfy every ingredient of scientific investigation as portrayed in his concept

of nature.

(iii) Socratic Period (C.500 BC)

The Socratic period similarly ushered in a golden age into Greek Science. With the combined efforts of Socrates, (470-399 BC) Leucippus and Democritus, the earliest atomists (c 460-370 BC), Plato (C 428-348 BC) and Aristotle (c 384-322 BC), a systematic and reasoned philosophical base was laid for science and technology.

Before the commanding influence of the Socratic philosophy, the Ionian atomists pioneered by Leucippus and Democritus of Abdera had researched in and developed a theory of atom arguing convincingly that the richness of the world, and indeed the fundamental character of the phenomenal world in all its spheres is reduced to the mechanical interplay of atoms. In what seems to be a wholesale adoption of the Pythagorean monads, which are endowed with the properties of the Permenidean being the one, Democritus propounded his atomist theory, arguing that there is an infinite number of indivisible units, which are called atoms. These atoms, according to the duo, are in natural and necessary motion. They do not differ in quality but only in quantity by their motion. They have neither top, bottom nor middle in the void wherein they circumvent. Such is the position which Aristotle in his *De Anima*, attributes to Democritus a comparison between the motions of the atoms of the soul and the motes in the sun beam, which dart hither and thither in all directions even when there is no wind (Copleston, 1962:91).

This position of the atomists, clearly scientific in content seeks to expose the essential qualities that assist in the composition of matter, without these being matter themselves. Such quality that the atoms are innumerable, uncuttable, unchangeable and perpetually in motion, randomly though, is said to account for the origin of the universe. Elsewhere, Nwoko (1992:45) argues similarly that man's skill in production and art depends on his grasp and control or directing of the nature of this continuously moving atoms. Suffice it to say,

therefore, that the Democritean atomic theory gave foundations to later understanding of atoms and the basic components of material elements. Today, however, the conception of atoms has radically changed following various scientific theories (divisibility, destructibility, difference in quantity etc) are scientifically proved (see Nwoko *ibid*). Notwithstanding its many negative effects, a good development of the atomic theory enhances physical and chemical production which today serve man's essential needs and desires especially in the discovery of a tremendous hidden world of energy and potency, but unfortunately too, a possibility of his own destruction.

Such mode of reality led Bernal to observe that Greek atomism (pioneered by Leucippus and Democritus) was the lineal and acknowledged ancestor of all modern atomic theories in that Gassend, the first of the modern atomists drew his ideas straight from Democritus and Epicurus, and Newton, a fervent atomist inspired John Dalton, who in 1808 corroborated Democritus' assertion that "matter is made up of small indivisible particles called atoms" (Holderness and Lambert, 1979:18). While appreciating the atomists attempt to give a complete explanation of the world in terms of mechanical materialism, (which as we all know, has reappeared in a much more thorough form in the modern era) the brilliant hypothesis of Leucippus and Democritus was by no means the last word in Greek philosophy: subsequent Greek philosophers were to see that the richness of the world cannot in all its spheres be reduced to the mechanical interplay of atoms. To this we shall now turn.

Beginning with Socrates', an Athenian born genius (c. 470 – 399 BC), science was liberated from the mechanistic interplay of atoms. His emergence, and influence brought into science genuine conditions of scientific knowledge (i.e. based on rationality). This brilliant innovation into science was, however, more explicitly exposed by two (of the best) great figures of philosophy i.e. Plato and Aristotle.

On his part, Plato (429-347 BC) was more inclined to Pythagoras. He was a great metaphysician, mathematician, astrophysicist and political theorist. His thoughts thus assume mathematical guise, and so almost always argue that all other studies should conform to the certitude of mathematics, which is the key to a rational method of scientific inquiry. He highly esteemed astronomy regarding the motions of the heavenly bodies as perfect geometric forms; and for his followers astronomy became a field for the exemplification of mathematics rather than (as today) for its application (*The New Encyclopaedia Britannica* (NEB) Vol. 28 Macromedia 15th Ed 1993:12). Understood as such, mathematics for him is an outward expression of the inner rational mind of its creator. Hence, according to him, God ever geometrises. He argues, subsequently, that to deny the existence of mind as a separate entity was to assume the universe to be the result of accident, which was a denial of the validity of philosophy. He, thus gives, Hippocrates the physician, the singular honour as "the first to separate science from philosophy". In his *Magnum Opus: The Republic*, he argues that geometry prepares the mind for the discourse of dialectics about the real ideas of which perceptible things are but images, leading ultimately to wisdom and illumination. For Plato, therefore, genuine scientific knowledge is possible through the intellectual apprehension of the ideal entities in the world of forms.

Similarly, Plato derived the so-called Platonic bodies, the five regular polyhedral which have equal sizes and equal angles. True to Plato's articulation, mathematicians have come to prove, many centuries later, that the possible number of regular bodies is only five. Also, the first unitary scheme of the universe developed in our time by Kepler as late as 1596 AD was from a consideration of these bodies. But this mathematization of the universe is said to be a doctrine of old which, according to Aristotle, is founded on Pythagorean mysticism.

A clearer and better foundation of Platonic science is constructed in his theory of forms or ideas which argues out "the generation of the universe", that "the sensible world is

becoming and that which becomes must necessarily become through the agency of some cause" an agency which according to Plato, is the divine crafts man or Demiurge who he said:

"took over" all that was in discordant and unordered motion, and brought it into order, forming the material world according to an eternal and ideal pattern and fashioning it into "a living creature with a soul and reason" after the mode of the ideal living creature i.e. the form that contains within itself the forms of "the heavenly race of gods, the winged things which fly through the air, all that dwells in the water, and all that goes on foot on the dry earth. As there is but one ideal living creature, the demiurge made but one world. (Taylor 1928:30 a 3-4; 30b1-c1; 39 e3-40 a2; 31 a2-b3).

This position, largely understood as Plato's physics, that, the generation of this cosmos was a mixed result of the combination of necessity and reason from an errant cause which itself is not a product of intelligence i.e. not an act of sentient beings. With the introduction of reason, Plato argues that, it acts as a persuading necessity i.e. making the "blind" elements subserve design and conscious purpose, even though the material is partly intractable and cannot be fully subordinated to the operation of reason. Plato, thus, seem to argue here that order and regularity characterize *techné* and that nature and reason are the essence of the form, and so production or manufacture or appropriate utility of a thing depends on knowledge of its nature. And the nature of a thing is its form or the essence or the ratio for which a thing is. Plato, thus, cautioned in his *Gorgias* that the art of making things must depend on the establishment of standards, models, paradigms and their like. Says he:

do not select and apply at random what they apply, but strive to give a definite form to it... dispose all things in order, and compel the one part to harmonise and accord with the other part until (they are) constructed a regular and systematic whole.(sic) (Gorgias, #503-404).

Plato was here at his best in enumerating a methodology of scientific endeavour but more cryptically, he argues that all human knowledge and activity, which are now carried out are mere imitations of the form in which the real is. The real knowledge and art is thus in the imitation of the real, not in imitation of the imitation. There is no genuine knowledge or art

(*techne*) in imitation of imitation. He, thus, argues conclusively that the key properties of a genuine *techne* are nature and reason which according to Nwoko are deliberately employed by Plato as portraying the real and its meaning (ratio) to distinguish the true *techne* and or science from something of pure experience. Justifiably, Plato himself illustrates this spirit analogously thus:

Whereas medicine is an art, and attends to the nature and constitution of the patient, and has principles of action and reason in each case, cookery in attending upon pleasure never regards either the nature or reason of that pleasure to which she devotes herself, but goes straight to her end, nor ever considers or calculate anything, but works by experience and routine (ibid # 501).

Aristotle (384-322 BC) on the other hand reconstructed what Plato deconstructed, namely experience, which he argues is the basis of science and technology. Says he: "from experience originate the skill of the craftsman and the knowledge of science, skill in the sphere of coming to be and science in the sphere of being" and that science and art (*techne*) come to men through experience. Nwoko (p. 48) here acknowledges Aristotle's thinking on this issue that "it is experience that helps man to universalise his judgement about class of objects or events it is a matter of art or *techne* to be able to apply individual cases to a universal judgement based on experience". Without discarding Plato's *form*, Aristotle rather sees it as the "ideas of art" which in one way exist and in another way do not exist. *Techne* or art, he says is a principle of movement in something other than the thing moved. (ibid p. 50) He distinguished between "practical wisdom" and "productive sciences". Whereas the former is "a reasoned state of capacity to act", the latter is "a reasoned state of capacity to make" (Nicomachean Ethics # 1140a-1140b).

Aristotle devoted his incomparable genius to systematizing and organizing the whole area of knowledge but with special interest on biological topics. Through painstaking observation and disciplined theorizing he created a biological science and a taxonomy similar to those used today. It is said here that, the whole of his science and indeed the whole cast of

his mind was deeply influenced by his first hand observations of living things. He argues out the relationship between biology and physics, the latter being for him a general description of the universe. Says he:

of the things constituted by nature, some of things are ingenerated, imperishable, eternal; others subject to generation and decay. The former are excelled beyond compare and divine but less accessible to knowledge. The evidence that might throw light on them and on the problems which we long to solve respecting them is furnished but scantily by our senses, on the other hand, we know much of the perishable plants and animals among which we dwell. We may collect information concerning all their various kind, if we but, take pains (cf NEB p. 12)

Borrowing greatly from his master Plato, Aristotle settled down to research on living things with a lavish use of Plato's theory of the generation of the universe and its creatures. He, thus, adumbrates that living things are type of existence, which as a whole is evidence of design. He is said to have researched into the nature of generation, of heredity and of sex, which earned for him a deserved place as a first class observing naturalist in the modern sense.

Like his master and every cosmologist of the Greek era, Aristotle had Pythagorean tendencies, which he exhibits in his physical scheme. He emphasised the perfection of the circle and of the sphere, on which therefore the world is modelled. He propounded that the heavens are a series of concentric, crystalline, mechanised spheres arranged round the earth as a central body.

We may thus, argue here that Aristotle's contribution to laying the foundation for science and technology in the Greek Culture and the entire western culture is incomparably fundamental. It is no gain saying that today's scientific technology owes its solid intellectual foundation to him (and his predecessors) as manifested in the speedy proliferation of basic industries. He, it is, who first attempted a systematic and reasoned study of the philosophical basis of science and technology.

(iv) Alexandrian School

Alexandria soon became another centre of the development of science and technology largely known as an age that witnessed turbulence and persecution, resulting to a socio-cultural disorder and lack of freedom. Though, this period experienced a wave of scientific and technological revolution from which later day scientific technologies have emerged. Exponents of this scientific revolution include amongst others Euclid (c. 300 BC), Aristarchus [c 270 BC] Hipparchus [c 146-127 BC], Theophrastus [c 372 – c 287BC] Archimedes [c 287 – 212 BC], Apollonius [220 BC] and Eratosthenes [c 276 – c 194 BC] It is to be noted that such remarkable scientific discoveries had evidence of the intellectual progeny of some Platonism and Aristotelianism.

Euclid [300 BC] is said to be an acclaimed father of geometry. He is fondly associated with the development of *forms and theorems of plane geometry*, which gave more scientific foundations to unproved architecture, sculpture and astronomy etc. (Nwoko, 1992:51). Such feat chronicled in his *Elements of Geometry* determined instruction in the subject for the next twenty two centuries, even to the present day.

Hipparchus [146 – 127 BC] on the other hand is said to be an acknowledged astronomer of antiquity. He is recorded to have erected the first observatory at Rhodes. Additionally, he developed trigonometry by which numerical calculations can be applied to figures drawn on either plane or spherical surfaces. He made numerous observations and collated the records of Babylonian and earlier Greek astronomers to see if astronomical changes had taken place in the course of the ages. He, thus, drew from these comparisons, two brilliant conceptions of the two precession of the equinoxes (NEB p. 12). He is said to have estimated well the distance and size of the moon, underestimated the distance and size of the sun (by about a factor of 10) made a catalogue of the positions and magnitudes of some 850 stars and brought to a state of high development the description of the planetary motions (NCE

vol. 12, 1967:1198).

Theophrastus [372 – 287 BC], a citizen of Lesbos features prominently in the areas of biological sciences. He made remarkable contributions in plant physiology, the efforts still find relevance in today's scientific endeavours. He made acute and accurate observations in his clear distinction between monocotyledons and dicotyledons. He also attempted a distinction of sex in plants with singular success for palms. These efforts have definite influence on modern biology.

Archimedes of Syracuse [287 – 212 BC] He is attributed with several foundational discoveries in science and technology. In Mathematics, he is recalled in the mathematical construction of the Archimedean spiral; the calculation of the value of π . He is also associated with development in the mechanical construction of the screw of Archimedes for raising water and for his exposition of the doctrine of levers, and Pulley System among many other mechanical contrivances. This has earned him the title of Archimedes the great mathematician and physicist. No wonder then that present day engineering technology (Mechanics and hydrostatics) has its foundations in his discoveries as found in his work, *on Plane Equilibrio*, the work in which are found fundamental principles of mechanics as rigorous geometric propositions. He postulated in the scientific spirit thus: Equal weights at equal distances are in equilibrium; equal weights at unequal distances are not in equilibrium but incline toward the weight at the greater distance (ibid p. 13)

Though adjustments and internal modification, this postulate developed into the principle of the steelyard and led Archimedes in the end to the discovery of the centre of gravity in a variety of geometric figures. He is said to have accomplished much in this endeavour amongst which include the calculations of the volumes and surface areas of solids with curved surfaces, tasks now performed by means of integral calculus. In the area of mechanics, he established statics and hydrostatics as mathematical sciences. He also invented

scientific devices. Similarly, Eratosthenes made an important contribution to science and technology more especially in the area of geodesy. He is said to have measured the difference in latitude between two points, Aswan and Alexandria, nearly on the same meridian and a known distance by means of noon shadows of vertical posts, given his value for the Polar, circumference of the earth as 24,700 miles in quite good accord with modern value of 24,818 miles. Of significance in this regard is that such level of accuracy helps in constructing an outline world map in which the Mediterranean area is recognised. Other scientific feats were accomplished by Hereclides [c 390 – 310 BC]. Following from the popular interest in Planetary studies, Hereclides like his predecessors made revealing discoveries of the Venus and Mercury which he describes as satellite of the sun on which the earth rotates daily (Chester 1965:425).

It is argued here that such revealing discoveries of the Greeks, no doubt, arrogate to them a honoured place in the historical annals of the time and hence today's industrial world. This most obviously instigates Nwoko's (1992:53) exciting conclusion that the Hellenistic scientific and technological revolution did not only provide conceptual and abstract foundations for later technological advancement, but also offered fertile grounds for the Greco-Roman interchange and cultural synthesis. It is on this record that there was good collaboration between the Greek inventors and engineers, and the Romans that spread the inventions through industry trade and agricultural technology i.e. inventing the special use of fired bricks, tiles and stones, development of powerful cement possible for submarine constructions, development of designs of arches, the vaults and domes (ibid p. 53).

More properly stated, Greek science was finally synthesised by two pupils of the Alexandrian school. **Ptolemy** (AD 140) for astronomy and geography and **Galen** (AD 130 – 200) for Anatomy and Biology (ref NEB p. 13ff). Ptolemy's profound interest was in the movements and behaviour of the planets. His most revealing achievement include the

determination of the distance of the moon by parallax; the method is in principle still in use today. He also estimated the moon's distance to be 59 earth radii which is not very far from the truth. Galen on the other hand elaborated a complete physiological scheme generally accepted in modern times. For him, three kinds of *pneuma* or spirit are involved in addition to the world – *Pneuma* – air, from which the basic principle of life was drawn through breathing.

The last of the contributors to the development of science in the Greek era is John Philoponus who worked in Alexandria as late as AD 525. His scientific feats are recorded in his voluminous treatise on the plane astralable and Prolix. Similarly, Philoponus did vigorous commentaries on numerous works of Aristotle critiquing and variously rejecting some of Aristotle's assertions. In his discussion of the motion of an arrow, he rejected the Aristotelian formulation and put forward, indistinctly, to be sure, the idea of inertia. He also rejected Aristotle's distinction between sublunar and celestial matter, arguing that terrestrial and heavenly matter are the same in kind and have the same physics. Such critique elevated the state of science more so as he came on board in the last days of the glorious scientific of Greek era.

It may be said then that philosophy, which began with the proposition that water is the origin and mother-womb of all things, certainly went beyond what the empirical data warranted. Beginning with mere pronouncements, science and scientific statements transformed into the invention of instruments and hence rendered socially relevant, seeing its best days before the rise of Christianity and indeed even before Christ was born. And even though science suffered a period of intellectual darkness in medieval Europe during the turbulent years of what S. F. Mason (1979:21) regard as "a somewhat barren period in the history of European civilization", this age still recorded notable marks in scientific technology. There were fundamental innovations in the field of technology and the craft of tradition, which made life more comfortable materially for the majority of men of this period than in classical

antiquity. They invented the horse-propelled plough, and the water wheel, which was widely used during the dark ages for grinding corn. Similar strides were recorded in the area of the crafts. Of note, according to Uduigwomen, are the spinning wheel used in the textile trade, water power which was applied to saw-mills and for draining mines, as well as printing, gun powder-making, canon-casting and later the making of firearms which improved military power (Uduigwomen, 1996:34). And although the Greek philosophers had not differentiated between physical science and philosophy and combined scientific observation of purely practical character with philosophic speculations, the entire endeavour cannot be totally removed of its scientific character. Such collaborative efforts informs the conclusion that there is in fact, a corporate sanity among scientist that guide thinking in wise channels without restricting fruitful imagination.

It may be argued further perhaps that such humble beginnings in science climaxed in the mechanical scheme of Aristotle and his successors which suggest a series of geared wheels could be summarised thus: (i) matter is continuous; (ii) all mundane things are made up of four elements which in their turn manifest the four "qualities" (iii) stars and planets move with uniform circular velocity embedded in crystalline spheres, centred round the earth. Each sphere is subject to the influence of those beyond; (iv) circular changeless, eternal movement is perfect order. It contrasts with rectilinear movement, which prevails on our changing and imperfect earth; and (v) the universe is limited in space and within an outmost sphere. It is unlimited in time, being subject as a whole neither to creation nor to destruction.

Evidently, ancient Greek is not only the cradle of modern science; it is the source of the materials used in constructing the incubator in which the modern science was hatched in the 17th century AD. Contemporary science in its fascinated state and, thus, argued in our time as the best of times is no wonder the product of Greek thought, hence to argue that the Greeks are idle speculators is to engage in nonsensical verbiage to say the least. Great

thinkers like Jones had alluded to this fact with which we unavoidably align; that,

If we combine Pythagorean emphasis on mathematics and measurement with the Atomist view that reality consist in entities varying only in shape, size and velocity, we have the conception from which modern physical theory began its great career. (Jones, 1970:38)

It may be said, however, that the entire corpus of ancient Greek science is Egyptian in both content and form for as far back as 100 years before the emergence of Ancient Greek science, scientific elements were to be found in one of the older civilizations in Africa, Egypt in particular, that is most often regarded as the cradle of civilization. Farrington Benjamin draws our attention in this regard when he says:

It is undeniable that the historians of science could not fail to acknowledge the debt of modern science to the Greeks. But ignorance reigned to that of Egypt. ...the Greeks acknowledge a heavy debt for the elements of their mathematical knowledge to the civilization of the Nile in Egypt (Benjamin, 1969:1).

It is to be noted that Ancient Egyptian science was more technique (practical) than theory. This is founded on their belief that techniques are fertile beds or foundations upon which science is raised. Indeed, their technical advantage achieved far enormously in "the fields of agriculture, architecture and medicine. They invented a practical system of geometry to fix property lines, developed a calendar, studied the stars, invented astronomy, named the constellations, discovered an alphabet, introduced the art of writing, and learned some physiology and surgery while embalming their dead" (Uduigwomen, 1996:33).

It is, thus, no exaggeration to conclude on this note that, modern technological science was not all conceived and developed in the west. The history of technology, taken as a whole, is a result of contributions from many nations and races from Africa, Asia, Europe, America and Australia. Mathematical science for example was invented by the Arabs. China invented the compass and the map, and made advances in astronomy and mathematics. Very startling revelations are coming out of today's research into the history of ancient Egypt. With the aid

of archaeology, it is becoming clear that ancient Egyptian civilization was Negroid, that it had its origin in the Sudan (the Nubia), and that the early Greek philosophers borrowed a lot from Africa. Pythagoras for example is believed to have spent 22 years in Egypt (Dubois 1965:44-49, 176-225).

3.4 The Medieval Scientific Heritage

The medieval period covers the Hellenistic age to the advent of the renaissance and reformation periods in Europe (east and west) taken as a whole the period experienced a lacuna in the scientific and technological pursuit until the 16th century scientific revolution. It was a period which succeeded the fall of the Roman empire, whose functions and authority were taken over by a new and remarkable organisation – the Christian church. Consequent upon the fall of the Roman Empire, a confused, distrustful, greedy, superstitious and defeated pagan majority capitulated to the organized Christian minority, that knew its own mind and stank from no effort and no hardship in executing its will. The Church, as it were, laid its foundation among the buried hopes, fears and desires of the masses, and gave the poor and humble parity with the rich, the wise and the proud.

The medieval age falls into three periods. The first known as the Dark Ages covers the centuries from the fall of the Western Empire to the recovery of the school of Aristotle, who had been almost completely forgotten. Outwardly, it was a period of stress and strain, the upheaval of a world already broken in pieces. Viewed from within, the period was marked by superstition and terror. Only in the church did men find some groundwork of authority and an element of order. Of the great inheritance of Greek thought, almost nothing had survived – it is argued that only Augustine infused into religious thinking all that Christian philosophy could tolerate of Neo-Platonism and perhaps more than was consistent with it.

Second period was marked by the discovery and translation of Aristotle and the reorganisation of medieval thought by St. Thomas Aquinas and the schoolmen, (a highly

trained body of scholars, i.e. monks clerics) teaching in monasteries, cathedral schools or universities). They moulded the mind of the age – the result was the medieval synthesis with its vast superstructure of theology, which equipped the western world with an intellectual system, a world-view that embraced not only metaphysics, logic and theology, but morals, politics and every aspect of human life. The schoolmen created a framework of belief and dogma in which coherence and intelligibility, though often founded on arbitrary assumptions, did service for the truth for many hundreds of years. It was coherent and within its accepted principle, logically constructed.

Third, from 14th century saw the beginnings of the impact of revived Platonism on medieval thought, the challenge of the new astronomy, as presented by Galileo, the great controversy on the relationship between faith and reason, and the demands of a renaissance world in love with life, which undermined Neo-Platonism. Christian ideas and authorities were cited instead of scientific investigations that could have revealed the facts about the natural world. An honest assessment of their views is that we can neither cope adequately with their arguments nor can assent to or refute them. Indeed, we feel that in the climate of opinion, which sustains such arguments, we can hardly breathe. The fact is that the world Patted into which they are so dexterously woven is no longer capable of eliciting from us any complete comprehension of its meaning. Historically considered, the medieval period was well-nigh barren in positive scientific results until versions of the Greek scientific works appeared in Arabic in the 10th and 11th centuries and in Latin, mostly from Arabic, in the 13th and 14th centuries. But this was a much later development, which helped in the growth of scientific knowledge both in the eastern and western Europe. The actual historical situation is more cryptically presented by Douglas Anele:

In the early part of the 11th century A.D most learned men knew and understood a little tattered fragments of ancient science, but thereafter something like progress was noticeable. The 12th century witnessed some semblance of renaissance for science in Europe due partly to her contact with the superior Islamic civilization in Spain and Palestine and partly to the development of towns with literate upper classes. It was in this period that the first speculative treatises on natural philosophy were produced. The 13th century witnessed the founding of monasteries, universities and the great age of scholastic learning. St. Thomas Aquinas (1226-1274) the theologian and Aristotelian, together with the experimentally minded Franciscan Friar Roger Bacon (1214-1294) who worked mainly on optics belong to this period (Anele, 1998:234)

Largely described by many as the period which index is sterility in scientific pursuit, and only as a period of unbridled dogmatism and superstition, the medieval age left a scientific heritage which modern science owed much to. Perhaps insight into the scientific heritage of this period is provided by Anele that, "it is becoming interestingly clear now, with more scholarship in the history of science, that some essential facts and principles of modern science owed greatly to the medieval period" (Anele, 1998:235). This thinking supports the supposition that there was something that could be called science which still required more anthropological imagination to be clearly understood, for at that time the distinction between techniques, theoretical science and popular magic was not at all clear to anyone; science was just embryonic. Such an array of scholars like Adam Smallbridge and Alexand Michham from England twelfth century dialecticians Adelard of Bath and Rubert Pulleyn, Richard of St. Victor (d 1173) and John of Salisbury; from Germany Hugh of St. Victor (d 1144) theologian, philosopher and mystic; from Italy, Peter Lombard (1100-60) all provided the most needed base for a rebirth in learning. In the area of science, Hugh of St. Victor classified and systematised science in his *Didascalion* in the like of Aristotle arguing that logic is a propaedeutic or preamble to science. Proper science to which logic is a preamble and for which it is a necessary instrument, is divided, mainly into such headings as theoretical science, practical science and mechanics. Theoretical science comprises theology, mathematics. (Arithmetic dealing with the numerical aspects of things; Music dealing with proposition;

Geometry, concerned with the movement of things) and Physics (which has its subject-matter the inner nature or inner qualities of things and thus penetrates farther than Mathematics).

Practical science is subdivided into ethics, economics, and politics, while mechanics comprises the seven illiberal arts; wool making, armoury and carpentry, navigation or commerce which according to Hugh reconciles peoples, quiets wars, strengthens peace, and makes private goods to be for the common use of all, Agriculture, Hunting (including cookery), Medicine and theatricals. (Copleston Vol. 2 Part I, pp. 188-189). The growth in scientific knowledge in that period came from the two distinctive civilizations, namely, the eastern Islamic civilization and the later western civilization.

The contribution of Islamic civilization to science was stupendous judging by the scientific climate of the medieval age, while the candle lights of learning and culture went out one by one in Europe and every hope of revival seemed lost, the Arabian philosophers and men of scientific minds stayed awake to flourish in the eastern cities of Damascus, Baghdad, Cairo and Cordoba in Spain. It is to be said that while scientific endeavours of the west disappeared with the Latin empire, and the Greek speaking Eastern Roman Empire started experiencing a disintegration though, some rudiments of valuable Greek scientific literature found relevance among the Nestorian translators at Baghdad, which further revision and additions were presented to serve as the primary source of Arabian science, which left a deep impression on the Latin world. The most outstanding Arabic scientific developments were in alchemy, in mathematics, in astronomy, and in medicine.

In the area of alchemy, a term used to describe very diverse literature, most of which is highly mystical, was greatly developed by the Arabs. The most prominent Arab alchemist Plazes (d. c. 825) through his writings made the earliest suggestions for furnishing a chemical laboratory, which has today greatly influenced the development of modern chemistry. Similar but better efforts in this direction came from Habir Ibn Hayyad in the latter part of the 8th c.

A.D. He is the first adumbrator of phlogiston theory in chemistry. He had developed and explained how to prepare arsenic and antimony, how to refine metals, and how to dye cloth and leather (Jeans, 1961:101). Again in the 9th century, further researches from an accomplished alchemist, Gebar introduced new and better methods of changing base metals and other substances into gold or silver. Thus, we find him investigating and improving the then standard methods of evaporation, filtration, sublimation, melting, distillation and crystallization as well as preparing many new chemical substances such as the oxides of sulphide and mercury. He was also knowledgeable on how to prepare tetraoxosulphate (VI) and trioxonitrate (IV) acids. It is these outstanding contributions that support Lewis' illuminating conclusion that they (Arabs) "freed both chemistry and physics from metaphysics and magic" (1977:75).

In optics, two great scholars of this tradition feature prominently, they include Al-Kundi of Basra and Baghdad (c 800-873) who worked on retraction of light and Ibn-al-Hazen (965-1038) who on the other hand gave a correct explanation of the act of vision. Ocular vision, according to him is achieved by something passing from the object into the eye. He relentlessly worked on the problem of finding the true relationship between the positions of a source of light and its image formed by a lens (Anele, 1998,236-237):

Islamic scholars also made spectacular strides in the field of mathematics. The major contribution in this area came from the Persian Mohammed Ibn Musa al-Kwarizmi who wrote a treatise on algebra, which contributed much to introduce our present numerical notation into Western Europe. It is on record that it is from his name that the word for arithmetic, algorism was formed. The title of his Latin version of his *Algebra* is the first western use of the word in the mathematical sense, which means "rectification", that is, transposition of negative terms of an equation to the opposite side (Britanica Vol. 12:14) it is no gain saying that the Arabs helped to put mathematics on a sound basis by the system of numerals which they invented

and which we use today, i.e. algebra, and plane and spherical geometry.

The advent of the 12th c saw an orchestrated programme of translation of works from Arabic to Latin thus, opening up Arabic science to the western eyeglasses. It became clear that Arabs had tremendously worked and developed the areas of astronomy and astrology as well as medicine. Astronomy and astrology were particularly developed in Spain by experts at Cordoba and Toledo. In particular, "the Toledan tables of positions of stars were drawn up in 1080, their authors seeking to replace the Ptolemaic by a strictly concentric system" (Britanica p. 14). Similar developments were recorded in the area of human medicine. Rhazes, the greatest and most original Muslim writer whose erudition was all-embracing argued out the distinction between measles and small pox. Alfarabi, Avicenna and Algazel variously made similar (though scientifically below Rhazes) contributions in the area medicine and surgery. Grossly deteriorated version of the Greeks though, Avicenna or Ibn sina (980-1037) the real creator of scholastic system in the Islamic world. A precocious boy, he learnt in succession the Koran, Arabic literatures, geometry, jurisprudence, Logic. Outstripping his instructors, he studied by himself theology, physics, mathematics and medicine and at 16 years of age he was already practising as a doctor. He published extensively in the area of natural science (physics mathematics, psychology, metaphysics and cosmogony) indeed his thought in these areas greatly influenced Latin scholasticism as fondly acknowledged by Copleston when he says that William of Auvergne the first vigorous opponent of Avicenna attributed the cosmogony of Avicenna to Aristotle himself. Nonetheless says Copleston, William himself followed Avicenna by introducing into Latin scholasticism the distinction between essence and existence. This is in addition to influence in other themes; that of knowledge and illumination and that of matter as the principle of individuation, (Copleston p. 220). It is, thus, no aggregation to say that the Arabs have made serious contributions in the area of physiology and anatomy. The Great Arabic contribution to medicine is in the introduction of new

vegetable drugs, many of which are still in use today. He (Avicenna) particularly distinguished himself in medicine, geometry, physics and law as well as philosophy. He interpreted Aristotle in a Neoplatonic manner.

In the Latin west on the other hand, scientific progress was not to be until the 11th century, when it came into contact with Latin translations of Arabic scientific texts. As noted earlier, science disappeared with the collapse of the Latin Roman Empire. The result being that there was little or no serious scientific pursuit in the west and hence no technical scientific vocabulary. They had only to depend on the Arabic translators for names of stars, of chemical substances, of apparatus, of Plants and even anatomical parts. Thus, through Arabic-Latin translations of the works of Aristotle and Ptolemy and also the recovery of the original works of Aristotle, there began a revival of intellectual coherence and, thus, gave to scholastic science its essential character. Another Muslim philosopher from the west provided a brilliant Islamic civilization which grew up in Spain in the 10th c, and which at that period was so greatly superior to what western Christendom had to offer. Such prominent names like Ibn Masarra (d. 931) Avempace or Ibn Bajja (d. 438) and Abubacer or Ibn Tufail (d. 1185) came to mind. But one great figure whose name prominently feature in the area of science and technology and who perhaps occupies a prominent position in the west comparable to that of Avicenna in the east was Averroes or Ibn Busd, popularly called the commentator of Latin scholastics. He studied theology, jurisprudence, medicine, mathematics and philosophy. He wrote extensively on Aristotle who he says was the final culmination of the human intellect. In his words, Aristotle was the completer of human science, the model of human perfection and the author of a system, which is the supreme truth... (Copleston p. 223-4).

Indeed, these organised scientific attempts provided the medieval world-picture with such medieval forerunners like Roger Bacon (1220-2292) making significant contributions in experimental science and the optics. There were experiments with the compass (perhaps under

Arabian influence); the problem of the path of light within a spherical lens was partially solved on a mathematical basis; a parabolic burning mirror was constructed or at least was attempted; and a solitary genius made a workable astronomical clock of great complexity. It is to be argued, here, that such new scientific spirit of the medieval age no doubt stimulated scientists to act and which made them argued today that the better empirical technology of the new science was the product of the medieval centuries, and that its method of exposition was a contribution of scholastic thought.

Astronomy and astrology, similarly engaged the attention of the scholastics. King Alpons X the wise of Castile had collected at Toledo body of scholars (mostly Jews) who had access to Arabic sources and calculated a set of astronomical tables. This knowledge guided the western world for a long time. Similar achievements of astronomy are recorded in the area of pure mathematics.

Understandably, the historians unanimous description of the medieval period as “the dark night of the middle-ages, when ecclesiastical authority reigned supreme and the human reason chained by heavy fetters, and as confining. itself to the useless and fanciful study of theology and so unworthy of study”, stands rejected. To condemn this period as one without knowledge, “all of a piece, an arid playing with words and a slavish dependence on theologians” is to say only half of what the medieval period meant in the historical evolution of science. Douglas Anele is more frontal in providing useful information in this regard. Depicted as one of unbridled dogmatism and superstition though, the medieval period, he says had every evidence of a scientific age and thus, added its tincture to the development of western science and technology. He says

It is becoming increasingly clear now with more scholarship in the history of science, that some essential facts and principles of modern science owed greatly to the medieval period... learned men of that epoch were not all trying to do scientific research as it is now understood... science was just embryonic then. ...there was something that could be called science which still required more anthropological imagination to be clearly understood (Anele, 1998:235).

3.5 The Renaissance Scientific Revolution (15th – 17th c)

The renaissance period in science in Europe represents the period interlinking the medieval period and the modern period. It was a turning point in the history of Europe, which marked the revival of learning and art after a period of decadence, hence causing continuity and discontinuity with the past. It was not only a time when classical learning was revived (as a result of Greek and Roman literature), it was also a period of discovery and emancipation. Nwoko acknowledges the spirit of this period when he says that,

...the period revived Platonism, Aristotelianism, promoting rationalism that separated philosophy and theology, and gradually there emerged interest in scientific thought and methods in centres like Padua (Nwoko, 1992:54).

Indeed, inroads were made into human learning, and both new discoveries and inventions were made. The geocentric theory (i.e. the earth centred) of Ptolemy suffered a major test and redefinition by Copernicus who later developed the heliocentric theory (i.e. sun centred) of Hicetas and Aristacus. The period also witnessed the invention of paintings by Griotto, and further developments in the areas of astronomy and anatomy. As succinctly put: Natural science was now to be born in its modern form with its stress upon observation and mathematics, an approach employed chiefly by Copernicus, Kepler, and Galileo (Mason 1962:225).

Thinkers of this period in the spirit of revival, pursued questions principally about the physical world. But unlike their predecessors, their pursuit was systematic and this gradually led to the emergence of the method in modern science, a method in which the scientists made remarkable strides. The traditional texts (i.e. explanation of events and natural phenomena in mystical terms), which hitherto were the final authority, gave way to observation and formation of hypothesis. It was the advent of the age of appeal to principles and the laws of nature rather than appeal to revelation and biblical injunctions. This posture saw the development of various instruments to test the exactness of the observed phenomena, through

which imaginative hypotheses and fresh knowledge began to unfold. Through this method,

Galileo discovered the moons around Jupiter and Leeuwenhoek (1633-1733) discovers spermatozoa, protozoa, and bacteria. Whereas Copernicus (1473-1543) formed a new hypothesis of the rotation of the earth around the sun, Harvey (157-1657) discovered the circulation of the blood. Gilbert (1540-1603) wrote a major work in the magnet and Boyle (1627-1691) the father of chemistry, formulated his famous law concerning the rotation of temperature, volume and pressure of gases (ibid p. 226).

This period witnessed many discoveries in the area of mathematics by Isaac Newton and Leibniz who independently invented differential and integral calculus. Thus, observation and mathematical calculation invented by the new scientists of the age soon became the hallmark of modern science. This new scientific attitude, according to Uduigwomen, (p. 38) has two implications on philosophy namely, the hypothesis that the process of nature can be explained and described in observable and mathematical terms triggered off the philosophical assumption that everything including the heavens, the minutest particles and even human thought were subject to the laws of motion or mechanical laws. The second implication is that the medieval assumption that the earth was the Centre of the universe and that man was the crown of creation was shattered. As argued elsewhere above, this informing new drive in science ushered in the great scientists of our time in the likes of Copernicus, Tyco Brahe, Johannes Kapler, Francis Bacon, Thomas Hobbes and Rene Descartes among others. These men of great knowledge improved on the early scientific heritage thus setting a tone for the new scientific enterprise which made scientific tradition survive to date.

Work by the great scientist of Cusa, the German cardinal Nicholas (1401-1464), reveals to us the serious attempts at establishing a methodological science. He experimented on the planets (i.e. a growing planet) and proved that it absorbs some weight from the air, thus proving that air has weight. Carried further, this scientific experiment led him to believe that the earth moves, without establishing any formal astronomic theory. This experiment most obviously induced Nicholaus Copernicus' heliocentric theory in place of the geocentric (earth

centred) assumption, which found great prominence in Ptolemaic astronomy. Copernicus was moved by his Platonic influence to believe that beauty and order must allow the mechanism of the universe to be explainable with mathematical order, as against the Aristotelian oriented Ptolemaic geocentricism. Suggesting a new system of the world, Copernicus, the Polish founder of modern astronomy, a physician and canon-lawyer of no mean stature, posited that the sun is the centre of the universe and that the earth, attended by the moon, revolved round the sun every year. In his words,

The Copernican theory postulates that the earth rotates on its axis and takes twenty-four hours to complete each rotation, and revolves like every other Planet around the sun in a circular orbit (Nwoko, 1992:55).

In this articulation, Copernicus provided a basic answer to the problem of motion of the heavenly bodies and thus made a new contribution to astronomy. Following strictly from the astronomical theory of Pythagoras, Copernicus saw error in any theory that did not fit into its mould, arguing that a scientific theory is a group of ideas which emerges through induction from basic propositions or assumptions, and that for assumptions or propositions to be true it must satisfy two elemental conditions, namely: (i) it must account for motion(s) of the heavenly bodies, (ii) it must conform with the Pythagorean notion that heavenly bodies were uniform and circular in their motion (Onuobia, 1991:13).

This new theory generated debate among scholars like Tycho Brahe (1546-1601), Johannes Kepler (1571-1630), Galileo and Isaac Newton (1564-1642). This new astronomic theory, (with slight modifications, was redefined within a scheme much simpler than that of Copernicus. Kepler, the revered German mathematician and Galileo Galilei furthered extensively the Copernican heliocentricism. In his three laws, Kepler succinctly corroborated the tenets of the system thus (i) that each planet moves in an elliptical orbit around the sun (ii) that each planet changes speed so that the line from the planet to the sun sweeps across equal areas of equal times (iii) that the time it takes for a planet to orbit the sun is related

mathematically to its distance from the sun (in Nwoko, 1992:55). These postulations later gave foundations to Isaac Newton's theory of gravitation.

Similarly further feats were recorded in the area of the science of dynamics by Galileo Galilei. Until his time, it had been supposed that heavy objects could fall quicker than light objects, thus proving that there was no measurable difference between the rates of all of objects in the vacuum at the leaning Tower of Pisa. The acceleration (that is the rate at which velocity increases) of falling bodies is always the same throughout the fall. He, thus, discredited the Aristotelian theory of falling bodies and went ahead to develop a scientific method based more on mathematical reasoning and experimental philosophy. For him the postulate that the speed of free fall is proportional to the weight of the falling body and inversely proportional to the density of the medium; that the motion of projectiles depends on some action of the medium; and that motion is impossible in the void very well formulated and defended by Aristotle stand roundly rejected.

Using his mastery of mathematics, Galileo furthered his inventions in science and technology to the benefit of the scientific community. He later improved on the Hans Lippershey's idea of telescope and built several with which he furthered astronomical knowledge by observing the heavenly bodies hitherto unknown. Through this observation, he came to the conviction like Copernicus that the earth moved round the sun. Galileo also made important contributions to the study of pendulum. He discovered the laws governing its behaviour from which another scientist, Hurggens (1629-1695) perfected the pendulum to make a clock.

Although such discoveries and their use (especially the telescope) irked the traditionalists and the clergy and hence persecuted and put in seclusion, Galileo continued his invention even in prison and condemnation. It is to be said then that, his philosophico-scientific contributions with the chain of his innovations provided good foundations for

science and technology in the west. Thus Galileo and his inventions mark the apex of the Renaissance scientific wake achievement with its influential astromathetical revolution. This is understandable in Galileo's belief that the work of nature is written in the language of mathematics (Nwoko 1992:55).

Another scientist of note who stands tall in the annals of the history of science. A celebrated English mathematician and physicist, Sir Isaac Newton (1642-1727) is said to have acted in agreement with the scientific discoveries of his time, but not only a great scientist whose genius achieved completion of the worldview prepared by men such as Copernicus, Galileo and Kepler. He is most noted in the three outstanding areas of his scientific discoveries namely the law of gravitation; the principles of calculus and the compound nature of light, his three laws of motion and four rules of reasoning. His most outstanding contribution to the scientific community are his laws of motion:

(i) Every body continues in its state of rest or of uniform motion in a right time, unless it is compelled to change that state by force impressed on it. (ii) The change of motion is proportional to the motive force impressed and is made in the directional to the motive force impressed; and is made in the direction of the right line in which that force is impressed... (iii) To every action there is always opposed and equal reaction: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts..." (cited as footnote in Nwoko, Ibid. 56).

Newton was a man of science whose contribution to the scientific world is simply unequalled. His *Magnum Opus: The Mathematical Principles of Natural Philosophy* contains the theoretical principles of Newtonian physics, a paradigm of scientific research for two centuries. Newton made notable contributions in optical theory he analysed the components of white light, studied the spectrum of colours, reflection and retraction of light as well as optical phenomena. Besides, his contributions are so solid that it was only in this century that the hard core of his theoretical system, his conceptions of space and time have been superseded. He, it was who revived the formidable atomistic theory which went into decline after Aristotle

and during the middle ages, and so provided science with its working model for centuries to come. Having deduced the motion of the planets, the comets, the moon, and the sea, this great genius of all times wrote in 1686:

I wish we could devise the rest of the phenomena of nature by the same kind of reasoning from mechanical principles, for I am induced by many reasons to suspect that they may all depend upon certain forces by which the particles of bodies, by some causes hitherto unknown, are either mutually impelled towards one another and cohere in regular figures, or are repelled and recede from one another (cited in Stumpf 1993:422)

Clearly, he had established a theory of bodies in motion, which according to him explains nature. This was to hold sway until the quantum theory and Einstein gave the twentieth century a new conception of matter, denying the attribute of indestructibility of the atoms.

Following in the tradition of Descartes, and to a little extent, Thomas Hobbes, Sir Isaac Newton set out to articulate a methodology of science anchored on two basic elements namely induction and deduction. The method consists of analysis and of synthesis or composition. Analysis consists in making experiments and observations and in deriving general conclusions from them by induction. Synthesis consists in assuming the established laws or principles or 'causes' and in explaining phenomena by deducing consequences from these laws. Mathematics, argues Newton, is the mind's tool or instrument in the whole process. Copleston (1964:160) correctly captures Newton's thinking in this direction when he says "It (mathematics) is needed for the start, in the sense that the motions to be studied must be measured and reduced to mathematical formulation... mathematics is an instrument or tool which the mind is forced to use rather than, as with Galileo, an infallible key to reality".

Using methodology, Newton demonstrated that nature not only consists of separate facts describable in mathematical terms, it is a system, that the whole of nature is actually concretely geometrical. As rightly observed by Lewis (1962:93) it (nature) is co-ordinated in its parts, so that one can be deduced from the others, and it possesses no characteristics that are

not so deducible. He argued further that, it is only by thus excluding everything qualitative and reducing everything to the measurable and systematic that nature becomes an object of knowledge.

Perhaps such intellectual current represents the ancient thought of the Pythagoreans whose view still find relevance and expression among contemporary thinkers and scientists. The suggestion here is unambiguously affirmed that, "the aim of exact sciences is to reduce the problems of nature to the determinations of quantities by operations with numbers".

It is, thus, clear to us so far that Sir Isaac Newton combined his esteemed status both as a philosopher as well as a mathematician and physicist to bestow a lasting legacy in the world of science. Such is what qualifies him as one of the outstanding makers of the modern mind, of scientific conception of the world. Copleston (Ibid:167) says of him that, "he carried on the work which had been developed by men such as Galileo and Descartes, and by giving to the mechanical interpretation of the material cosmos a comprehensive scientific foundation, he exercised a vast influence on succeeding generations".

Within the scientific sphere, Newton gave a powerful impetus to the development of empirical science, as distinct from *a priori* theorizing, and by developing the scientific interpretation of the world, he helped to provide subsequent philosophical thought with one of the most important data for its reflections. Since then, science, especially the physical sciences has not remained the same.

Other great scientific currents similarly ignited the renaissance age from the likes of Theophrastus Bombastus or Paracelsus (1493-1541) who attempted to combine Neo-Platonism, alchemism, experimentalism and animism to build an ontology for medical science; Andreas Vesalius (1514-1564) who made some notable contribution in anatomy; Ambroise Pare who improved the techniques of surgery; and the English physician William Harvey (1578-1657) who contributed to medicine by extensive study on physiology. These great

strides in scientific revolution add up to other extensions of the renaissance revolution as for instance the development of modern engineering that produced the steam engine; the rapid advancement in metallurgy and mining; the emergence of modern textile industry especially in Britain, to institute a new world-view for man; the emergence of the new science. It is to be said that with the emergence of the new science, a new world view was instituted; not much reference was made to the supernatural in explaining the phenomena of nature as was the case in the medieval period. Rather, the whole new drift of the new scientific method was toward a new conception of man, of nature, and of the whole mechanism of human knowledge. It was this new epistemological attitude of science that took the centre stage in subsequent scientific endeavours as represented in the philosophies of Francis Bacon, Thomas Hobbes and Rene Descartes.

Founded on this new scientific method of inquiry, Francis Bacon (1561-1626) argued in favour of experimentation as a basis for scientific knowledge. This, he argued could assist in the formulation of universal principles and scientific laws. The mind, he says, has been distorted by passions and errors of traditional learning, which he called idols and distempers of learning respectively. These obscuring elements, according to him, prevent the mind from reflecting truth accurately. Truth was not, as Plato thought, the native inhabitant of the mind, it came from outside by observation and experiment. Philosophy for him must be a candidate of this culture. He argues point blank thus: "when philosophy is severed from its roots in experience, it becomes a dead thing". A new philosophy according to him is wanted, not an opinion to be held but a work to be done; not abstract truth but mastery over nature; not logical deductions from untested first principles but the interrogation of nature, leading to the changing of the world. Such is the process knowledge comes to us. Hence, only when men mean by knowledge the understanding which comes from acting upon nature and changing it will philosophy show us that life is not a vale of tears; as far as we learn to make nature do

better. To discover scientific knowledge, therefore, the mind must be cleansed of the obscuring elements. This led him to advocate the method of induction by simple enumeration. That is, the method of deriving laws from the observation of particulars (facts) and their series and order.

Bacon's Methodology, helpful though, is limited on two counts, (i) his assumption that a hypothesis simply suggests itself after enough facts have been assembled is not in conformity with the modern scientist's conception of an hypothesis as a guide in the selection of facts that are relevant to the experiment (ii) the method undermines the importance of mathematics for science.

Earlier, Bacon had recognised three great technological innovations – the magnetic compass, the printing press and gunpowder, as the distinguishing achievements of man, and he had advocated empirical science as a means of enlarging man's dominion over nature. Bacon argued out a practical role for science, implying then a harmonization of science and technology, and "he made his intention explicit by urging scientists to study the methods of craftsmen and craftsmen to learn more science" (New Encyclopaedia Britannica 'NEB' Vol 12, 1993:469).

Thomas Hobbes (1588-1679) Bacon's friend and countryman set out to overcome the limitations inherent in Bacon's scientific method by adding the mathematical and deduction reasoning to scientific philosophy. He laid his foundation of scientific philosophy in his belief that geometry was the key to the study of nature. He, thus, sought to recast the whole gamut of knowledge in line with this single approach. To do this, Hobbes assumed that, it mattered little what the object of study was, that the method of observation and deductive reasoning from axioms, formed from observation, would yield exact knowledge. He, therefore, set out an ambitious project, which was to recast the study of physical nature, the nature of man, and the nature of human society, using the same method throughout. He argues out the cast of his

mind on this method thus:

The whole method, is synthetically consisting of that order of speech which begin from primary or most universal propositions, which are manifest of themselves, and proceeds by a perpetual composition of propositions into syllogisms, till at last the learner understands the truth of the conclusion sought after (F. Copleston Vol. 5 Part I 1964:22)

It is to be understood that by emphasising this method(s), Hobbes seems to imply the debt, which science and man owe to mathematics. It is here inviting to use his thought to point this fact out. He says: "For whatsoever assistance doth accrue to the life of man, whether from the observation of the heavens or from the description of the earth, from the rotation of times or from the remotest experiments of navigation; finally, whatsoever things they are in which this present age doth differ from the rude simpleness of antiquity, we must acknowledge to be a debt which we owe to geometry" (ibid). By simple conclusion, Bacon straightforwardly acknowledges mathematics, as the languages of all the other sciences, without which there would be no advances in astronomy. Similarly, the benefits conferred by applied sciences are also due to mathematics. He justifiably argues "if moral philosophers took the trouble to ascertain the nature of human passions and actions as clearly as mathematicians understand the nature of quality in geometrical figures' it would be possible to banish war and secure a stable peace.

The suggestion here is that there is a close link between mathematics and physics, and which makes Hobbes to conclude authoritatively thus: "those who study natural philosophy study in vain, except they begin at geometry; and such writers or disputers thereof, as are ignorant of geometry, do but make their readers and hearers lose their time" (ibid).

Following the tradition of both Bacon and Hobbes, Rene Descartes urged that the general principles must be the basis for deduction. Like Hobbes he believed that mathematical reasoning is the best method for discovering true knowledge and that the operations of nature can be fully understood through the method of mathematics. Hence, scientific theories must

be trimmed down to those susceptible of mathematical development. It is his view that experiments served to illustrate ideas from intuitively given principles; they do not determine those principles.

Scientific method from the discussion thus far could be reduced to two basic tendencies, which have today become the foundational systems determinant of modern technological revolution. These are, Francis Bacon's inductive reasoning and Thomas Hobbes' and Descartes' Mathematical – deductive reasoning. While Bacon placed emphasis on experimentation in order to formulate universal principles and scientific laws, Hobbes and Descartes emphasise the use of mathematics to establish the concept of the universe. This dualism gave origin to modern empiricism and rationalism respectively, two systems which as it were established two major orientations and therefore two scientific cultures in modern Europe. In the Islands (British Isles etc.), empiricism dominated with advancement in experimental science and inventions. But in the continent, for instance in France, Germany, Italy, Holland etc. rationalism and some form of idealism flourished. It is to be said however, that modern science and technological advancement are beneficiary of the two.

3.6 Scientific Revolution Modern to Contemporary Times

The legacy of the renaissance scientific advancement rests on the two fundamental systems of induction and mathematico=deductive method of Francis Bacon and Descartes respectively. It thus dichotomised Europe into two namely, the theoretical French scientists and the English experimentalists. It meant then that the Englishmen supplied the impetus for the improvement of industrial technique while Frenchmen were preoccupied with the less productive, but important work of criticizing the doctrines of the church and state and popularising the philosophy of the Enlightenment. Two such basic systems, acting in concert engineered the many scientific discoveries and inventions which have today excited and benefited quite a population, and threatened many others' existence. Indeed, the intellectual

flair given to science by the Baconian principles triggered a wave of scientific research which results were then directed toward useful ends.

Although the renaissance period recreated interest in the tradition of science and technology real inventions and discoveries in science started in the 18th century. Research in Chemistry was revived through the German iatrochemical school resulting in the production of the phlogiston theory (Onuobia 1991:19) according to which chemical substance contains three essences or principles, sulphur which represented the principle of inflammability, mercury also called quick silver which covered the principle of fluidity and salt which expressed the principle of inertness. Further modification was suggested by Joachim Becher (1635-1682) and in 1703 George Ernest (1660-1734), a Professor of medicine and chemistry redefined the phlogiston theory as an essential element of all combustible bodies, oil, fat, wood, charcoal and other fuels.

Similar interest in chemistry was shown in Britain. Such scholars like Joseph Balck, Henry Cavendish and Joseph Priestly, all carried out experiments designed to overthrow the German phlogiston theory and the Greek doctrine that the earth composed of water, earth, air and fire which bore close resemblance to it. It is to be noted that much was achieved in this area especially in the discovery of chemicals and their uses. For instance Balck discovered carbon dioxide, Cavendish discovered and published an account of how to prepare hydrogen (inflammable air), Priestly discovered many gasses like ammonia, hydrochloric acid, Nitrogen dioxide, oxygen, carbon monoxide and sulphur dioxide (ibid pp. 10-20).

French scientists also made many discoveries and inventions in the area of chemistry. Antoine Lavoisier, a leading French scientist criticised Boyle's contention that when fine particles are absorbed the weight of metals increased. The true nature of combustion for him is when the combustible substance come into contact with oxygen that change is evidenced in the weight of a substance undergoing combustion i.e. burning is the result of the rapid union of

oxygen and burning material. He also discovered the method of describing chemical reactions by equations. It may thus be credited to him that he, it is who inaugurated the chemical revolution by replacing the phlogiston theory of the German iatrochemical school. France also produced great mathematicians like Laplace and Lagrange, and Sadi Carnot, the renowned engineer among others. A state supported system of education was introduced, rewards and scholarship were given to deserving inventors and students, and the Ecole Polytechnique was founded. By the time of Napoleon Bonaparte, Paris became the centre of scientific excellence that attracted many people of scientific minds.

The Swedish scientists took the centre stage of inventions and discoveries, this time, more in the field of biology. The development of the first successful method for naming animals and plants which is still being used today, though with some modifications, is credited to Carolus Linnaeus, a Swedish scientist. Albert Von Heller organised all the findings of biologists about the nervous system, the circulation of blood, respiration and embryology into a systematic physiology (Uduigwomen 1996:41). Other inventions and discoveries of the 18th century include, sound, by Joseph Sauveur (1653-1716); current of electricity or galvanism, by Aloisio Galvani (1737-1798); proof of the law of inverse squares by Charles A. Coulomb (1736-1806). Similarly, Electric sparks and invention of Leyden Jar, measurement of heat were discovered by Joseph Black (1728-1799); steam engine was developed by Thomas Newcomer; while war rockets using hammered iron cylinders as container for gunpowder was developed by Ali Hyder, an Indian adventurer in the 1770's and a method of vaccination against small pox was discovered by Edward Jenner in 1796.

These, in addition to Adam Smith's first systematic formulation of classical economics published in 1776, William Herschel's identification of the planet Uranus about 2880 kilometres from the earth and the revival and publication of a code of ethics for medical personnel opened the gates of scientific progress and defined the direction of future scientific

enterprise. Indeed, this century saw the invention of the balloon and later the first large lighter than air craft successfully flown in France by two brothers; Joseph Michel and Jacques Etienne Montgolfier. The 18th century, thus, prepared the basis for great achievements in the 19th century in Europe in the fields of physics, chemistry, geology and biology.

With the advantage of hindsight, the 19th century appears as a golden age for modern science. Science in this century expanded its tentacles of new areas of inquiry. Mathematics and experiments were combined in physics, and controlled experimentation in biology received a new lease of life. Thus, many important advances were made, more so in formulating and discovering of the fundamentals of physical sciences.

In physics, different research areas were successfully unified by the concept of energy, defined as the ability to do work. Such eminent 19th century physicists include Hans Christian (1777-1851). Michael Faraday (1791-1867) Hernan Von Helmholtz (1821-1894) and James Clerk Maxwell (1831-1879) among others. Working in concert, these men of science contributed to the theory of energy conversion and conservation though working within the context of Newtonian theory.

In particular, James P. Joule discovered that heat is a form of energy. Indeed, he is credited with the famous law of conservation of energy, a law which states that, "energy can only undergo a change in form, but can neither be created nor destroyed" (Uduigwomen p. 41). Michael Faraday, also, discovered that a moving magnet is capable of inducing an electricity current. H. C. Maxwell corroborated Faraday's position mathematically, but added that light and other energy waves are fundamentally the same.

In chemistry, outstanding inventions and discoveries were made. Chemists built on the foundations of the nomenclature of chemical substances founded by the French chemist Lavoisier, and elaborated further, Charles Dalton's atomic theory, the theory that "all material objects are made up of small, indivisible and indestructible particles called atoms". Russian

scientists also made remarkable contributions to the scientific spirit of the 19th century. Dmitri Mendeleev, for instance, simplified and systematized the description of chemical reactions. He grouped the chemical elements according to their atomic weights and chemical properties, thus clarifying the relations between the various elements. Such scientific feats in chemistry moved it closer to unity with physics, and achieved an increased power in industrial application (reference next chapter).

Ernest Mach (1838-1896) a professor of physics (Prague) and professor of philosophy (Vienna) brought his philosophical mind to bear on his knowledge of the physical sciences when he developed a phenomenological physics which was adapted as an approach in the field of thermodynamics. This method in science consisted in "a one dimensional stream of unit observed facts". He argued in this line that the observed world is made up of units of atomic fact. Following this line of thought his follower Ludwig Wittgenstein, and Bertrand Russell later developed a realist view of meaning which the later was to develop into logical atomism.

This phenomenological philosophy of science was heavily criticised by Boltzman for abolishing the distinction between metaphysics and scientific theory which, consequently discarded the conceptual framework of time and space replacing it with unit of observed facts. The advantage of this is perhaps that, by the vigorous objection to mechanics by Mach, the use of mechanical models has been abandoned for mathematical models in physics and other sciences. This facilitated the ion-energetic of science and technology, especially during the industrial revolution from the 1850's. This was the time when the combined efforts of all the sciences helped in the achievement of mass production of items which characterised industrialization including the developments in precision engineering that went with it. Such a state of affairs is what confirms when he observes that:

chemistry proved particularly useful in the above regard (industrialization). Its development aided the development of textile industry as spinning and weaving machines helped to increase output, there also arose the associated difficulties of bleaching, and large scale manufacture of chemicals helped to resolve them. (Onoubia, 1991:22)

In the area of agriculture, the German chemist Lēibig was on hand to respond to the challenges of soil fertility. Acting on the premises that plant could not create mineral salt and that what they (plants) took from the soil must be replenished, he developed artificial chemical fertilizers for the specific end. Today such scientific discovery has been essentially developed to satisfy the demand of large scale subsistence faming in form of organic fertilizers. Essentially, however, it is to John Lawes (1814-1900) that the scientific community and mankind in general owe the full development of agricultural chemistry.

In 1876 Louis Pasteur founded Microbiology. He studied fermentation while working in a brewery industry. He successfully located the specific micro-organism which soured wine and discovered that it could be killed by warming the wine up to 55⁰C; he similarly investigated silkworm diseases and isolated the responsible micro-organisms, and researched into cattle anthrax, chicken cholera and finally he researched into human diseases in the 1880's.

Using the hindsight of Pasteur's strides in microbiology especially his work in fermentation and putrefaction caused by microorganisms, Lord Lister (1827-1912) perfected such knowledge for use in the surgery. He used solution of phenol, obtained from coal tar in water to reduce blood poisoning after surgical interventions (Ibid. p. 22). Further and better discoveries in human medicine were made with the use of Anaesthetics when Von Lieting invented chloroform in 1831 which was later perfected by Professor James Young Simpson, a Professor of Medicine and first introduced on Nov. 4th 1847. Its use marks a new beginning of painless surgery and childbirth through surgery. Further, in the area of physical medicine, it emerged that microorganisms are rendered inactive through cultivating them outside the

animal body and they are served to immunise the animals against normal active strains on being reintroduced into the body. This specific accomplishment is credited to Robert Koch (1843-1910) a German scientist who is also credited to have discovered the bacteria that cause tuberculosis in 1882.

Other discoveries of the century include x-rays by Wilherlm Roentgen in 1895, the element radium by Marie and Pierre, Curie in 1898, quantum theory by Max Planck in 1900, Chemotherapy – the treatment of diseases with chemicals by Paul Ehrlich in C 1900, during which Sigmund Freud also developed his theory of psychoanalysis, and the discovery by a French Physicist, Bequerel (1852-1903) of what is today known as radioactivity.

It may be added briefly that, beginning from the 1870's, experimental biology attained new heights. Through the works of Rabi (1853-1917) and Van Beneden Mendel (1822-1844) and de Vries (1848-1835) much comes to us about chromosomes. Allied studies in the area of inheritance and mutation in monumental works of Bateson (1861-1926) and Johannsen (1857-1927) also come to mind. Today the disciplines of genetic engineering attest to the invaluable contributions of these great scientists. Earlier fundamental discoveries in biology were made, namely the Cellular structure of organism by Theodore Schwann and the natural selection by Charles Darwin (1809-1882). In particular Charles Darwin's theory of evolution (1859) was most remarkable in scientific circles. It unified the disciplines of biology, physiology and geology. Primarily, it is a humble attempt at explaining the origin of species, and particularly the descent of man. Motivated by the work of the British geologist, Charles Lyell, who put forth a proof to show that the development of the earth surface has been a very slow and gradual process through millions of years, and adding up to it another geological theory that the earth reached its present shape through violent changes known as cataclysms, Darwin developed a sophisticated scientific theory hinged on the argument that life process of both plants and animals evolved through ages, from simple organisms, a journey that spanned over

six (6) billion years. The process took the form of natural selection, through competition and the survival of the fittest. (Uduigwomen, 1996:42)

This theory is significant in scientific circles, but it clearly contradicts the theological assertion that God is the causative agent in the evolutionary process. While accepting our incompetence to stand in judgement for or against science or religion, we neither have the tools to abolish God nor disprove science. Such is the tragedy of human knowledge (science and technology) the limit of which can neither discover God and his ways, nor annihilate Him.

Thus far, it could be said that the major theme of 19th Century Europe which was progress and science justifiably received credit for much of it. It also shared in the general optimism of that time. Three basic factors are decipherable in the general praise of science. First, we have the ancient tradition of respect for learning as a contribution to civilization, independently of its application. Second, there was the discovery that science could be usefully applied in industry. And thirdly, there was the conception of natural science as a weapon against religious dogma and popular superstition. Put together, science became a weapon of liberation in the hands of the great men of science which dividends humanity is a beneficiary. Indeed, these three factors, taken together, served as a religion to many an intellectual and remained a strong inspiration for science until contemporary times. It is no wonder then that the 20th century sustained such spirit of science, and even blossomed certain tendencies in the womb of 19th century science.

Science and technology in the 20th century, is highly professional in its social organization, reductionist in style (i.e. investigations were concentrated on the artificially pure, stable and controllable processes set up in the laboratory) and positive in outlook. Such indices of science produced great achievements too many to be catalogued in this work. We shall however consider two such achievements namely the macro (big) science through Einstein's theory of relativity, and that in the micro (small) science accomplished through the

indeterminacy principle of Max Planck (1858-1947) and later Werner Heisenberg (1901-1976).

The specific theory of relativity (1905) and the general theory of relativity (1916) were posited by Albert Einstein (1879-1955) to resolve certain theoretical and experimental anomalies in Newtonian physics. Newton had assumed the existence of a universal coordinate system or frame and for measurement in space and time, by which implication, a measurable shift in position of the invisible, super-elastic substance, either, that supposedly pervades the whole universe, should be observed in terrestrial measurements with reference to the earth. i.e. that time and space are given absolutely, and are alike for all observers. Upon analysis, Einstein revealed that something is fundamentally wrong with this assumption, arguing that we cannot compare the time in two different places without sending a signal from one to the other which, logically demands the passage of time. Consequently, says Einstein, "there is no universal now" there is only "here and now" for each observer, so that space and time are inextricably interwoven, and are species of a single reality.

Most fundamental in scientific discovery and later development in energy resources is his establishment of the basic equations that make it possible to know scientifically the great amount of energy latent in matter and which makes the exploitation of nuclear energy possible. He similarly made enormous contribution in the invention of quantum mechanics, which support investigation by Max Black and later Werner Heisenberg, the German physicist, was reduced to a formal principle in 1927 and given a sensible name of the principle of uncertainty or indeterminacy. The principle asserts that: "It is possible, in principle, to measure with complete precision the position of a subatomic particle simultaneously (Bronowski, 1960:69).

The indication of this principle is that, every description of nature contains some basic and irremovable uncertainty. In other words, we can never predict the future of a subatomic

particle with complete certainty, since as a matter of fact we cannot be completely certain of its present. In social relations, the principle tends towards tolerance and or accommodativeness, for the future in life cannot be predicted with every level of accuracy – the future from the point of view of the present is problematic.

It is to be noted that these theories have led to a radical revision in the basic concepts of classical Newtonian physics and has increased the application of statistical method in microphysics and other areas of the physical and human sciences to reduce the level of inaccuracy. The two theories demand, at the societal level, that all of us ought to jettison dogmatism, fanaticism, and intolerance, and embrace open-mindedness, the desire to listen to others, and the recognition that our most cherished beliefs may be shown to be erroneous in future.

Notwithstanding the altruistic intention of the early physicists in the area of atomic research, further intensive researches during the second world war into the structure of atom led to the development of atomic and later chemical weapons which today threaten humanity and have the possibility of wiping the entire human race on the surface of the earth planet (detailed discussion in the next chapter).

In the field of Earth Science, much has been achieved. Man's need to fight energy crisis and explore his earth environment for sustainable development has substantial reward. Having developed a new science for this purpose i.e. Geophysics, man has explored metals among the rocks and earths substratum. As a science of exploration for natural resources such as minerals, oil, salt, gas, coal etc., Geophysics has aided mankind in understanding better such phenomena as continental drift, plate tectonics, volcanicity, earthquakes, polar wandering etc. Such knowledge has aided exploitation in commercial quantity which accruing revenues are further channelled for man's essential desires. On the other hand, man's knowledge of the dangerous ecosystem is further directed in planning and managing it to avoid human

catastrophe.

The 20th century has also seen the developments in the field of healthcare delivery. The combined efforts of individual scientists and organizations as World Health Organization (WHO), United Nations Children's Education Fund (UNICEF), among others, have resulted in biological researches which have led to breakthroughs in the treatment of such killer diseases as tuberculosis, malaria, polio, whooping cough, etc. In contemporary times, organised scientific efforts are targeted at discovering a cure for the deadly virus HIV to unlock the mystery behind the killer disease, Acquired Immune Deficiency Syndrome (AIDS). Dr. Jeremiah Abalaka, a Nigerian physician, proprietor and chief consultant, Medicrest Specialist Hospital, Gwagwalada, Abuja made revealing discoveries in the area of human medicine in the treatment of HIV/AIDS in 1999. Following Louis Pasteur's work centuries ago on rabies, Dr. Abalaka developed not only a vaccine that can prevent an HIV negative person from contracting HIV if he/she had taken the vaccine previously, but also a vaccine that can cure a person who is HIV positive (cf. Nigerian Academy of Science Report on treatment of HIV/AIDS on Internet: TIVNET@haywire.csuhayward.edu) 3rd July 2000). Perhaps, earlier scientific researches which led to the discovery and development of natural antibiotics; Penicillin by Fleming (1881-1955) and synthetic antibiotics by Ehrlich (1854-1915) have not only made medical treatment effective, but have also contributed to a better understanding of the process underlying life. Other similar discoveries were made as for instance the discovery of radiotherapy by Marie Curie, which has helped in the treatment of cancer and Christian Benard who pioneered heart transplantation.

Great advances have also been made in the areas of electronics, communications and computers. The first source of electric power was constructed by Alessandro Volta, a Professor of Natural Philosophy at Pavia who, experimenting on William Gilbert's finding documented in his De Magnete in 1600 ("On Magnete and Magnetic bodies, and on the great

Magnet, the earth") took a series of disc of zinc and silver separated by moist cardboard and arranged alternately to form a pile. Earlier in 1831, Michael Faraday had showed that an electric current can be generated in a wire by the movement of a magnet near it and constructed a machine for producing a continuous supply of electricity i.e. first electric generator (McNeil 1990:41).

However, the science of electronics could be said to have started with the invention of the thermionic valve by J. A. Fleming, patented in 1904. Latter years were to see the emergence of the telephone, radio and television services in many nations as a universal means of mass communication system enhanced by the balloon and satellite. With the manufacture of thermionic valve; the first computer ASCC (or Automatic Sequence Controlled Calculator) was completed by H. H. Aitken in collaboration with IBM in 1944. Two years later, at the Moore School of Engineering at the University of Pennsylvania, the first electronic computer was completed. Today, the computer has been so improved that it can process information almost of the speed of light, and it is said to be capable of performing two billion calculations per second and this speed can be further increased almost to infinity.

Inroads have been similarly made in the field of aviation. Following the initial flight success by the Wright brothers, the aviation industry has not remained the same. Planes have now been used for both civil transportation and defence. This has also been followed by space exploration and research. As curiously stated by Uduigwomen "today, man can travel to and from the moon (and other planets) and there are artificial satellites orbiting the earth" (Uduigwomen, 1996:44). Man has indeed fulfilled the creators' injunction to "dominate the earth". For instance, in 1957, Russia launched the first artificial satellite, followed by the United States of America (USA) in 1958. Again in 1961, Russia and the United States of America jointly commissioned a manned satellite into the space, and in 1969, Neil A Armstrong and Edwin E. Aldrin, Jr. landed on the moon and brought Moon rocks and dust

back to the earth for scientific study. Subsequent years have seen many other exploratory space programmes; the USA space shuttle, Columbia completed its first mission in April 1981 and made several successive flights. It was followed by the challenger", which made its first mission in April 1983. Both vehicles were used to conduct myriad scientific experiments to detect the possibility of life in other planets and to deploy satellites into orbits. (McNail, 1990:43)

With such monumental achievements of science in the 20th century, and which scientific experiments which are carried over into the new millennium, more is expected from this *jet-age* of science especially in the area of biological science; (genetic engineering in particular), and information technology. The new millennium prides itself as a possible age of surprises in bio-medical breakthrough judging from the preliminary finds by the Human Genome Project (HGP) (2000) in deciphering the human genetic book of life which bio-medical application could lead to better management of ailments and numerous other diseases that affect man. Similarly, the new millennium promises to prolong human life further going by the latest scientific breakthrough in molecular biology. Indeed research in biology with the aid of modern techniques and instruments has begun to unlock the mysteries of cell formation and reproduction through the self-replicating properties of the DNA molecules present in all living substances and thus to explore the nature of life itself.

Modern technological medicine has made tremendous contributions towards the generation of life through cloning technology. This reproduction technologies which started on a small scale on the farm, were further given more claut with the introduction of embryology and genetics and moved from animals to humans to clones in this historical order: in 1950, there was the first successful freezing (at 70⁰c) of bull semen for transport and later insemination of cows. 1952 saw the first animal cloning by Robert Briggs and Thomas King. They made frogs from tadpole cells; and in 1962 John Gurdon improved on this effort, and

cloned frogs from older tadpole cells. The generation of human life asexually was then introduced in 1978 with the birth of baby Louis; the first child conceived through in vitro fertilization by Patrick Steptoe and R. G. Edwards of England. In 1983, the first human mother-to-mother embryo transfer took place. Raph Brinster's laboratory created the first transgenic livestock, pigs that produced human growth hormone in 1985. And in 1986, artificially inseminated surrogate mother, Mary Beth Whitehead carried baby M to full term, then tried to keep her. But she failed. Then, the most outstanding of it all at the close of the twentieth century Wilmut and colleagues announced the birth of Dolly, a sheep, the first mammal cloned from embryonic (single adult) cell in 1996 (cf. *Newsweek*, March 10, 1997 pp. 43-45).

3.7 Conclusion

The historical development of science and technology thus far, brings to mind two fundamental issues. On the one hand, science and its development have the capacity to heal, and on the other, it has the capacity to kill. Human reason and knowledge, on their own, without practical application remain an ideal without social relevance. Hence the Baconian suggestion that scientists should study the methods of craftsmen and craftsmen to learn more science is borne out on the developments in science and technology in the last two centuries (18th & 20th centuries). The application of scientific knowledge to practical positions have led to breakthroughs in the electronics which today has given us radio, television, the tape recorder, the video recorder, the pocket calculator, automation and robotics, the electron microscope, the heart pacemaker, the myo-electrically controlled artificial limbs, the automatic aircraft pilot, the master and the laser computer aided design and manufacture, solar cells, satellite communication with the rocket, man in space and unmanned space probes. These and other feats in the area of bio-medics and the general science of genetics has opened man to the endless limits of what science and technology can do. Indeed, progress science and

technology have combined to leave us on the shore of a vast ocean of possibilities brought about by electronics, bio-medics and or genetic engineering.

Today, the possibilities resulting from developments in science and technology is assuming paradoxical dimensions, more purposeful, and purposeless; more meaningful and bizarre; more useful and destructive; while achievements science have served to prolong life, they have also served to provide resources for the brutal extermination of it. Such paradoxical nature of science has created a dilemma in the minds of people which made Onuobia (1991:23) to conclude that "nobody is sure the direction science is going, good or bad", and these raise the question of values in relation to science and technology. With even a greater fear spread all over the world that man can unleash tremendous natural forces from the atoms, which devastating effect first came to our knowledge at Hiroshima and Nagasaki on August 6, 1945, humanity is forced to ask fundamental questions about science and technology; What has science and technology done for man, and what can it do for him? What is the rationality of science and technology? What is the aim and end of science and technology in the promotion and protection of the general good of humanity? Is it part of the destiny of man and the finality of science and technology that man turns out to be the slave or victim of the product of his own ingenuity? Or is it true, as it is popularly held, that, science and technology are neutral? Such interrogatives shall engage our critical attention in chapter four. Our next chapter shall however discuss the science of human conduct in relation to scientific and technical endeavours.

CHAPTER FOUR

4.0 MORALITY OF HUMAN DEVELOPMENT

4.1 Introduction

Human nature, ethicists are agreed, is constituted of reason and passion. Thus, man may be properly defined as a moral being whose actions are either morally right or morally wrong. Taken as the products of man's reason, that is, theoretical knowledge, which is *episteme*, and the principles of action, that is practical knowledge which is *techne*, contemporary science and technology have their ultimate end in the perfection of the whole man. Thus, if contemporary science and technology must receive credibility as an action of human rational action, its ultimate finality must coincide with that of the destiny of man, that is the advancement of the good of the whole human person.

Science and technology assumes a proper direction only as far as it achieves the integral good of man, in his/her material and spiritual goods, the two poles between which the human being is caught. A genuine ethic for science and technology consists in a true normative science of human conduct that promotes both the material pole which in reality, the shadow of personality and a spiritual pole which does concern true personality, the meaning and bountifulness of man, the form or the soul of the whole being, man. In this regard, ethical principles concern themselves with the norms of standard of human behaviour along the line of the moral law with the sole aim of advancing the integral good of the human person.

This chapter attempts a critical evaluation of the morality of human actions. In so doing, we shall undertake an analysis of such ethical theories like moral positivism, ethical hedonism, intuitionism, utilitarianism and categorical imperative. Moral humanism shall be advanced here as a moral theory which brings out the essential features of morality neglected by other ethical perspectives. In itself, it is a morality that is determined by the full, integral development of the human being as a human being. In its essential feature, this ethical

paradigm directs the endeavours of the man of science and technology away from dehumanization and depersonalization towards human sustainable living.

4.2 Ethical Decision and the Concept of Moral Value

All of us constantly face certain kinds of situations, which is usual to call moral or ethical. Clearly as we recognize or classify such situations as moral, we are not always sure whether our classification is right or wrong. In fact, apart from philosophizing, we are not likely to be very concerned with such clarification. So diverse in nature and context are such situations that we may fail initially to see them as having anything in common. Still, *ethical problems are related*, and if we give heed, less to the new situations than to the questions they raise, we will see that in these very questions is found the relatedness that links diverse situations as ethical ones. And ethical reflection, we may say, is directed toward certain kinds of questions about human situations and problems, no matter how diverse they may seem.

What is it, then, that constitutes an ethical? 'Ethics' is derived from the Greek word '*ethos*' which means "character" and, in the plural, "manners". The synonym morals derive from the Latin '*moralis*', which Cicero used to render the Greek '*ethikos*' and also means "character" and "manners" or "customs". Such etymologies suggest that the ethical refers to one's own relationship (character) to his and other's manners and customs. In reference to philosophical usage, this is *partly* right, yet partly misleading. Ethical experience and reflection are about human conduct but, what is omitted is the problem of evaluation, of judging by reference to the right and the good; the fundamental principles of the moral law (Omeregbe, 2003:4). Thus, ethics is a normative science of human conduct concerned with the way men, in all their endeavours, ought to behave, it is the norms of conduct to which human action ought to conform.

To see a bit more directly what ethical questions and concerns are about, we may turn to an illustration. In November 1915 a Chicago surgeon named H.H. Haiselden refused to

operate on a baby boy four days old. Though contrary to accepted medical practice and ethics, he did this, he said, 'in the interest of the human race and more particularly of American manhood'. The baby was extremely defective and would probably remain so throughout life. Dr. Haiselden believed the infant to be dying, although its life could have been prolonged if an operation had been performed. The doctor's position was that, given the consent of the parents (whose consent was got) "nature should be allowed to take her course". When no other doctor or nurse intervened, the result was that the child was allowed to die. The doctor had made his ethical decision and made his evaluation in the situation.

Needless to say, the moral reaction to Dr. Haiselden's decision was immediate and widespread. The Chicago Anti-Cruelty League and the Illinois Humane Society held meetings, threats of court action were made. Surprisingly, however, these two societies announced themselves in agreement with Dr. Haiselden. The result was that he was exonerated by a coroner's jury, which settled the legal question. But many voices expressing different moral judgements were nevertheless heard as well. Miss Jane Adams of Hull House condemned the act absolutely. Only the One who gave life can take it away, she said, and she asked, what right does the doctor have to take a human life? Everything is born into the world with an inherent right to live... Letting of that baby die when its life could have been saved is a crime against the race instead of the benefaction claimed' (Time Magazine, 1984:20).

A specialist in children's diseases wrote that when an animal is disabled it is shot, so when a child takes all the pleasure out of life for its parents, and is helpless, it should not be allowed to live and give unhappiness to the living. Still another opinion was expressed by one writer who said that he believed that a child with congenital malformation to such a degree that the mental development necessary to a self-reliant individual is prevented should be permitted to die. "The only good or value for the child is in this capacity of development". Finally, still others suggested that all children born with congenital abnormalities are a

detriment to society. Therefore, they said, it is humane to cut off their future sufferings and those of society (See Time Magazine, 1984:18-25)

Few people will deny either that Dr. Haiselden faced a moral situation, or that the various spokesmen mentioned in the illustration made moral judgements on his action. Let us look closely at the illustration to see just what made it a moral situation. Firstly, we notice that Dr. Haiselden was called upon to act in the light of a *choice* or a decision. He was not reacting mechanically or only simply responding to a stimulus like the knee-jerk reflex: he was choosing to act in such a way that some (then non-existent) end would be achieved. Thus, ethical situations, we may say, *involve human actions rather than mere behaviour* and response; or, as an older terminology had it, they are *voluntary rather than involuntary*. Within the domain of *voluntary*, we find *four factors* or data whose presence define situations as ethical more fully:

The *first* of these is the experience of *choice* i.e. an agent's act of volition in deciding between two or more alternatives (Ozumba, 2001:3). This datum is very difficult to treat briefly, for discussions of it often turn quickly to one of the most vexing and difficult of all philosophic problems, that of free will. *But clearly, Dr. Haiselden had a choice to make.* Indeed, whether he believed in determinism or not, he still faced a situation in which he believed that

- (i) there were alternatives;
- (ii) he was called upon to choose because the outcome of the situation depended to some degree upon his choice, and
- (iii) he was in a situation in which he could have acted otherwise.

Apart from some such experience, one would hesitate to call Dr. Haiselden's situation a moral one. And it is just for this reason also that critics – Jane Addams and the others – made their moral judgements. If Haisleden's actions were simply a development and outcome like

the growth of a flower, one might grade them as appropriate or not but one would hardly censor them and call them blameworthy or commendable. If we adopt the word 'choice' for this datum, we can say that the possibility of choice is a necessary condition of the moral experience.

The *second* observation to make about the experience suggested in the illustration is that the issue of choice and the outcome of action are related to the question of *value* i.e. something that is desirable either for its own sake or for the sake of other ends which will aid in realising a particular goal. Values, or *what was believed to be valuable, were at stake; goods and evils were set in opposition to each other*. Such a concern with values is another identifying mark of ethical experience. A value (or good) is whatever is approved, esteemed, or desired. Enjoyment is often taken as a rough synonym of value. Disvalue is evil or that which is disapproved. Now people differ in what they take to be of value: Miss Adams said it was life itself, others said happiness, or utility, or individual development. Such differences of opinion about what is valuable suggest a distinction between what might be called a true value and a false or only apparent value. A true value, if such can be found, would be one, which has been judged so by an adequate criterion of value. Ozumba calls it intrinsic value, which refers to desiring things for their own sake e.g. happiness, when it is regarded as the ultimate (Ozumba, 2001:4).

Third, we find in our illustration the idea of *obligation*, of what ought to be, and therewith the concept of right as against wrong. Of course, the participants in the debate differed about what ought to have been done; and they therefore differed about what they considered to be right and wrong in the situation. Still, it is because of a sense of obligation, a belief that some choices are right, others wrong, that we can speak of Haiselden's action as moral at all. Philosophers have interpreted the nature, meaning, and role of this datum of obligation differently, though almost all of them have believed it be a central factor for

morality. Sometimes, as with *Immanuel Kant*, the experience of obligation is seen to be the very core of the moral experience, so that obedience in action to the necessities of duty constitutes the moral experience, and defines duty and rightness as well. For other philosophers, value experiences is more basic, so that for them what ought to be is determined by what is recognized as valuable.

The *fourth* and *final datum* we find in our illustration is the rule – the *moral law* or principle – to which the debaters appealed in their judgements of the possible goodness or rightness of Dr. Haiselden's action. Moral Laws are not always quite so explicit as they are in this illustration, but possible reference to a principle is taken by many philosophers as another necessary condition for the moral experience. Miss Adams, we remember, appealed to the principle of an inherent right to live; Haiselden himself spoke of the development of American manhood; and the others appealed to happiness, usefulness, and self-realization. It is such rules or principles that define and identify what people believe are true values and valid, binding obligations.

In our illustration, we find the data of choice, value, obligation, and principle essential to the moral experience. They constitute that experience, though they also pose the problems that concern us as we reflect on the human situation involving them. We ask about values: Are there any values, which we and perhaps all men should acknowledge? In what ways are values binding on us? Are there distinctively moral values, and how may they be related to other values? We wonder about obligation: what is our duty? What basis or justification does it have? And we ask about principle: is there a moral law, which is definitive for human beings in their choices and decisions? As we become more reflective on these and similar questions about the data of morality, we become at the same time more philosophical about them.

As philosophers have developed the field of philosophical ethics, they have worked on three levels:

The *first* of these is largely descriptive and seeks to identify the moral experience in a descriptive way. We have been on this level in discussing the case of Dr. Haiselden. Much of the work here is now done by social scientists, though before the rise of such disciplines as psychology and sociology, moral philosophers had to do this kind of inquiry themselves.

A second level of inquiry is *normative* ethics (normative means what we ought to be). Here philosophers try to work out acceptable judgements regarding what ought to be in choice and value. "We ought to keep our promises" and "justice is a virtue" are examples of normative judgements that many philosophers find acceptable.

Finally, there is a third level of philosophical inquiry usually called *critical* or *meta-ethical*. On this level, philosophers seek to work out a theory of the meaning and justification of our judgements of obligations and value. Meta-ethics does not propound any moral principle or goal (except possibly by implication), but rather consists entirely of philosophical analysis. It seeks answers to questions like, what is the meaning of 'good'? and, can ethical judgements be justified or warranted? The proceeding discussion shall dwell on this extensively. Suffice it to state however that while our consideration of ethics in relation to human behaviour as exemplified in the case above falls so far within that part of ethics dealing with individual conduct, we are not limited to the individual alone.

There is also the field of *social behaviour*, including institutions, programs, and 'social actions' such as punishment and war and science and technology. These too are the subject of reflective philosophical concerns; for problems of choice, value and obligation arise with regard to them as well. Is war good or right as a means of national policy? Does the welfare state support or hinder the development of moral values? Is punishment justifiable as a social institution? And if so, why? In the field of technological science, our area of research, many questions abound. What are the limits of human scientific knowledge about nature that should encourage prudence and caution from both those who want to reshape it and those who want

to preserve it? What is the role and limit of morality in the enterprise of science and technology? What does the good life for man, one of the many members of the biotic community consists in this era of the threatening forces of techno-scientific civilization? How ought the theoretical knowledge of man be used in setting him properly on the road to his dignity and destiny; of sustainable living in the biotic community?

To understand the content and contexts of morality and make moral evaluations and decisions we are compelled to go beyond actual principles and discuss the nature of morality and moral value itself and attempt a discerning analysis of ethical theories.

4.3 Approaches to the Concept of Moral Value

To understand the science of human conduct and make moral evaluations entails much more than actual principles. Taking a cue from the case study above, one is wont to argue that making value judgement in any human experience compels us to go beyond actual principles to a critical evaluation of morality and moral value itself. Before we analyze the mainstream ethical theories, we shall critically examine three basic approaches to the concept of moral value, namely, the objectivists, subjectivists and the emotivist approach.

Concerning each approach, we shall ask two questions:

- (i) What is the point of the approach?
- (ii) Is the analysis in question adequate and helpful in resolving ethical issues?

4.3.1 The Objectivist Approach

The objectivists approach in its modern version is closely associated with the name of George Moore, an English philosopher. This approach views moral concepts as referring properties or intrinsic qualities. In his book entitled *Principia Ethica*, Moore declared:

"It appears to me that in Ethics, as in all other philosophical studies, the difficulties and disagreements, of which its history is full, are mainly due to a very simple cause: namely, to the attempt to answer questions without first discovering precisely what question it is which you desire to answer". (Moore, 1903:vii)

What Moore really wanted to know was: What is a moral judgement? When we say 'Sophia acted rightly', what are we saying? In order to answer such questions adequately Moore proposed that we must do two things: we must discover these features which are *common* and distinctive of all moral judgements. We must discover these "*properties*", "*characteristics*" or "*qualities*" which all moral judgements share. Thus, Moore writes:

'My business is solely with that object or idea which I held rightly or wrongly, that the word is generally used to stand for. What I want to discover is the nature of that objects or idea, and about this I am extremely anxious to arrive at agreement' (Ibid:10).

According to Moore there are two types of judgement applicable to ethical decisions:

(i) **Judgements of Instrumental Value**, that is, judgements to the effect that something leads to something having intrinsic value. Thus, if I say, 'Money is good', 'Education is valuable' or 'the presidential system is commendable', I may be saying so because money, education and presidential system are good because they lead to values that are intrinsically good, i.e. good in themselves.

(ii) **Judgements of Intrinsic Value**, that is, judgements that declare that something is good-in-itself. Thus, I might say 'education is good', 'honesty is commendable; or religion is good' because without reference to anything else education, honesty and religion are good. That is to say that something is good in itself without reference to exterior factors.

Between both judgements there are certain differences:

- (i) Instrumental judgements declare that something is good in so far as it leads to something good in itself. But judgements of intrinsic value declare that something is good without any such reference.
- (ii) In the case of instrumental judgement, evidence can be adduced indeed must be adduced in order to vindicate them. But in the case of judgements of intrinsic value no evidence may be adduced on their behalf.

For example, if I say that Chinua Achebe's *Things Fall Apart* is good, I can mean it is so because it helps me to pass an exam or is good for passing the time or because it tells me much about Nigerian society in transition etc. Now all of these reasons may be described as instrumental judgements which may or may not be true, which can be vindicated or refused by appealing to facts etc.

But, if I say that the book is simply good then I can adduce no evidence in favour of *that* statement and I cannot convince the other person to see it that way by adducing evidence. He either 'sees' it as I do or he does not.

Since all ethical judgements are ultimately judgements of intrinsic value, judgements of instrumental value are ultimately based on judgements on intrinsic value and no ethical judgement is adequately based unless it includes judgements of intrinsic value. It is here important to ask whether the objectivist analysis of moral value is adequate. If the concept of goodness or any other moral value is to be treated as if it were a property, a quality or characteristic that is recognizable, then the concept of goodness follows the logical behaviour of all property concepts like yellowness, heaviness, hardness etc. This does not mean that we 'see' goodness like we might see yellowness or feel heaviness as that of the weight of a box. The concept of goodness refers to the non-sensuous perception of a supra-sensible concept or property. This is clear in the sort of words Moore uses to describe the type of knowledge in question: "awareness", "apprehension", "recognition", "acquaintance" – words which suggest a strong analogy with sight or touch.

If the concept of goodness is a simple, unanalyzable property as Moore claims, goodness the fundamental concept in ethics then, the only way I can teach it is by example. I cannot provide a defining meaning of it in terms of other properties because then, it would be neither simple nor unanalyzable.

The only source of disagreement concerning the recognition of such a property can only be based on linguistic differences, that we are really using language in different ways and perhaps with different meanings. Apart from such difference the only source is either in deception or organic defect. Consequently, when we talk about properties like yellowness or heaviness we can argue rationally about them and disagree about them until all the facts are known at which point there is no further room for disagreement because this is what we mean by a property or quality.

But if ethical concepts like goodness are interpreted in this fashion we can account for the genuine rationality of ethical discussions. We cannot account for a distinctive characteristic of ethical discussions; disagreement can persist even when all the facts are known.

The objectivists approach can explain the possibility of ethical agreement because since ethical concepts are like properties and characteristics, once all the facts are known agreement about characteristics and properties is inevitable. But it cannot explain the continuation of disagreement when all the facts are known. And this is what frequently happens in the case of ethical disagreements.

4.3.2 Subjectivist Approach

The characteristic feature of all subjectivist approaches to the analysis of moral concept is that in some way ethical concepts are reduced to subjective relations; that ethical concepts are relative either to the speaker, or to a group or an age. Thus, for example, we say "Maureen is faithful", "The meat is nice", or "The drink is refreshing". The concepts here – faithful, nice, refreshing – refer to particular groups or individuals; they presuppose some referent to which they are related. Some concepts differ from words like 'square', 'red', 'extended' which are typically property words (objectivist). There are many typically subjective relational words like 'loyal', 'faithful', 'devoted', 'patriotic' and the like. We may even add words like 'next

to', 'near', 'pleasant', 'fatiguing', all of which refer to a relational referent and cannot be understood until that relational aspect is known.

When we say that a concept is a subjective relation we claim that its frame of reference is always related either to an individual or a group. Thus a concept, as a subjective relation, either reports on the views or feelings of an individual or a group.

What distinguishes concepts as subjective relations is that it is an essential part of their meaning that they refer either to some group or individual. Patriotism cannot be understood except in relation to a particular country so that before you can describe an act as patriotic you must know many things. For example, a man blows up a large ammunitions factory. Someone asks "was the act patriotic?" There is no clear way of resolving the question until a number of factors are known, e.g. *What* country owned the factory? *Why* did he blow up the factory? – may be he did it by accident, may be he did it because he was paid to do it. May be he did it because he was a traitor. *Who* was he?

If, for example, I say that philosophy lecturers have an appreciation for classical music and I analyse this statement as a subjective relation, all I am saying is that a certain group of people have feelings of appreciation for classical music. In fact I am saying nothing about the music itself.

Let us consider a further example. If I say "ice cream is nice" or "beer is refreshing", I am simply recording the fact that ice cream pleases me or that drink restores me. But what about a person who detests sweet things or a person who has already taken five or more bottles of beer? In these latter cases you could hardly describe ice cream as nice or beer as refreshing.

We may, therefore, sum up this brief analysis of ethical concepts as subjective relations by making the following points:

- Ethical concepts, as subjective relations, essentially refer to a frame of reference that is either a group or an individual.

- Reasoned discussion concerning issues in such an analysis can only be concerned with the existence of opinions or desires. But such discussions cannot be concerned with the quality either of the opinions or desires because in all cases the frames of reference are logically different.
- If issues are discussed according to an analysis that treats ethical concepts as subjective relations then even if all the facts are known, disagreement may still persist because the frame of reference is different in each case.
- If disagreements do persist such disagreements cannot be *reasoned* disagreements since, as already stated, the frames of references differ in each case.
- If agreement is achieved it merely signifies the fact of the coincidence of desires and the alignment of opinions.
- If we apply the analysis of concepts as subjective relations to ethical concepts we discover that such an analysis runs into certain difficulties. This is more so when we take moral concepts as reporting a feeling the speaker has
 - (a) If goodness, for example, refers to an individual's feelings of approval then to say "X is good" means "I have a certain feeling of approval toward X. This means that I ask similar questions about good as I ask about relational concepts. "Is this refreshing?" etc. When it comes to a question of subjective relations at this level no reasoned disagreement is possible. But we know that when we disagree on ethical issues that we do give reasons. We do not merely state that "it is good *for me*". Consequently an analysis of ethical concepts reducing 'good' to subjective relations has to be rejected because it does not cater for the obvious fact that different people validly and meaningfully disagree about ethical matters.
 - (b) If goodness is a subjective relational concept, then, two people would never mean the same thing when they state "X is good". For in each case 'good' means 'good for me'.

- (c) In fact it could mean that *no person* could ever mean the same thing at different times. For 'good' means 'This is *now* approved by me'.
- (d) No argument could, in any degree, be relevant to supporting or casting doubt on the justifiability of say ethical judgement unless it could be directed at showing that the person who makes the judgement has made a mistake about his feelings or his opinions. But in ethical matters:

Firstly, I am not just concerned whether I have a feeling. It should be the *right* feeling. Secondly, it is a fact that people often use the same language and argue about the same things in ethical contexts. Thirdly, people do bring arguments to support their assertions – not only in the sense of psychologically disposing each other – but as real proofs that "X ought to be approved" independently of my feelings.

(ii) Moral Concepts as Reporting Feelings or Opinions which the Group Shares

Against this version of the subjective relation theory there are two formidable facts about ethical discourse:

- (a) When I state I am doing the right thing I realize that it is not merely the same as saying "my group feels that this is the right thing to do". In fact I may think I am *right* in cases even when I do not think that the members of the group have the required feeling towards my action.
- (b) I may be in doubt that the action is right even when I do not doubt that the group has the required feeling toward it.

These considerations bring out the point that whatever a man is feeling when he is feeling an action to be right, he is certainly *not* merely feeling that his society has in general a particular feeling toward it. When one is in doubt about the rightness of an action it is not merely about the fact as to whether many or any at all have the required feeling.

It is clear that the theory accounts for disagreement in ethical discussions because according to it, ethical positions are a matter of feelings even if seemingly reasonable feelings. So the theory does supply a deficiency we already noted in the objectivists' theory, namely, when all the facts are known, disagreements persist. The subjectivist theory however, is not acceptable because even though disagreements persist in ethics they are merely matters of feeling, but not reasoned disagreements. In fact the subjectivist theory does not give adequate place to the role of reason in ethics. If and when moral concepts are reduced to subjective relations, then, there is no possibility of *reasoned* disagreement on ethical issues as such even though there may be disagreement about many features of the matter. In other words *since moral concepts are treated as reports on feelings*, there can always be disagreement, but since such concepts are relational there can be no reasoned disagreement because of the different frames of reference in each case.

4.3.3 The Emotivist Approach

The emotivist approach to the analysis of moral concepts is based on its general theory of meaning. Emotivists assume that empirical verification is the sole criterion of sense and meaningfulness. By this they mean that unless the truths declared by statements can in some way be experienced they have no literal meaning and, therefore, cannot be considered as either true or false or matters concerning which there can be rational discussion. Thus, if I claim "there are spirits in the trees", the statement according to the Emotivists, is meaningless because nobody has and can experience the nature of a spirit, that is, a space-less, time-less, untouchable being.

Now, according to the emotivists, all genuine propositions must not only be declarative, they must also be empirically verifiable: a genuine proposition in stating that such and such is or is not the case. In fact Emotivists distinguish three kinds of propositions, namely: (1) tautologies, that is proposition whose meaning is clear from an analysis of the

internal relationship between the subject and predicate. Thus, all mathematical and logical propositions are tautologies. Then there are (2) meaningless statements, that is, statements which are neither tautologies nor empirically verifiable and yet claim to state something that may be either true or false. Thus "God is infinite" is an example of a meaningless statement.

According to the emotivists, ethical statements are not empirically verifiable, they assert nothing. In the words of A.J. Ayer, one of the architects of the Emotivist theory,

If a sentence makes no statement at all, there is obviously no sense in asking whether what it says is true or false. And we have seen that sentences, which simply express moral judgements, do not say anything. They are pure expressions of feeling and as such do not come under the category of truth or falsehood. They are unverifiable for the same reason as a cry of pain or a word of command is unverifiable because they do not express genuine propositions (Ayer, 1936:105).

Thus, to say "X is good" is to explain or express an emotion of approval like 'hurray' or 'well done'. But it neither refers to a property nor reports on a feeling because there is literally nothing to refer to or report on, that is, if you claim that ethical statements, as such, refer either to properties or feelings about which we can reason. The argued position here is that moral judgements have no literal meaning and as such, can be neither true nor false, valid nor invalid.

What, then, is the role of reason in ethics according to the emotivists? Certainly reasons may help in adducing facts in order to support a claim. Reason may help in attempting the refutation of another's claim. But the claims themselves are not rational and the relationship between facts adduced by reason is not logical or rational, but purely psychological and emotional.

We argue about the truth or falsity of the facts. We may query the evidence brought forward by the opposition. But once all such preliminary steps are taken, reason has no further role to play not because, as George Moore claimed, ethical statements refer to matters that are ultimately intrinsically good but because there simply is nothing 'intrinsic' or otherwise to

refer to. And the same applies to the analysis of moral concepts as subjective relation. What such statements do is they induce, enhance, express or alleviate emotion. But they have no logical or rational role as such. In the true opinion of Omoregbe (2003:19), this theory amounts to a reduction of ethics to subjectivism. It denies the objective reference to ethical terms, thereby removing objectivity from ethics.

Far from Ayer's Smacks of inconsistency in respect of the theory, C.L. Stevenson argues that ethical agreement and disagreements are common because value, the subject matter ethics, is the kind of thing that is disputatious. He sees moral judgements as expressing and not reporting attitudes. Moral statements, therefore, evoke certain attitudes and persuades the hearer to adopt similar attitudes (Ozumba, 2001:109). Thus, moral disagreement is, therefore, a genuine attribute of ethics because men have different believes, the ingredients that inform attitudes.

The emotivists theory shares many of the advantages of the Subjectivist approach. But it is different from that approach because whereas the Subjectivist looks on moral concepts as reports on feelings etc, the Emotivist goes further to say that ethical statements do not even report feelings; they evince and express feelings. The Emotivists made a major contribution in distinguishing ethical disagreements from disagreement about facts. The work of such philosophers has done much to elucidate some distinctive characteristics of ethical concepts. They clearly brought out the distinction between ethical claims and claims about empirical facts.

But the Emotivists overstated their case by denying all literal significance to ethical concepts. When people make ethical claims they are not merely expressing their inner feelings about something, they are saying that there is something objectively good and commendable or objectively bad and uncommendable. Indeed, moral statements are meant to state objective

facts about the moral nature of actions.. We, therefore, reject the emotivist theory as an adequate analysis of ethical concepts.

Our examination of the three different forms of analysis of moral concepts reveals that, while each of them is helpful in its own way, none is adequate. Rather than repeat the criticisms we have already noted, we concentrate here on some of the assumptions that underlay these theories.

We note that the objectivist theory catered for the role of reason in morality by analysing moral concepts as referring to properties or intrinsic qualities. While there was something 'in' the object, reason had a role to play. Likewise the subjectivists' theory in translating moral concepts as feelings and attitudes accounted for the role of reason as long as there was something 'in' the subject. But since according to the emotivists ethical statements as such refer to nothing either 'in' the object or subject, reason had no role to play.

Two underlying assumptions here have led to confusion. Philosophers have assumed that in order for reason to have a role in morality, there must be 'something' either 'in' the object or subject. It is *because* of this same assumption that Emotivists eliminate reason from ethics altogether. Furthermore, the theories in question have been exclusive where they should have been openly comparative. Instead of saying moral concepts are *like* properties, *like* feelings, and *like* exclamations, they claimed they were exclusively properties, feelings, or exclamations as the case may be. Clearly, there are valuable elements of truth in the theories we have examined. The problem now is whether we can supplement them while retaining their strengths and avoiding their weaknesses.

In connection with this possibility we may look on moral concepts as *openly comparative*. As far as the role of reason is concerned, we may describe them as *gerundival*, that is, as concepts stating that X or Y are worthy of approval. Thus, to say 'X is good' is to say that X is like a property, a feeling, or like an exclamation. But strictly speaking, as a

reasoned form of discourse, it is more reasonable to say there are solid reasons worthy of approval in favour of X or Y.'

Given, therefore, that we have accounted for many of the formal aspects of moral values and given that we have retained a role for reason in matters strictly ethical, we must now enquire into the *sort* of reasons that constitute moral reason. This leads us to the question of the standards of morality as variously expressed in theories.

4.4 Analysis of Ethical Theories

From our discussion thus far we have discovered certain things about moral values. First of all, in some sense, moral values are objective apart from the facts that are related to them because even when all the facts are known in an ethical dispute, reasoned disagreement may still persist. Secondly moral values resemble feelings and attitudes and for this reason, they have an essentially relational aspect. Reflection on our moral experience clearly shows us that moral values radically differ from facts and that therefore reasoning in ethics is of a different kind than reasoning about scientific or empirically factual issues. Thirdly, we have discovered that reasoning in ethics is really a matter of providing moral reasons worthy of approval in various situations. For this reason, even though we do not reject the insights of the objectivists, subjectivists or Emotivists, we describe moral concepts as gerundival concepts.

Given that reason has a role to play in determining ethical issues as such, we now ask: *what sort* of reason constitutes moral reason. We want to know the sorts of reasons that would be acceptable as sound moral reasons for acting one way or the other or for desisting from action.

Let us consider a few conversations as examples:

- (i) A student describes to a group of friends how he has perfected a system of hostage taking in the Niger Delta. Some of his friends are shocked. A says: "But you should not be a terrorist. You should know that terrorism is against the Nigerian law. If everyone

did what you are doing the whole system would grind to a halt". 'But everyone doesn't do it,' says *B*. 'It serves to promote the interest of the oil producing communities who have been severally cheated by the Nigerian nation. And it does benefit him considerably. There is no danger of he getting caught. He will have more money to buy books, so that he can study more easily'. And *C* says 'If he's got the brains to work out how to turn the system to his own advantage, why shouldn't he use them? If he were in business, he's to be praised for doing just that'.

- (ii) Meanwhile, a more worried-looking group of students are discussing whether the healthy, single girl sitting quietly at the head of their table should or should not have an abortion. *D* says he thinks she should. "She doesn't want the baby. It would mean years of strain, hard grind and social stigma. And for what? The world doesn't need another person. And if the child is dull, it will have a dead-end job, and if it's bright, it'll join the thousands of other unemployed graduates. The fewer the people there are in the world the better for each person living in it. To have the baby would only add to the girl's misery". *E*. says "Even if you knew for certain that the child's future was going to be appalling, that in itself does not resolve the issue. We must take into account not only the consequences for the individual, but also the consequences for the general; social well-being of the society. *F*. adds 'Of course the appalling future of the girl and child are not the only issues. Surely there is a sacred, moral duty to do the right thing at all times', irrespective of the consequences. "Surely there is a God there. And has He not declared 'Thou shalt not kill? It is unnatural to interfere with God's design for nature. *E*. The girl who is pregnant says 'Is it unnatural to control disease to amputate a leg to save the body?.. And everyone looks uncomfortable. None of them seem to have got to the root of the matter.

Even though many opinions on moral issues may be heard in daily life, they also represent the considered and matured opinions of philosophers over the ages. We select here for discussion some samples with the view to working toward an adequate theory of the sorts of reasons or standards for human behaviour in the age of techno-scientific revolution.

- a) The morality of human actions depends on the law allowing or forbidding certain ways of behaving (*Moral Positivism*).
- b) The morality of human actions depends on the desirable and undesirable consequences in increasing pleasure or diminishing pain for the individual (*Ethical Hedonism*).
- c) The morality of human actions depends on the desirable and undesirable consequences in promoting general social well being and diminishing social hardship. (*Social Utilitarianism*).
- d) The morality of human actions depends on the obligation one experiences in acting for the sake of duty alone. (*The Categorical Imperative*).
- e) The morality of human action is determined by the full, integral development of the totality of the human person (African moral humanism).

4.4.1 Moral Positivism

The Theory of Moral Positivism is probably the one most widely held among philosophical laymen. It is so called because it holds that all morality rests on *positive* law, either enacted or customary. This theory claims that all morality is determined by commands, rules, laws, conventions, customs; that morality is the result of someone's will commanding or forbidding certain kinds of acts. Morality, therefore, is not based on something intrinsic in the act itself or in the nature of man, but in the imposition of a will, something quite distinct and extrinsic to the human act in question. This theory rests on the premise that all principles or norms which command human obedience result from the sovereign authority who in the words of Jean-Paul Sartre (1970:21-22) creates his own nature (essence) devoid of absolute

transcendent values. The argued point here is that, man is the unique source of values and there can be no transcendent law(s) or norms anywhere, meant to guide his conduct.

The plausibility of Moral Positivism is explained by the following facts:

- (i) that there is much contradiction and doubt about moral values themselves. And the law introduces uniformity, objectivity and simplicity, and that,
- (ii) people are normally more of moral obligation as a result of law. It is easy, then, to conclude that moral obligation is nothing more than law. Hence, it is an accepted fact of experience that commands and threats are very powerful ways of engendering a consciousness of obligation and compliance.

If we accept the fact that standards of morality can and, indeed, must be critically established, then the theory of Moral Positivism is inadequate as a standard determining the sorts of reasons that would qualify as moral reasons in resolving ethical issues. Common rules and laws require an imponent, who gives the commands, imposes the rules, lays down the laws. This confronts us with a dilemma; either we know the imponent or we do not. If he is known, as our earthly rulers and legislators are, then, though there will be no difficulty in discovering what his commands or laws are, his words, like ours, may be fallible. How could you possibly tell, on this view, whether his word was correct or incorrect? If morality is the word of ordinary legislators, then we can never know what is right and what is wrong, but only what they commanded us to do in particular situations and circumstance. Their commands (laws) are nothing but mere expressions of their feelings, which attempt to evoke the sentiments of the person expressing them.

It is neither the law nor the command itself that creates a distinct moral obligation but the good or evil to be achieved or avoided by virtue of the command or law. If the command or law creates an obligation, it is because of its role and necessity in achieving the desired

aims. Consequently, it in itself receives its moral sanction from the same more fundamental source.

The aim of rules, laws, and customs is to achieve the social goal. Nobody denies that this is a worthy aim. But, is the social aim the sole moral aim? Is it true to say that all morality ceases in the absence of laws in relation to social goals? Is there no such thing as a moral obligation that is independent of law and rescinds from social goals? It must be said in response to these questions that it is wrong thinking to extricate law from ethics. While it is agreed that ethics is wider in scope than law, law itself is not only a subject matter of ethics, ethics is the judge of law, for morality takes precedence over law and is itself the standard for law. Joseph Omoregbe lends his voice here thus:

Law is at the service of morality and dare not contradict morality without ipso facto ceasing to be law and losing its right to be obeyed. In order therefore for any law to be authentic and deserve to be obeyed, it must conform to morality and never contradict it. (Omoregbe, 2003:6)

This position serves to argue that, posited laws cannot serve as substitutes to morality or moral law; a self-imposed law, a universal law. While posited law differs from one society to another, the fundamental moral principles are the same all over the world, and while a morally sound society makes law redundant, a society of low moral standard has greater need for law and its authoritative reinforcement hence, the reasoned observation here is that, people of high moral standard have no need for law, nor is law a problem to them since they observe from personal conviction what the law demands.

It must be admitted, however, that such concepts as convention, custom, rule, social pressure – all of which are species of law and command – are quite complex. In a more elaborate discussion of the theory of Moral Positivism, they would have to be subjected to more detailed analyses bringing out their differences from each other and how they relate to moral situations. But even then, any refinement of the theory of Moral Positivism would be

faced with the same radical question: How can any human authority of itself provide an adequate basis for resolving moral issues?

While one recognizes the strengths of the theory of Moral Positivism, particularly its role in showing how law may be effective in attaining desirable social goals, nevertheless the fact is that external criteria or standards do not provide us with the sorts of reason that would institute an adequate basis for determining moral issues. In same way, the relevant reasons must arise from the act itself. And to theories suggesting this approach we now direct our attention.

4.4.2 Ethical Hedonism

By rejecting the theory of moral positivism we have implied that morality is in some way inherent to the human act itself. Some philosophers look to the consequences of human actions as a standard or principle by which to judge human actions. They ask whether the act produces desirable consequences. If so, they call it a good act. If it produces undesirable consequences, it is said to be a bad act.

One form, which this way of thinking may take, is to judge the goodness of an act by its pleasant or unpleasant consequences, either for oneself or for others. The concept of pleasure itself cannot really be defined. It is a fundamental, irreducible datum of human experience. It can only be described in broad outline. But if we cannot define it, we can certainly experience it and, therefore, know it.

Modern hedonists prefer to use the word *happiness* to pleasure. The concepts of happiness and pleasure are serviceable in distinguishing these theories, which identify happiness with sense of pleasure (Aristippus, Bentham, Hobbes) and those theories, which declare that happiness must take into account the contentment of the whole man which includes the satisfactions of the spirit (Aristotle, Aquinas, Mill, Sidjwick etc.).

The greatest protagonist of ethical hedonism in modern times was Jeremy Bentham (1748-1832), jurist, economist, political theorist and a philosopher of some sort. According to Bentham, pain and pleasure are the two sovereign masters governing mankind. Whether it is the psychological hedonism of Jeremy Bentham or ethical hedonism of John Stuart Mill, man is said to be a being who is by nature a pleasure seeking animal; that all human actions are directed towards the search for pleasure (material or spiritual/mental). No man, the theory holds, would do anything if he were to know that no pleasure would eventually be derived from it either immediately or remotely, directly or indirectly. The point of the theory may be summed up thus, that firstly, all human action is activated by pleasure and pain alone (psychological Hedonism) and that moral actions whether good or evil, are not determined in themselves, but by their consequences for pleasure and pain respectively. Secondly, all those acts that increase pleasure and diminish pain are morally good, while those which increase pain and diminish pleasure are morally evil (ethical Hedonism). Stumpf here recasts Bentham's presentation thus:

Nature has placed mankind under the government of two sovereign masters: pain and pleasure. It is for them alone to point out what we ought to do as well as to determine what we shall do. On the one hand the standard of right and wrong. On the other hand, the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we think: every effort we can make to throw off our subjection will serve but to demonstrate and confirm it. In other words, a man may pretend to abjure their empire but in reality he will remain subject to it all the while. (Stumpf, 1993:77).

No one should dream, Bentham informs us, that any man will lift his little finger to serve another unless it is for his own advantage. It is true that there are many situations in which serving another is a way of gaining one's own advantage; but it is always the later reason, which moves the agent. And this self-preference always holds, even should the gain for self be detrimental to any or all others. This is the way man always was and always will be constituted, and our moral theory, he thinks, must be based on this fact.

Ethics is nothing else than the art of directing the actions of men so as to bring about the greatest possible happiness on the part of those whose interest is at stake. Happiness, that is to say, pleasure and the avoidance of pain, is the only right and universally desirable end of human action.

It follows that the morality of an act, its goodness or wickedness, is to be judged by its consequences. An act is good or evil depending on its usefulness for producing pleasure or pain. Pleasurable consequences are good, while painful consequences are evil. Only pleasure is good in itself and only pain is bad in itself. It is true that a pleasure, which is good in itself, may be bad if it entails pain in its consequence; and a pain, which is bad in itself, may be good if it entails pleasure in its consequences. But no action is in itself good or evil. An action in which the pleasant consequences overbalance the painful consequences is a good act, and the more so the better the act. If, on the other hand, the painful consequences overbalance the pleasant ones, then the act is evil. Just as the act *is neither* good nor evil in itself, neither is the intention nor the action.

If we closely examine the theory of hedonism, we discover that it is not true to say that all human actions are activated by pleasure and pain alone. Indeed, if in fact this were the case there would be no pleasurable theory of ethical hedonism because that human being would in any case always do what is most pleasurable and avoid the painful without the moral injunction.

The fact is that every human action is a complex of various elements. Besides pleasure, such act has other qualities as well. This creates a desire to appropriate them. And in their appropriation, we attain pleasure. Rather it is *because* we desire them that they give us pleasure. It suffices to argue then that, the ethical hedonist confuses the ends of human activity with the principles directing human activity. For example, the pleasure seeker is not the person who seeks pleasure in all he or she does, but rather the person who will only do the things that

increase pleasure or diminish pain. This is what Aristotle describes as “an accompaniment of an activity” which may be either good or bad (Omoregbe, 2006:83).

If the pleasure seeker sought pleasure alone in all he did he would be attempting something that is psychologically impossible. For it is a fact of psychology that in order for a man to act he must first be attracted by something in the object that catches his attention and induces desire. If he sees it as something good for him, he elicits a wish for it. Pleasure enters as a concomitant of a will attaining possession or fulfilment in pursuit of a desired good. Thus, there are really two confusions to be avoided:

- a) We must distinguish the experience of pleasure itself from a pleasant experience. There is no such thing as an experience of pleasure alone, there can only be a sense of enjoyment in the attainment of pursued goals or the fulfilment of desired ends.
- b) While a man may live by medicine and not for it so too, a man lives by pleasure but not for it. To try to do so is to confuse ends and principles. An end is that *for the sake of which* we act in a particular way. It implies either success or failure in its attainment. If we are successful in the pursuit of our end or goal we assume some further ends or, in the case of failure, for example, we may change our tracks.

A principle is a rule *in accordance with which* we act. We may adhere to it or we may deflect from it. But whether we do or not, the principle remains the same. If we decide that we want pleasure and nothing but pleasure then we decide to act in accordance with these principles that ensure pleasurable experiences. And our criticism is that a life lived solely in accordance with principles of pleasure is unworthy of man and leads to many decisions that in fact we would not accept on moral grounds.

The arguments above illustrate for us the particular malice of the pleasure seeker. It is not so much that he seeks pleasure in all his activities rather it is that he will only assume those moral obligations and demands in which he is guided by the pleasure principle.

In one of his more daring remarks Bentham declared:

If I have a crown in my pocket and not being a thirst, hesitate whether I shall buy a bottle of claret with it for my own drinking or lay it out in providing sustenance for a family I see about to perish for want of any assistance so much the worse for me at the long run: but it is plain that, so long as I continued hesitating, the two pleasures of sensuality in the one case, of sympathy in the other, were exactly worth to me five shillings, to me they were exactly equal. (Bentham, 1948:118)

This point of view so shocked John Stuart Mill that he wrote:

It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied, than a fool satisfied. And if the fool or the pigs are of different opinion, it is because they only know their own side of the questions. The other party to the comparison knows both sides'. (Mill, 2003:82)

From a moral point of view this is perhaps the most devastating argument against ethical hedonism of the egoistic kind. As we have already maintained, pleasure cannot be a sole experience for and in itself. Pleasure does indicate achievement, satisfaction, fulfilment though, all such satisfactions are part and parcel of other goals. This means that just as there is a certain hierarchy of activities and goals in human action, so too there is a hierarchy of pleasures as their normal accompaniment or quality. But just as the hierarchy of goals is determined by the total good of the subject, their sources, so too pleasures are likewise evaluated. This position is categorically suggested by Joseph Omoregbe.

He says:

It is true, of course, that we sometimes (in fact often) seek pleasure, but it is not true that the search for pleasure underlies all our actions. People make sacrifices; undergo pain and inconveniences in order to help other people without any intention or prospects of eventually deriving pleasure from such actions. Man is not selfish, self-seeking or pleasure seeking, as psychological egoism and hedonism would have us believe. (Omoregbe, 2003:8)

Suffice it to say, therefore, that it is wrong thinking to argue that pleasure is the only thing desirable for its own sake. To insist that all those acts that increase pleasure and diminish pain are the only morally good acts while those which increase pain and diminish pleasure are

all morally evil is, to say the least an overstatement. It is a fact of life that, not all pleasures are good and that not all pains are evil. There are pleasurable pains as much as painful pleasures. Any pleasure that is derived from a bad activity is painful (bad) pleasure, and any pain that is derived from a good activity is pleasurable (good) pain. Moreover, the hedonist confuses pleasure with happiness which are in fact not the same thing.

It may be argued in conclusion here that, ethical hedonism does not cater for the sense of *merit* we experience in our decisions on moral matters. We have a decided conviction that there are *bad pleasures* and that there are *good pains*. We think that the pleasure taken either by the agent or spectator in, for instance, a lustful or cruel action, is bad; and we think it a good thing that people should be pained rather than pleased by contemplating vice or misery'.

The refutation of ethical hedonism is in no way suggesting a puritanical attitude to life as if pleasure was something evil and, therefore, should be eliminated from life. Nor does it suggest the stoical view that since virtue is the sole worthy goal of human striving, pleasures should be kept to a minimum. What it does mean is that, as human beings are very complex individuals with various needs of different kinds, there is a demand for order in satisfying the needs and controlling such satisfactions. Human beings have, within themselves the principle of such order in so far as it is recognized that reason plays a role in determining both satisfaction and control. This principle tells us that even though pleasure plays an essential role in life, it is not a reliable guide. If there is a hierarchy of pleasures attached to a hierarchy of goals, we must search further for an adequate basis of human activity.

4.4.3 Utilitarianism

If ethical hedonism is to be rejected because pleasure is not the sole goal of human strains, or because selfishness offends our moral consciousness, then, perhaps we may argue that human well being in general should be the standard of morality. For sure we do not restrict morality either to pleasure or selfishness. Thus one may propose the view that the sole

and ultimate standard of right, wrong and obligation is the *principle of utility* or *beneficence*, which says quite strictly that the moral end that is sought in all that we do is the greatest possible balance of good over evil (or the least possible balance of evil over good). This implies that whatever the good and the bad are, they are capable of being measured and balanced against each other in some way. This is the general theory of utilitarianism. (Read Omoregbe, 2003:233-338, Ozumba, 2001:117-120).

The theory attempts to avoid the deficiencies of other theories. On the one hand, it tries to overcome the inadequacies of ethical hedonism and, on the other, it reacts against these theories, which say 'we simply know what is good and what is evil' (intuitionists). According to the Utilitarian view, we only know what is good and what is evil by evaluating the consequences of our actions in measuring the balance of good over evil, or well-being over unhappiness. It holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure, and the absence of pain; by unhappiness pain and privation of pleasure. We must distinguish two kinds of Utilitarianism: Act-Utilitarianism and Rule Utilitarianism.

(i) **Act-Utilitarianism** holds that in general or at least it is practicable for one to tell what is right or obligatory by appealing directly to the principle or, in other words, by trying to see which of the actions of his will, or is likely to produce the greatest balance of good over evil in the universe. One must ask What effect will *my* doing of *this* in *this* situation have on the general balance of good over evil? Not "what effect will everyone's doing this *kind* of act in this kind of situation have on the general balance of good over evil? (Rule Utilitarianism). Generalizations like 'Telling the truth is probably always for the greatest general good may be useful as guides based on past experience but the crucial question is always whether telling the truth in *this* case is for the greatest general good or not. This version of utilitarianism holds that the rightness or wrongness of an action should be decided only on the basis of the

consequences of the action. In the words of Omoregbe “those actions that produce good results – the greatest good of the greatest number – are good; while those that produce evil results – Pain or Unhappiness – are evil” (Omoregbe, 2003:237).

Act Utilitarianism does not take into account the nature of an action itself; what count is the result or the consequences of the action. We should, therefore, always perform those actions that will produce the best possible results for the greatest number of people. It can never be right to act on the rule of telling the truth if we have good independent grounds for thinking it would be for the greatest general good not to tell the truth in a particular case, any more than it can be correct to say all cows are black in the presence of one that is not.

(ii) **Rule – Utilitarianism** is a rather different view, which has also been attributed, like Act-Utilitarianisms, to Mill. As the name suggests, it emphasizes centrality of rules in morality and insists that we are generally, if not always, to tell what to do in particular situations by appeals to a rule like that of truth-telling rather than by asking what particular action will have the best consequences in the situation in question. Such rules will themselves be determined by their role in promoting the greatest general good for everyone. That is, the question is not which *action* has the greatest utility, but which *rule* has. We should ask, then, when we are proposing to do something not ‘what will happen if I do that in such a case?’ but ‘what would happen if everyone were to do that in such cases?’ The issue in point here is the useful consequences that result from everybody adopting and obeying this rule. Only those rules should be adopted which if observed by everybody, would produce the best possible results for the greatest number of people. It means here that a rule that brings to birth a “less utility content is to be replaced with another one that has capacity for greatest good to the greatest number” (Ozumba, 2001:118). The principle of utility comes in normally at least, not in determining what particular actions to perform (this is normally determined by rules), but in determining what the rules should be. Rules must be selected and maintained, revised, and replaced on the

basis of their utility and not on any other basis. The principle of utility is still the ultimate standard, but it is to be appealed to at the level of rules rather than at the level of particular judgements.

The act-utilitarian may allow rules to be used; but if he does, he must conceive of a rule like 'telling the truth' as follows: 'Telling the truth is *generally* for the greatest general good'. By contrast the rule-utilitarian must conceive of it thus: "our *always* telling the truth is for the greatest general good". Or 'it is for the greatest good if we *always* tell the truth". This means that for the rule-utilitarian it may be right to obey a rule like telling the truth simply because it is so useful to have the rule, even when, in the particular case in question, telling the truth does not lead to the best consequences.

Since Utilitarianism has two forms each of them must be examined. Regarding both forms, it is quite obvious that they are an improvement on ethical hedonism. For Utilitarianism is not restricted to pleasure alone, but takes into account the whole range of human behaviour and well-being. Utilitarianism is not restricted either to the individual or a particular group but extends itself to the whole range of human beings. Nevertheless Utilitarianism in each of the forms has deficiencies.

If it can be shown that Act Utilitarianism in fact precludes the fulfillment it intends then it must be rejected. It, thus, seems that strict adherence to this theory does not lead to universal beneficence. It can be shown that following such a theory renders universal beneficence impossible to achieve. Therefore, such a theory is inadequate.

This fact – the impossibility of achieving universal beneficence – can be illustrated by comparing what happens in the army in which *everybody* is intent on victory in *every* act and applying the findings to our own case. If every soldier is inspired by the single aim of victory, the end will not be achieved by telling each man so to act, as in *his* judgement best achieves victory. And these are some of the reasons:

- a) No soldier can effectively act if he acts entirely on his own.
- b) No soldier can tell his part in the operation if he does not know what others are doing.
- c) Any common action would be a mere welter of conflicting, uncoordinated, self-selecting, confusion.
- d) Commands lose their force because soldiers will interpret that their own way and, the commander knowing this will be more reluctant to issue them except where they make little difference.

If victory is to be possible, there must be law and order; there must be people who make decisions and people who carry them out precisely because they came from a higher authority. In fact, a soldier may not even see the connection between what he is commanded to do and the victory to be achieved. Yet, it is the condition of victory that different people do different things in a fixed order so that the collaboration of all brings VICTORY.

Applying the analogy of the army and regulations to Act Utilitarianism, it appears that, if the end of each and every act is to be effectively pursued, it is actually necessary in such a case that promotion of this end should *not* be each man's sole criterion of practical decision; on the contrary, each man must be prepared to do, must think it wrong not to do some acts which, in his judgement and perhaps also in fact, are not such as to promote the general good.

From the example of the soldiers' directly intending victory and thereby rendering it impossible, we can draw a general conclusion: If in each act we directly intend the fundamental aim of such acts, then, we render impossible the achievement of that aim. To state this by way of example: If a profiteer directly intends profit in each act of enterprise, if each member of a team directly intends scoring goals in each move, that scoring will be very much reduced; if in an election, every member of the supporters directly intends the maximum of votes, then in each of these cases-profit, goals, votes- the desired end will not be achieved.

And this flows from the logic of the relationships between fundamental options, desires, aims and the direct intention of each activity in relation to them.

Act Utilitarianism runs into particular difficulties in professional ethics. If I am an Utilitarian Doctor, and I entrust the care of my health to a simple Utilitarian Doctor, I assume that he is beneficent to me in a general sense. But I cannot presume that he is *uniquely* beneficent toward me unless such an attitude does not become an obstacle to his sympathy for the good of all. As a simple Utilitarian, I cannot criticize his reservations; I must accept the implications of his position. I could not get him to promise, in the manner of the Hippocratic oath, always and only to deploy to my advantage his skills. I could not really and usefully, ask him to disclose his intentions regarding me, his patient.

The reason for the reservations and non-disclosure of intentions is, in each case, the same and interesting; as long as universal beneficence is directly the unique standard of each of my activities, there is no other principle which may stand as clearly justified and therefore, in practice, to be accepted. Consequently, basic principles like keeping promises, telling the truth, revealing intentions can never be ascertained and, therefore, acting on their acceptance becomes unnecessarily risky, in fact, impossible. You can only make promises where there is a certain expectation that promises will be kept. You can only tell the truth where language is acceptable as an instrument of communication. You can only reveal intentions where there is a common ground of understanding among people. But where each of these expectations is vitiated by a condition, such institutions and practices are ruled out of court. If general beneficence were the only criterion, then promising and talking alike would be idle pursuits.

It is possible in a certain situation to have two acts, A and B, which are such that if we calculate the balance into being, we obtain the same score in the case of each act, say 100 units on the plus side. Yet act A may involve violating a promise or telling a lie or being unjust while B does not imply any of these things. In such a situation, the consistent act-utilitarian

must say that A and B are equally right. But clearly in this instance, B is right and A is wrong, and this fact would be recognized by our common moral consciousness. Hence Act-utilitarianism is unsatisfactory.

There is a decisive objection against Rule-Utilitarianism too. Suppose we have two rules, R1 and R2, which cannot both be made a part of our morality. Suppose further that in the case of each rule, we know the results of everyone's acting in appropriate situations on that rule and that when we compute, as best we can, the values of those results, we find that the score is even—in both cases we obtain the same balance of good over evil in the long run for the universe as a whole. Then the rule-utilitarian must say R1 and R2 will serve equally well as principles of right and wrong and there is no basis for choosing between them. But it still may be that they distribute the amount of good realized in different ways: acting on R1 may give all of the good to a relatively small group of people without any merit on their part (to let merit count at this point is already to give up Utilitarianism) while acting on R2 may spread the good more equally over a larger part of the population. In this case, it seems to be that we must and would say that R1 is an unjust rule and R2 is morally preferable. If this is so, we must give up even Rule-Utilitarianism.

But the rule-utilitarian could still argue that, in fact, he accepts the principle of special obligations. He will claim that, if we take a more farsighted look, we can see that greater happiness is produced by recognizing and insisting on special obligations. Family life is a great source of happiness, and family life as we know it would be impossible if we did not look on ourselves as having much stronger obligations to members of our own family than to perfect strangers. But this seems to be tantamount to abandoning utilitarianism. It may also be noted that, rule utilitarianism concerns itself with the social impact of notions in accordance with certain rules. This seems to suggest that morality has a place only in socially significant areas of action. But this point of view seems to eliminate from consideration the individual

aspects of moral experience and, therefore, does not adequately cater for the whole range of moral experience. In determining good and evil, *whose* goals are chosen? *Whose* values, *what* criteria? The Rule Utilitarian cannot adequately answer these questions.

The problem with this theory is not only that it makes judgement provisional, but also that it gives the impression that truth is relative, temporal and contextual. It bases its moral decision on consequences beyond human control and never really judges the correctness or wrongness of a thing in principle. This theory is at best incomplete.

4.4.4 The Categorical Imperative

We have discovered that in determining the morality of actions, consequences alone are inadequate as guides. We, therefore, examine features of actions that are independent of consequences, in our search for an adequate standard of morality, that is the categorical imperative of Immanuel Kant.

The ethics of Immanuel Kant (1724-1803) was to a large extent activated by a reaction against hedonism, especially the egoistic variety of it, and his theory took the form that the primary thing to consider is not the happiness produced by an action or indeed its unhappiness, nor even any of its consequences, but the nature of the action itself.

Nothing, he says, is intrinsically good but a *goodwill*. Kant tries to prove this by taking other alleged intrinsic goods, such as happiness, intellectual eminence, etc. and showing that each of them may be worthless or positively evil when it is not combined with a goodwill. That a goodwill is one that habitually wills rightly. And that the rightness or wrongness of volition depends wholly on the nature of its *motive*. It does not depend on its actual consequences. And it does not depend on its intended consequences, except in so far as the expectation of these forms part of the motive. Of course a mere idle wish is of no moral value. But, provided we genuinely try to carry out our intention, and provided our intention is right, then the volition is right no matter what its consequences may be.

According to Immanuel Kant, *an action cannot be right unless it is done on some moral principles, which the agent accepts* (Omoregbe, 2003:222). These principles or maxims of conduct are divided into two classes, which he calls Hypothetical and Categorical Imperatives. *A hypothetical imperative is a principle of conduct that is accepted, not on its own merits, but strictly as a rule for gaining some desired end* (Ibid. p. 223). Suppose that I refuse to make a certain statement on a certain occasion, for the reason that it would be a lie, and that lies ought not to be told. Suppose that my ground for believing that lies ought not to be told is that they undermine confidence and, thus, reduce human happiness. Then the principle that lies ought not to be told would be, for me a merely hypothetical imperative. It is accepted as a rule for maintaining human happiness, and not on its own merit. It is, thus, both contingent and derivative. It is contingent, because conditions are conceivable in which lying would not reduce human happiness, and in such conditions I should no longer accept the principle. And it is derivative, because the acceptance of it in existing circumstances depends on my desire for human happiness. The latter is my ultimate motive for not lying.

Following from the above premise, Kant argues that any action which, in a given situation, is right or wrong at all, must be right or wrong, in that situation, for any rational being whatsoever, no matter what his particular tastes and inclinations might be. There is nothing impossible about the supposition that there might be rational beings who have no sensations at all e.g. angels. Therefore, there is no hypothetical imperative, which would be acceptable to all rational beings as such. Hence if there be any principles of conduct which would be accepted by all rational being as such, they must be accepted on their own merits and must, therefore, be categorical imperatives.

We may now come to the final question: "What characteristics must a principle of conduct have in order to be accepted on its own merits by every rational being as such? Kant's answer is that the feature, which is common and peculiar to such principles, must be a certain

characteristic form, and not anything characteristic in their content. And the formal criterion is this; it is necessary and sufficient that the principles shall be such that anyone who accepts them as his principles can consistently desire that everyone else should also make it their principle of conduct and should act upon it. This supreme criterion Kant calls 'The Categorical Imperative' because it states the necessary and sufficient conditions that must be fulfilled by any principle if the latter is to be a categorical imperative and action determined by it is to be morally right. Omoregbe (2003:224) chronicles the six different formulations of the categorical imperative thus:

- (i) Act only on that maxim through which you can at the same time will that it should become a universal law.
- (ii) I am never to act otherwise so that my maxim should become a universal law.
- (iii) Act as if the maxim of your action were to become, through your will, a universal law of nature.
- (iv) So act as to use humanity both in your own person and in the person of every other, always at the same time, as an end, never simply as a means.
- (v) So act that your will can regard itself at the same time as making universal law through its maxim.
- (vi) So act as if you were always through your maxims a law-making member in a universal kingdom of ends.

We may sum up the theory thus, an action is right if and only if the agent's sufficient motive in doing it is in fact that he recognizes it to be required in the circumstances by a right principle of conduct. A principle of conduct is right if, and only if, it would be accepted on its own merits by any rational being, no matter what its special tastes and inclinations might be. It must, therefore, be a principle, which is acceptable to rational beings simply because of its intrinsic form, and not because it is a rule for gaining some desired end. And a principle will be acceptable to all rational beings, if and only if each could consistently will that all should adopt it and act on it. This is the essence of Kant's theory.

It may, at this juncture, be argued that, Kant's insistence on duty, his rejection of a morality of consequences in an age ever preoccupied with success, social well-being and the like were very timely. His first claim, however, that nothing is intrinsically good except goodwill appears to be an over-statement. If in fact we accept, as we do, that a goodwill is something intrinsically good in itself, all we can claim is that a goodwill is a necessary constituent of any whole which is intrinsically good.

To rest all morality on the motive of duty is unnatural and inhuman. The love of a mother for her children, the sacrifice of a man for his friend cannot really be explained by appeal to duty alone. Certainly a sense of duty will be present in such circumstance, but love and generosity are always esteemed as higher motives than mere duty and give the act a greater moral worth. We fall back on duty only when other motives fail. Duty is rather the last appeal against wrong acting than the highest motive for right acting. In this sense too we can say that Kant's Categorical Imperative is more beneficial in guiding us in what not to do than in what positively to do. How could Kant explain heroic acts, such as giving one's life for one's nation? These are always thought to be the noblest and the best, precisely because they go beyond the call of duty.

That the moral law commands us with a *categorical imperative* is undoubtedly true, and Kant emphasises it well. But it cannot be properly understood unless the goal toward which the duty 'do good' is determined. Kant lays down a formal principle, that is, the features that all moral actions must have. Such features are: rationality, permanence, universalizability. By permanence he means that if an act is once right, it is always right. By universalizability he means that an agent must be able to claim that what he does holds good for all others in similar circumstances as his situation. By rational, he means that an act must be right for all rational beings. Thus, according to Kant, it is wrong to tell lies because lie telling becomes self-defeating for rational beings.

Kant, however, does not claim that it can be shown of all wrong ethical principles that their universal application would be impossible but merely that it would contradict our nature to will it. Thus, in discussing why we ought to help other men who are in need, he says that society could still subsist even if the principle of not helping others in need were universalised. Because there are many possible circumstances in which we should wish to be helped ourselves. We cannot really maintain that we seek only our own interest and likewise claim that others should help me in distress. Kant is not falling here into egoistic lapses. Rather, he is saying it is not consistent, we put it 'not fair' to benefit by the kindness of others, as one must, and yet refuse to do others a kindness when they need it. While the 'egoistic' motive is prudential, the latter is certainly moral. Kant's general principle is "Act as if the maxim of your action were to become a universal law". When we act according to a principle which we could not wish to be generally applied, Kant thinks we are acting immorally.

Kant seems to be stating something important here: the making of arbitrary exceptions in one's own favour is immoral. Furthermore, it does seem that in some cases the use of a criterion like Kant's is more in accord with our ordinary ethical thinking, as for example, in the case of tax evasion where the harm done is insignificant in an individual case, but would be very serious if others did likewise. Where a difference perhaps does enter is in the fact that among people there are many who would look to the consequences of tax evasion whereas, Kant would look to a certain inconsistency in such an act by a rational being.

Furthermore, it is true that there is really something inconsistent about wickedness in the sense that it aims at an end, the attainment of which is at the same time by its inherent nature self-defeating. For the man who is guilty of it seeks satisfaction for himself, yet real satisfaction cannot be attained by evil but only by good.

It is true that all our answers to the question "what is right"? are of universal application in the sense that granted that an act is right for me, it must be right under the same

circumstances for everybody. In this sense, any moral decision claims universalizability. However, this principle needs modification and must take into account external circumstances, psychological make-up and different types of good to be achieved. This, of course, is outside the scope of this chapter.

We may, therefore, conclude this analysis of the adequacy of Kant's theory by observing that whereas it has much to commend and it brings out essential features of morality neglected by hedonists and utilitarianism, it is, nevertheless, deficient because

- a) it treats goodwill too exclusively
- b) it does not recognize the wider range of moral motivation.
- c) It is, in fact, inadequate in giving positive guidance in many cases.

We turn, therefore, to the analysis of the final theory, that is, the morality of human development or human integration.

4.4.5 African Moral Humanism

In the theories we have examined so far, each of them makes a genuine contribution towards understanding the nature and standards of morality. Nevertheless in various ways they are inadequate. Basically, they are inadequate because they do not adequately cater either for the range of moral consciousness nor for its complexity. Let us, therefore, outline such a theory which may, in general, be described as moral humanism. *This theory advances a morality of human integration, that is, a morality that is determined by the full development of the human being as a human being.*

With this in mind, we may look on morality as the emergence within us of a distinct way of looking at life, interpreting issues, directing attitudes and evaluating actions. This "way of looking at life" is not in itself as yet an endorsement of any particular moral point of view, but the recognition of a certain dimension to be sustained in all human actions. It is the recognition from within an individual or a particular society of a certain perspective on life

that is distinct from the public good. It is the recognition of a certain dimension in life, certain considerations that must be taken into account if we are to be true to ourselves as human beings. This, for us, is called African humanism; an African morality that promotes rules of good conduct in the achievement of human well-being (Wiredu, 1983:11). It explores the primary and indispensable status of the human persons over things. It guarantees and promotes the good of the human person as a basis of a sound and authentic civilization.

We may bring out the distinctiveness of this moral awareness by examining some examples:

- (i) A shark attacks one or two swimmers at the beach. The first swimmer helps his friend and braving the danger, wards off the shark and brings the wounded companion to safety.
- (ii) Two husbands have wives afflicted with a lingering and incapacitating HIV/AIDS disease. Both families are alike in many respects except with one difference. One husband does his best to be both father and mother to the children whereas the other man decides that he has had enough, deserts his wife and children, emigrates and under an assumed name takes up a whole new life.

Obviously our emotions react differently to each husband. But beyond emotion itself, there is a remaining element. By a *judgement of value and fairness* we have to approve of the first husband and disapprove of the second. Such *judgement is not based on a law, social pressure or consequences*. The moral element emerges as an irreducible datum of human consciousness.

From these examples, which could be multiplied, we can conclude that

- a) Moral value can only exist in a *free being* and in his or her human acts. We can only become morally good by willing it; it cannot come about by accident.

- b) Moral value is *universal* in the sense that what holds for one holds for all in the same conditions, because moral values show the level of man's responsibility, his measure as a human being.
- c) Moral value is *self-justifying* in the sense that it does not depend on any extrinsic reasons.
- d) Moral value has a pre-eminence over every other value. A moral value can be compared only with another moral value. If a moral value conflicts with another type of value, this other one must take a subordinate place.

The foregoing analysis brings out the point that we do form for ourselves an ideal of human conduct and an ideal of what constitutes a human being in action., the ideal conduct and the ideal human being are not two distinct ideals, for a man's conduct is his life. It is only good conduct that can make a good person. A person is called good because his or her past acts show such a person to be the kind of individual from whom good acts are expected.

Such an ideal is part and parcel of the moral judgement itself. Such an ideal is *moral*, good for the person. This does not mean that a man lives up to it. But it does mean the ideal he *can* live up to because he *ought* to in virtue of what he is, namely, *human* being. We have, then, an ideal of the perfectly self-controlled and self-conducting human being. As far as a man approaches this he is good; as far as he defects, he is bad. The notion of the *moral value* as expressed here is *that of intrinsic or perfect good* as opposed to the instrumental or consequential value. The ideal is good in itself, not as leading to something else distinct from it. In suggesting that morality is a dimension of all human actions, we are not claiming that morality has a monopoly on life as if all other dimensions should be sacrificed in its name as canvassed by Immanuel Kant. It is possible to claim that morality is an essential ingredient of every human action without impoverishing other dimensions.

What we are getting at is that, there is a way of looking at life in which in every human decision certain values must be upheld. People are conscious of their activities as rational activities and their implications, people become implicitly aware of a certain need to evaluate their actions against their rational source in human kind itself. In recognizing that need to integrate source and action, a people emerge or act as morally responsible persons. Such a need does not emerge inevitably because it, too, is subject to the dynamics of free rational behaviour. And once it does, there is no inevitability about its permanence. But there is no doubting the broad contours of the moral dimension. If human conduct is to be rational and, therefore, guided by reason, it must be regulated and, if so, there must be an overall sense of direction, a recognized approach, that is traced by the moral demands of human action.

What are these demands? They consist in a certain *obligatory character* of moral value which becomes clear in a further analysis of our examples. It, also, becomes clear in the example of a man offered a huge fortune for one act of betrayal of his country's military secrets to the enemy. This is an act which ought not to be done. Thomas Mason (1985:105) chronicles the demands thus:

- a) Eliminate the *legal sanctions*. Even if he found some loopholes in the existing civic code and as a result of which he could not be prosecuted his act is still reprehensible.
- b) Eliminate the *social sanctions*. Even if he found that nobody know about it, we still experience its wrongfulness. In fact we know that society can act immorally and if so, social approval is not always morally reliable.
- c) Eliminate the *psychological sanctions*. Generally a person has feelings of depression, disgust, and shame, the inability to eat or sleep with the twinge of remorse and guilt. But people may be immune from such feelings. Yet the moral element remains. If by some drug the guilt feelings could be removed, the guilt itself remains, *the ought not*, the wrong persists untouched though no longer perceived.

- d) Eliminate the *religious* sanction. If, per chance, God did not condemn such an act we would somehow feel that He ought to condemn it. We could begin to doubt his justice so that God's existence and nature itself would be in question. God, we would think, does not live up to the ideal. This perhaps is the clearest indication of the absoluteness of the moral claims.
- e) What remains in the *moral sanction*, is that of the *ought*, guiding us in the proper use of our freedom. *It is a freedom that is a necessity and a necessity that is a freedom.*

This necessity is objective because though it affects *me*, the acting subject, it comes from the object, i.e., the kind of act, I, the subject, am performing. The act in its actual being is something contingent because it may or may not be, but in its ideal being as presented to my reason and will, something to be done or omitted, it assumes a practical necessity demanding decision.

This demand is *absolute*. Bad use of artistic, economic or scientific abilities are penalized by failure. But bad use of my moral abilities-becoming less a human being than I ought to be, is a fault because whereas I have no obligation to pursue particular activities and hence no obligation to succeed in them – I cannot help being a human being and am bound to succeed as a human being. If I fail, it is my fault; I am a *bad* individual. In despising moral values – truth, justice, concern -I. In despising values, I despise myself according to how I accept or reject the moral call *to be* as a person. Moral value is the scale in which I necessarily rate myself, mere subjective opinion, but an objective estimate of my true worth in the scheme of things. This rise or fall is not something optional. I am not allowed to fall. It is not a question of whether I am interested or not in my betterment; I am not allowed not to be. It is not a disjunctive necessity: do this or take the consequences. It is simply: do this.

I am not allowed to expose myself to the consequence of not doing it. In fact, whatever the consequence are, these themselves must be judged by this moral criterion and all

consequences must contain their own moral worth. We can agree with Kant, then, to a point that, moral value is categorical, that is, it is neither hypothetical nor disjunctive, but is categorical, holding a place-coordinate with and superior to all others.

Although moral value is essential to human decision-making, it is not the sole motive of such decisions. Rather, morality is a reframe within which we make our choices. The purposes of these choices may be instrumental in terms of activities engaged in for their own sake as in reading and dancing. But in any case we may mention, the moral claim is part of the activity itself not as something to be produced, nor as an achievement distinct from the activities, but as a growth, a perceptiveness that emerges and is adduced through the dynamics of my own rationality. As I reflect on human experience, my own in particular, I discover in human action certain characteristics that define the moral dimension.

The details of this dimension are not as important as the recognition of their general thrust and character. They are universal, categorical, and measured by the dynamism of rationality itself, in pursuit of the specific good of the human being. Since the recognition of such a frame of reference is deeply embedded in my rationality, then, it must also contain those elements, which are implied by socio-rational behaviour. Nevertheless moral claims do not achieve their justification in alleviating suffering or doing the socially acceptable thing.

The fact here is that, there are many kinds of rules, which are calculated to improve the quality of life. Each makes its own contribution. The distinct contribution of moral rules is not to intend directly the improvement of the conditions of the good life, nor the public good, but the rationality of human behaviour. It is not *because* rules are useful that such rules are morally binding as utilitarian would have it. It is because they are moral and, therefore, rooted in the richness and complexity of man's nature that they are also useful to him. It entails inwardness, subjectivity and self-knowledge of the scientist or technologist for example to engender sustainable human development.

The social dimension is clearly relevant to the evaluation of moral claims and rules. The consequences of different actions on the public good cannot be omitted in any assessment of moral claims. The function of the moral claim is not so much to enhance consequences for individual or social well being, but to compel man to live rationally and because he lives rationally, consequences are crucially important in establishing or following any claim in the name of morality (Dilworth, 2004:201).

But if moral rules and claims enter all human situations, have we not placed them on a pedestal and placed them as obstacles to the spontaneity of human action? Have we not unwittingly endorsed a form of rule worship? We must not be too hasty here. We claim that morality is obsolete, but this does not apply to moral rules as such. Thus, while we claim that it is never allowable to be unjust or deceitful, it is justifiable, indeed necessary, at times to 'break' a particular rule of justice or truth if and only when in so doing, the greater general good of humanity is further advanced.

This brings us to an important feature of moral rules namely; to what extent may we claim there is a moral obligation to develop oneself, to enrich one's human integration? We can only answer this question if we first look at what we mean here by a person. *A person is a being who is born to be, as a human being.* By this, we mean that a human being is by nature a being who realizes his natural potential within a frame of understandings and expectations that he himself appreciates and which determine him as a human being. The supreme criteria for him are *the truth* as he perceives it concerning the world in its widest sense and himself as he perceived himself as part of it. Thus, to be a human being is to be a truth-searching, truth-affirming, promise-making, justice-seeking, other-accepting, co-existing, co-operating, law abiding being. These are features, which are neither imposed from outside nor dictated from above. But they are discovered within himself as declaring the core of his own being, a core all the time in the process of becoming more what he has been since the day of his birth.

All human beings choose themselves as the goal of their aspirations. But there is a perverted self-choosing and an authentic self-choosing. One who self seekingly and pervertedly chooses himself/herself and places himself or herself at the centre of all being and thereby desecrates and manipulates everything and, in the process destroys himself or herself. This is the reason why every human tragedy can be reduced to a wrong form of self-affirmation always involving a denial of one or more of the basic characteristics that define a human being. But when one chooses oneself in authentic fashion one chooses oneself as a realization of all being through the realisation of one's own being. Such realization consists in an acceptance of oneself within the order of being and a self-realization, a growth in that being as participated in through one's existence. It is for this reason that self-acceptance and self-realization within the human frame of being, is the gateway to the full life, to reality, the only way to participate in the being that is. This, indeed, is the human essence, the being of man, the being among beings described by the German word 'Dasein' or 'being-there' i.e. beings who witness other beings and who, in their essential nature, "can never encounter only (ourselves)" (Adams 1946:27).

A human being, therefore, is not fixed in his nature like a tree or a dog but over the years he not only grows and matures but in his being he becomes rich and complex, capable of ever more new and sophisticated activities. Some such growth is spontaneous and automatic as at the more instinctual levels. Other such growth is self-realized, rooted in man's freedom, in fact constituted into reality, though not created by that freedom. It is, therefore, both provisional and unpredictable.

To bring out this element of provisionality, unpredictability and ambiguity in human beings, we distinguish in each human being the *human mind as free*, capable of free judgements and acts and, on the other hand, the *human mind as insight* into evidence and understanding. It is not that we have two minds or two areas of the same mind, but two

functions of the one mind which normally go together, but where one may be more in evidence than the other at different times. For example, in scientific inquiry the mind as insight is generally uppermost whereas in decision-making, the mind as free is dominant.

Thus, there is in human consciousness a "reason insight" and a "reason liberty". The question arises: how do both features of reason coincide to form a perfect unity, namely, unanimity of insight and completion of expression of liberty? This side of the grave there is no such possibility. Precisely because we are dealing in areas where freedom plays a decisive role, one's convictions are accompanied with awareness that through freedom one has made them one's own. As they have been freely acquired, so they can only be freely regained or relinquished. As a result, the human mind, should it so desire, can resist with limitless power any external attempt to make it change its opinion. As soon, therefore, as individual liberties come into play in society in areas where demonstrative proofs do not have a place, there is the distinctive problem of allowing such individual liberties to express themselves, their intellectual and spiritual multiplicity.

One cannot divide the various levels of unity as if they were separate and unrelated to each other. Indeed the contrary is the case. As one writer put it:

The individual human being is not a crossroads where several participations in general realities meet (matter, ideas etc.) but an indissoluble whole, of which the unity is prior to the multiplicity because it is rooted in the absolute. (Ogbinaka, 2002:85)

By this we mean that man is first and foremost a unity and a totality in virtue of which he absorbs and integrates into himself many levels of being. Thus, it is not so much that they eyes see or the ears hear but it is man who sees and hears. It is not the emotions that feel and the attitudes declare but it is man through his emotions and attitudes who feels and disposes himself. Here we encounter a duality which however does not deny the unity which runs through man's being: spiritual/material; unique/multiple; self-possessing/outgoing; absolute/relative. In all of these forms of duality, there is a certain primacy and hierarchy of

finalities. It is not that the more human and spiritual form destroyed, they cut out other forms, rather it absorbs and integrates them into its own finality. In this process it also enlivens, enriches and refines them. Thus, the individual person as a moral being is subject to the collective will of the society. The individual pursues his finality through the collective finalities of others in the society.

For man to be man, he must be alive to the possibilities of his being at all levels, neither repressing nor suppressing his emotions, but accepting all and integrating them into the finality of the person that he is. The only categorical imperative he owns absolute allegiance to is the promotion of human progress. Everything else is conditional, provisional and dispensable.

4.5 Conclusion

In the light of our acceptance of the morality of human development or integration as the standard or morality, we may now take a brief look again at the theories we have examined. Concerning all of them we make the following observations. First of all, we accept the contribution they have made to our understanding of morality and also in enabling us to make moral decisions. Secondly, we point out some of the inadequacies of such theories in virtue of which they cannot, in the final analysis be accepted. We argue in conclusion, here, that our ravaged humanity and its environment through human ingenuity can only be conducted back into its essence by relearning the lessons our ancient ancestors knew, which allowed them to live sustainably for hundreds of thousands of years but which we have abandoned. This attitude of the mind is what we refer to as African moral humanism here understood as the ethic of sustainable development. It rests upon the idea that every person and everything is related to every person and everything, and that human nature is good and instinctively seeks the divine and that humans only become dysfunctional when they grow up in a sick culture which produces violent and damaged humans. It is, thus, argued that this

ethical paradigm places limits on techno-science so as to avoid the destruction of the foundation of human life. It argues further that the good life is far from mechanical ingenuity, scientific breakthroughs, and easy and cheap productivity in itself, but in sharing in the creativity of human nature in, which in his totality; body and soul, is ultimate. It is a morality that calls humanity to a home coming to bring humanity back into its essence. It is the saving power from the danger of modern techno-scientific civilization in which the common good of all is promoted and protected. It is an African communal ethics which conveys the idea that man is socially and communally linked like a chain ontologically with everything else. Further elaboration on this shall be done in chapter six of our work.

CHAPTER FIVE

5.0 SCIENCE, TECHNOLOGY AND THE PARADOXES OF OUR TIME

5.1 Introduction

Advocates of scientific neutrality argue that, science as a body of knowledge has no moral or ethical quality substantially, value judgements, cultural biases and that, political standpoints do not in any way influence or determine scientific knowledge. They argue further that, there is nothing 'good' or 'bad' about scientific knowledge. Such position is acknowledged by the great Galileo himself that "the conclusions of natural science are true and necessary, and the judgement of man has nothing to do with them" (Lipscombe & Williams 1979:6).

While acknowledging the quality and weight of such informed position, it suffices to say that this position is a contradiction in terms for the simple reason that the pursuit of knowledge in itself, which aim the scientist claim is the province of science, is in itself a good thing. This inherent implication of the scientist's claim is perhaps more reasonably understood in the language of Black (1975) who draws a distinction between the pursuit of knowledge as information and knowledge as understanding. He points out that the collection of information in itself is a product of value judgements. Better still, human interaction has it on record that science (or at least its application) could be a power for good or evil.

Indeed, the interaction of science and technology considered in the last chapter attest to this fact; science has been seen as the means of relieving human burdens, and this, and not the disinterested pursuit of knowledge, has often motivated scientists. It is perhaps this idea of science and technology and its impact on man and society, and the consequences of such impact that Bertrand Russell provocatively remarked that in, discussing the effects of science upon human life we have therefore three more or less separate matters to examine

- (i) the nature and scope of scientific knowledge
- (ii) the increased power of manipulation derived from scientific technique
- (iii) the changes in social life and in traditional institutions which must result from the scientific technique demands. This chapter concerns itself with the second and third matter.

The understanding here is that, man, aided by science and technology, has the capacity to make or mar a world of his choice. Two issues arise from this. The first is whether the world of man's choice may be the best possible world and, or, the most desired world for the greatest number of people. The second issue is whether such a choice is a free one or can be a free one that is blame worthy. Bertrand Russell argues that:

In so far as he is wise this new power is beneficent; in so far as he is foolish it is quite the reverse. If therefore, a scientific civilization is to be a good civilization it is necessary that increase in knowledge should be accompanied by increase in wisdom. I mean by wisdom, a right conception of the ends of life. This is something science itself does not provide. Increase in science itself, therefore, is not enough to guarantee any genuine progress though it provides one of the ingredients which progress requires (Russell 1962:ix-x).

The implication of this thinking is that science and technology is a mixed blessing. Such an explosive impact has far reaching consequences which, according to Jim Unah (1998:344), "potend good and bad for man; consequences that spell good and evil for society; consequences that snatched humankind out of the cruel forces of nature and yet threaten them with collective suicide". It means for us against this backdrop that science and technology have both demonstrated that they constitute a double-edged sword, if man is wise in the use of the instruments of his brains and hands, he would conquer nature and make it subserve his essential interest. If, on the other hand, he becomes foolish, he would wipe out human existence and the entire earth with its habitation.

Such is the nature of man that he can be described as a bundle of paradoxes, a being empowered by God to create itself thus "you shall have the power to degenerate into the lower

forms of life, which are brutish. But you shall also have the power, out of your soul's judgement to be reborn into higher forms which are divine" (Ehusani, 1991:16).

This chapter is a critical exposition of the impact (positive and negative) of science and technology on the human society. It argues that the phenomenal technological advancement notwithstanding, our new world has seen "the emergence of the machine, and the disappearance of the person". i.e. science and technology have both healed as well as killed the society.

5.2 Are Science and Technology Neutral?

The concept of neutrality associated to any human activity suggests an inherent quality of perfection. In relation to science and technology, the neutrality theory argues for itself the omniscience, which suggests and elevates the scientist (and to some extent the technologist) to the role of a high priest expounding its truths. Whether such dogmatic posturing is true or not, accepted or rejected, this theory grants to itself the self-contained completeness of knowledge – truths especially when science is considered in the context of what is normally defined as pure and applied science.

Sir Ernest Chain more clearly states the thesis of scientific neutrality thus: ...science as long as it limits itself to the descriptive study of the laws of nature, has no moral or ethical quality, and this applies to the physical as well as the biological sciences (1970).

This position is traditionally inherent in scientific thinking more so that science seeks to ascertain the truth about nature, which hypotheses which aim to move nearer and nearer to an accurate description of natural laws, which are seen as universal truths. Such thinking is also anchored on the fact that objective reasoning cannot deny scientific facts and all scientists must inevitably reach the same conclusion.

It means, then, as Joan Lipscombe and Bill Williams (1979:6) posited, that "value judgements, cultural biases or political standpoints do not in any way influence or determine

scientific knowledge. There is nothing 'good' or 'bad' about scientific knowledge". Such understanding of science has been carried forward and is strongly supported today which perhaps may have informed the thought of Bronowski who attributes to science "an unrelenting independence in the search for truth that pays no attention to received opinion or expediency or political advantage (Bronowski, 1971:25).

The neutrality of technology unlike science does not very well find convenient application. Indeed, there is no way in which we can talk about "the pursuit of knowledge for its own sake" or the objectivity of observations, experiments and theory as applied to technology, for it necessarily implies the application of science, invention and industry and or commerce to matters which are of importance to our life style and must, therefore, have a social effect. Notwithstanding such position, technology is, undoubtedly, commonly regarded as being neutral in some senses of the word. Considered as a collection of machines, techniques and tools, technology is here said to be neutral in the sense that in itself it does not incorporate or imply any political or social values, and that it is neither 'good' nor 'evil'.

Taken, therefore, as a blameless tool, any beneficial or harmful effect is said to arise out of the motives of the people applying a particular piece of technology and the end to which it is used. It means, then, that where a particular application, chosen for its beneficial results, produces harmful side-effects, these are blamed either on inadequate social policies or on lack of sophistication in the control of the effects of technology. Whichever is chosen as a whipping boy, concludes Joan Lipscombe and Bill Williams (1979:19), technology itself is 'neutral'.

But the most challenging question is, "to what extent is science and technology neutral?" The question of the neutrality of science and technology is essentially the question of the rationality of science and technology. This is perhaps where the essential link between science and technology very clearly bears on man in his integral whole, in both his material

and spiritual life, but more so in the spiritual towards which the material must serve. Suffice to say here that the argument in support of "an unrelenting independence [of science and technology] in the search for truth that pays no attention to received opinion or expediency or political advantage" is an exercise in the promotion of ignorance and scepticism. To quote Andrew Efemini:

Anyone with scientific consciousness, understands the place of science in man's struggle to improve his living... (science is not) something that should be pursued for its own sake but something that should be pursued for man's benefit (Efemini, 1982:18).

It thus means that, traditionally, practical knowledge i.e. *techne* which is concerned with making (*recta ratio factibilium*) directed to the perfection of the object of knowledge, combines with theoretical knowledge i.e. *scientia* or *episteme* comprising also contemplation of nature, which goal is the perfection of the subject (the knower) to bring about the ultimate end in the perfection of the whole man. Such an endeavour is a conscious and goal oriented one, which not only reflects the value systems of the society at that time, but are value laden in themselves.

Granted that science is a move towards the unknown according to which "it is impossible to foresee the practical results of any research in pure science", it is neither a blind move nor a goalless move. Matthew Nwoko aptly suggests here that:

At least a scientific research worthy of the name must be a planned venture. Even if the scientist does not foresee the remote consequences of his venture, but the planned structure of his work carries or must carry an ultimate intention of discovery for the good of man (Nwoko, 1992:143).

It is, thus, the inherent vocation of the scientist to lay bare the richness of nature, which practical use the technologist will bring to bear for the good of man. This is the rationality of scientific inquiry, and such is the rationality of technological practice. Understood as such, both the scientist and the technologist are said to be humanists who "must not only reach out to the world's wealth of knowledge and practice, but must also pursue the solution of our

problems (of industrial, manufacture, environmental pollution, economic progress etc) with dedication, conviction and patriotism (Newswatch Feb. 12, 1990:14).

Furthermore, to argue that science is unaffected by extraneous factors, which pontification justifies scientific neutrality, is an overstatement to say the least. The dialectics of science is intertwined with theological, ethical, ideological and other non-scientific arguments, which at some points become impossible to separate them, and stand-points on reality were determined by considering all these aspects. R. M. Young (1971:31) thus, argues that, "what people were prepared to accept as the 'truth' was not determined by science alone" but also by subtle and often un-acknowledged influence of social factors.

The deliberate suppression of scientific knowledge or the active promotion of particular theories, which conform to a specific political situation, similarly counts against the neutrality theory of science. A ready example, here, is the Lysenko affair in Russia in which a whole area of genetics was eliminated from Russian teaching and his theories imposed because they were more supportive of the political system. Russian scientists worked within the framework of these theories believing them to be 'true', at least as far as the existing evidence was concerned (D. W. Caspari and R. E. Marshak 1965:275-278). The case of Jeremiah Abalaka, a Nigerian, is another example in which the scientist's search for the truth and or scientific knowledge is substantially tempered with to bolster up the Nigerian/foreign interest. Pursued to a logical conclusion, and in the extreme case, 'scientific facts' (if Abalaka succumbs) may be the invention of a political regime instead of results from disinterested pursuit of knowledge for its own sake.

Again, proponents of the neutrality theory say that science concerns itself purely with a description of the world as it is, and so argue out the impossibility of scientific knowledge giving rise to normative and evaluative statements. Arguably it cannot give rise to statement about what should or should not be (normative), nor can it pass judgement on what is good or

bad (evaluative). Indeed orthodox philosophical argument has it that the only valid conclusions of deductive arguments are the ones which contain only material which is already in the premises, consequently scientific premises (factual) cannot lead to normative or evaluative statements (Lipscombe and Williams 1979:8).

But, this argument collapses because of the difficulty in identifying which premises are factual – normative statements, it is argued could be expressed in the same way as factual ones, and there are considerable difficulties in clearly distinguishing one from the other. Black thus asserts that:

Some normative evaluative propositions are objective (generally accepted and not subject to individual values) and this removes the distinction which separates scientific propositions from others (1975:40).

It is, thus, possible for science to provide factual statements that could lead to normative or evaluative statements. An example of this could be:

Plant defoliants can cause food shortage (factual)

Food shortage lead to people starving (factual)

It is wrong that people should starve directly because of man's action (Normative)

Therefore, plant defoliants should not be used (Normative)

The base of our argument, here, is that the scientist has a social responsibility for the application of his work. This is informed by the logic of distinction between the abstract concept of 'science' which argued position is the pursuit of knowledge for its own sake, from the practical manifestation of that concept. This is science in the context of an overall activity.

Black mentions that:

Science as an overall activity can no longer be considered as the disinterested pursuit of truth. Even where scientists are working on the purest science, which has no apparent applications, scientists cannot escape the dilemma of responsibility because the speed of development is such that discoveries are often harnessed very quickly to industrial, military or other practical uses. (Black, 1975:40)

Besides, much of today's pure research is consciously directed at serving specific

objectives and or solving some problems. Black argues further that:

It can no longer be considered neutral and is carried out with a definite purpose in mind: to increase the profits of industry or strengthen the power of government. Scientists involved in such projects know this and because the science is no longer neutral they have forfeited any claim to moral neutrality; they cannot subsequently plead 'not guilty' when this purpose is achieved and horror (or praise) is expressed at the results (ibid).

We may, perhaps, argue further that such state in which science has found itself, of developing and applying its results to specific objectives, thus, removes it out of this old argument of scientific neutrality (as for example the work in plasma physics carried out specifically with the aim of generating electricity from nuclear fusion). In such circumstances, there is no realistic way of separating basic research from its application and, hence this harnessing of science to specific ends implies the end of scientific neutrality and with it the end of any legitimate claim to moral neutrality.

W. H. Ferry convincingly that "technology has a career of its own, so far not subject to the political guidance and restraints imposed on other enormously powerful institutions" (Ferry, 1971:120). Obviously, such conclusion sounds like the distant drums of science which pays no regard as to whether people accept the 'truth' it claims to have as part of its very nature, or not. At best, such assumed neutrality of technology has arisen because certain characteristics associated with science have, unjustifiably, been transferred to technology hook, line and sinker. Richkover more correctly presents this scenario when he says:

A certain ruthlessness has been encouraged by the mistaken belief that to disregard human consideration is as necessary in technology as it is in science (Richkover, 1965:154).

But such conclusion is founded on illicit premise. Technology understood as an art or skill, entails in its essence the employment of means to accomplish some end: opposed to nature, which in itself is a product of the rational faculty. Essentially, technology thus means a set of principles, or rational method, in the production of something or in the achievement of

an end. By its nature, technology is not and cannot be neutral, because human needs and values remain its essential ingredients. It is, perhaps, this conclusion that the German language (especially in the philosophical usage) explains the term *Technik* as the utilization of the knowledge of method or mode of production of material goods to serve human needs. That is, technology by its nature is determined by the society. In the words of Dickson:

In general we can say that a society's technology, when viewed as a social institution rather than a heterogeneous collection of machines and tools, is structured in such a way that it coincides with its dominant modes of action and interaction... Technology does not just provide in its individual machines, the physical means by which a society supports and promotes its power structure, it also reflects, as a social institution this social structure in its design. A society's technology can never be isolated from its power structure, and technology can thus never be considered politically neutral (Dicson, 1974:25).

This explains the fact of our being dominated by technology and which our generation has seen "the emergence of the machine, and the disappearance of the person". The reason for this, according to Dickson, is the political nature of technology. This dominating technology, he says reflects the wishes of the ruling class to control their fellow men. Looking back into history, we cannot but agree with this simple but thought provoking truism. The very process of industrialization, for example, did not arise from an objective assessment of production needs determined by economic factors. It arose from the desires of the dominant social class, the providers of capital, to dominate and control both nature and work force. Consequently, these set of values and desires were built into the design of the machines and factories which benefits are confined to the members of a particular social class.

To understand properly this argument of the neutrality of technology, it suffices to clarify the distinction between science and technology. While the work which the scientists do varies considerably along the spectrum from pure research to applied technology, that of the technologists is concerned almost exclusively with developing and implementing specific ideas with a definite end in mind. In putting this issue into proper perspective therefore, two

questions come to mind, namely, the question of the intended product of the work of the technologist: how far, if at all, should the technologist make judgement about the desirability or otherwise of the end product in considering whether or not to apply his technical skill to a particular project? And the question which arises from the unpredicted harmful or undesirable consequences which often arise from the application of a particular technology: how far is the technologist 'innocent' or responsible for such consequences?

The answers to these questions are not far-fetched. It is argued here that, the professional status of technologists makes them culpable for the work of their hands. If they are truly professionals, they have a responsibility to relinquish their neutral role and to take steps to limit the harmful consequences of their works. As professional automotive engineers worth their salt, for example, they have the capacity to construct cars that may reduce road deaths and injuries, high noise levels, congestion, pollution and despoliation of the countryside among other harmful consequences. To argue the opposite view that technologists are not in any way responsible for the intended consequences of the use of their product is to create an artificial distinction between responsibility for the development of a product and responsibility for the use of that product. Such distinction is simply a question of conscience which does not find relevance in this consideration. Einstein was here clear on this issue when he forcefully writes: "we scientists whose tragic destination has been to help in making the methods of annihilation more gruesome and more effective, must consider it our solemn and transcendent duty to do all in our power in preventing these weapons from being used" (Time, December 1999:59).

More unacceptable is even the question of unforeseen consequences of technological invention and development. The question put in context is, is it still acceptable for the technologist to plead innocence when his device intended for human benefit turns out to do more harm than good? The answer in this regard is No! Hardin (1972 especially chapter 7) is

vehement on this score and, thus, introduces the concept of *guilty until proven innocent*, suggesting further that this should be applied to all technical development. Professor C. S. Momoh canvasses a similar idea in his "Philosophy and Moral Scientism", according to which all scientific and technical inventions are allowed to play out their effects in the scientists' laboratory, and those with harmful consequences disallowed to see the light of application. He says:

For any scientific invention to be worth its salt, its consequences and purpose for mankind and humanity must be seen to be moral... the simple test is: will the application of scientific invention or discovery advance the moral worth of mankind? If 'Yes' such a discovery should be developed and embraced. If the answer is 'No', such an invention should be left to cool away in the laboratory. (Momoh, 2000:82)

The concern in both thinking is that, the burden of proof of both the effectiveness and harmlessness has been placed on the proponent.

All this boils down to the fact that the technologist (and technology in general) is clearly denied any shelter behind the neutrality shield. Technology is not and should no longer be seen as, a neutral tool. It should be assumed to be harmful until proven otherwise. While accepting that such action on the part of man is likely to delay benefits and so limit the maximization of human creativity, it serves as a call for the critical examination, and re-examination of the product of man's mind and hands so as to confirm them as rational action which they truly are, to serve man better and maximally.

Technology as part of the human culture, is for the good of man and his society, which basis it is judged as valuable, as having proper meaning. M. I. Nwoko (1992:136) confirms this lucidly as he says; So genuine technology draws its values from the good it serves man. Actually, the goal of technology is its service to man to help him realize more his being.

It is to be said, in conclusion that both science and technology have been mis-presented over and over as neutral endeavours. Our postulations have proved this to be false cultures seeking relevance in history. Indeed, science and technology in social context reveal to us

living and astonishing testimonies; that once generated by human culture, science or technology in turn becomes a determinant factor in the social transformation, a transformation which may be good or evil, beneficial or destructive, depending on the manner of its appraisal in the society. Genuine science or technology is a system of rational endeavour (action), which in itself presupposes organization of all the elements of the endeavour (or work). Mudimbe and Appiah both acknowledge this intellectual attitude to collapse the concept of scientific (and technological) neutrality. Hear them; scientists, like the rest of us, hold on to theories longer than may be justified to: they suppress unconsciously or half-consciously or consciously... evidence they do not know how to handle: lie a little (Oluwole 1999:34).

As activities of our ingenious minds and hands, science and technology are not and cannot be value-free. Hence, the burden of proof (of evidence of marked injury to man) should lie on the man who wants to introduce any change (or scientific or technological breakthrough) before the change or the breakthrough will proceed for public use. The complicated planet, inhabited by more than a million and half species living together in a more or less balanced equilibrium, in which they use and re-use the same "facilities" cannot, and should not be improved by aimless and uninformed tinkering. Thus argued, "all changes in a complex mechanism involve risk and should be undertaken only after careful study of all the facts available. Changes should be made on a small scale first so as to provide a test before they are widely applied. When information is incomplete, changes should stay close to the natural processes which have in their favour the indisputable evidence of having supported life for a very long time" (Schumacher 1979:130-131). Some two decades ago, the emergence of nuclear energy was astonishingly progressive, and promised salvation and solution to human production related problems. Today, the same product is at damnation best described as a "hazard with a hitherto inexperienced 'dimension', endangering not only those who might be directly affected by their radiation but their offspring as well".

It is, thus, a disastrous abdication of moral responsibility for scientists or technologists to ignore the consequences of their inventions or who resist questions of societal need and engage in wilful blindness that cannot lead to the good of all, humans and the environment.

Whether it is science or technology, it concerns a body of organized rational modes of theoretical foundation or making, involving also the analysis and judgement of the value orientation of the patterning of the action whereby resources are mobilized for the attainment of the common (greater) good.

5.3 Globalisation of Scientific Technology and Human Decline

Science and technology are two modes of human activity that are organised around interaction with nature. Such interaction is neither random nor casual, but conscious and goal oriented, which character derives from the need to understand nature in its diverse structures and patterns of working. But, even within these two modes of human activity, there exists a symbiotic relationship; science provides information to technology, and technology in turn provides science with ingenious precision instruments, which extend the scope of human sources of knowledge and also provides avenues for practical utilization of scientific theories.

It is, therefore, not an exaggeration to argue on this score that science and technology have reached a pyramidal stage in our time, most probably because the scope of human needs has attained weird and bizarre dimensions. This has led men and women into many inventions and discoveries. Starting from the very humble beginning with the use of railways, carriages and cars, then steamships and the invention of airplanes, man conquered the land, water and the airspace. Today, man has penetrated outer space thus enabling engineers, technicians and scientists to explore and exploit the outer space for limited periods of time and to return to earth with the product of their effort. Today mankind has started to make active use of outer space for its own purposes. Artificial satellites orbiting the earth are employed to relay television programmes, transmit communication over long distances forecast the weather,

discover deposits of minerals and so on

These are clearly phenomena advancements in science and technology which qualify the twentieth century to be described as the 'fastest' century in human history and in which the human being of today could also rightly claim to be the most mobile homo-sapiens that ever existed. Thus, the global scientifico-technological development has several characteristic features though, one most important element in each of the great technological breakthroughs is that each can be used to further the progress of man. No doubt then that humanity is in common agreement that scientific technology has brought many good things to man and society, which perhaps has elicited peacock's conclusion that "in spite of scepticism in certain circles about the long-term effects of science (and technology), our contemporary world is a world of science (and technology) in the sense that science (and technology) is/are generally thought to command the dominating heights of the cultural landscape" (Peacocke, 1987:3), and shaping the outlook of mankind everywhere and everything positively.

Put together therefore, the breakthroughs in science sourced from the advent of the miletians culminating in the achievements of the 20th century *homo faber* in the fields of technological medicine, food and agricultural technology, communication and information technology and even ammunition technology have altered the lives of humanity positively. We now possess the tools to fulfil the creator's charge to "be fruitful, multiply, fill the earth and subdue it" (Gen. 1:28). In Africa, such western technological endeavours have changed the once "dark continent" and opened it up to benefit from the most glamorous of human civilizations in the areas of economics, education, medical care, communication and industry among others. For,

without the possibilities offered by modern science and technology, life would be impossible for many. The weak could become extremely vulnerable, since they would be unequipped to deal with an otherwise hostile and unyielding nature (Ehusani, 1991:7).

The twentieth-century is arguably the most dehumanised, the 'bloodiest' in history as evidenced in the internationalisation of military technology through the use of atomic bomb that devastated the Japanese cities of Hiroshima and Nagasaki in 1945., which consideration shall be our next concern.

Scientific and technological discoveries, sometimes assume international/ transnational properties, thus, impacting on peoples and cultures other than those of the source of its origin. When this happens, such scientific or technological inventions are internationalised and, thus, assume within it a quality of interdependence. As a globalized endeavour, scientific technology entails mobility of the world technology. Generally understood, globalization is mobility of the world economy, capital etc. It means simply a shift from one land to another, and from one owner to another, everyday, of goods, people, information and ideas (of a scientific or technological, political or economic nature).

Such an understanding portrays globalization as an ideology which postulates portend innumerable advantages among which include "freedom, by which it implies, liberation of the market relations from whatever fetters, including state regulation and even state boundaries, with the usual seasoning of talks about democracy, civil society, human rights and other attributes ascribed to the society of the western countries" (Alexei Vassiliev, 1999:2).

Framed and reinterpreted in the neoliberal manner, globalization looks like a universal blessing, a miraculous magic wand which is going to fling the doors of immeasurable wealth wide open before the suffering and hungry, ensuring material welfare, spiritual upsurge, improved healthcare, access to education and information for mankind and the protection of human rights and dignity. To what extent such ambitious dreams have been achieved has been a contentious issue. As argued above, without the possibilities of science and technology, life would be impossible for many. Indeed, globalization which benefit made science and technology the society's main productive force; the decisive factor of the increase in labour

productivity, gave the world the most glamorous of human civilizations ever. This conclusion is, however, only one chapter of the twentieth-century story.

In an ABC (U.S Television) Network program "News from the Earth", Richard Nixon described the twentieth century as the bloodiest in history; the century of war (December 26, 1988). With a qualitative new convulsion of internationalisation and interdependence of the world scientific technology, humanity stands dangerously open to the negative appropriation of scientific and technological ideas. The most gruesome of which is the dropping of atomic bomb in Hiroshima and Nagasaki in 1945. Such action of man's inhumanity to humanity reveals the frightening possibility – the extinction of the human race, and the obliteration of all life on earth through the product of our intelligence and the work of our hands. Ehusani captures this dangerous culture more succinctly that;

As the genius of our most intelligent citizens find expression in the ammunition industry, warfare has become the most highly developed activity of twentieth-century humankind. With fifty-five thousand nuclear weapons not only stored in the arsenals of the world, but constantly oiled and tested, does it take a soothsayer to see annihilation staring us in the face? (Ehusani, 1991:7)

Perhaps our fears are confirmed by the expressions of great thinkers, thus, making matters worse for humanity, that there is an accustomed belief nursed by humanity and nurtured by the metaphysical tradition from Heraclitus of antiquity to Russell of our present day that man could do with occasional wars. The question here is not whether humanity has accepted such thinking and behaviour as part of its nature, but whether it serves to promote both his being, and the end of the product of his intelligence, and the work of his hands. The answer to both questions is NO. Beginning from the reverse order it is in the nature of science and technology "to help cut society adrift from its traditional moorings" they are both inherently directed at the satisfaction of the being of man and the promotion of the common good; in most cases in the development of resources in the satisfaction of the mass essential needs of man and the promotion of the quality of life on earth, but not in some other ways, in

the destruction of the earth planet. Our discussion here focuses on the latter.

Albert Einstein was once said to have asserted the aphorism, "science is a wonderful thing if one does not have to earn one's living at it" (Time, p. 36). This is, perhaps, to the extent that science is neutral. But this, we have discountenanced. What Einstein obviously meant by this aphorism is that, to the extent that science is pursued in line with its defined nature, it is bound to make revelations that are most likely in advance of the common good. But in spite of the laudable contributions and stupendous accomplishments of science and technology, they have nevertheless succeeded in introducing disorder and pain, and in some cases, reduced or even eradicated the value attached to human life, (Uduigwomen, 1996:160) and so caused disharmony in the ecosystem.

In the area of health care and medicare, the application of scientific knowledge has brought about unbearable and intolerable consequences on humanity. In today's industrial world, abortion is no longer a crime (at least in most European and western countries) even in Africa. Most democratic nations are today pushing ahead with bills to either liberalise the law on abortion or legalise abortion, and make it a right, or a civil right which will be protected by the constitution of the country. In Nigeria, such attempt was protested by the Catholic Women Organization (CWO) as an instrument of dehumanisation and devaluation of human life. In the United States of America, a woman has a right under the United States of America Law, to determine the life of her unborn child for any reason at all under the first two trimesters and in certain cases during the third trimester, unless it can be proved that the child could survive outside the womb (Ehusani p. 9). For many European nations, like the U.S., abortion is not a moral issue anymore today.

Similarly, technological medicine has promoted such other controversial issues of *Euthanasia* (i.e. mercy killing or release of a life devoid of value) and *Infanticide* and *benign neglect* (killing or allowing to die, children born with congenital deformities). Through the

use of the instrument of scientific technology, life is so brutally devalued, and or trivialised on a wide scale worldwide (see **Time Magazine**, March 19, 1990:65. Paul Marx 1985).

Perhaps, more frightening is the progress made today in reproductive technology and genetic engineering. Today's technological medicine practises in vitro fertilization, artificial insemination, surrogate motherhood and embryo transfer. These procedures which carry with them abuses, seek to remove the mystique surrounding human generation, and in so doing, the dignity, value, and uniqueness of the human person is not only undermined, but the entire human person is destroyed in the process. James Royle (1969:212) is more forceful on this score that, much amateur psychology is really an attack on the value of persons (and that) man may be the object of scientific study, but a person is not a thing. Civilization begins to totter when man begins to use people as things. It is perhaps on this score that the science of cloning is similarly jettisoned on account of the devaluation of the human person. Science and technology, must be pursued in the light of the promotion of the health of the human person i.e. to heal and not to kill.

Demaneing to human life, too, is the invention of sperm banks into which individuals are invited to donate their seed. This, it is argued, is aimed at not only helping childless couples to have children, but also at the possible improvement of the gene pool, and perhaps too for commercialisation of the womb, and or harvest and sale of foetal tissues for the purpose of experimentation etc. In our day, technology has helped in accelerating this wholesale attack on the dignity of the human person with the opening of a web-site by Ron Harris in the U.S.A of beautiful women offering themselves for buyers of eggs for infertile parents (monitored on BBC World Service October 24, 1999). This, is aside from the fact that our increased knowledge of the DNA and the chromosomes that make up each cell of the human body, has rekindled the Nazi idea of suppressing the bad stock and propagating a race of thoroughbreds.

Thus, through such techniques and procedures like *in vitro fertilization, artificial insemination, surrogate motherhood, extra corporeal gestation, foetal experiment, and sex pre-selection*, humanity produces and disposes its kind at will. Such act of playing God raises the serious question of whether man is the author of life, and or, can author life by introducing radical mutations into the nature of human species.

The act of commercialisation of the womb during which a woman gets pregnant only to surrender the fruit of her womb at any stage of its development for a fee, or the discarding or wilful destruction of embryo produced in excess, are all most degrading to humanity, to say the least. This is without prejudice to the fact that, contraceptives, pills and myriad of birth control methods have given rise to increasing number of cases of infertility. Jim Unah argues justifiably on this score that, "young people who cannot afford to make babies, but who desire to do so in future have no insurance against infertility which arises from the use of preventive remedies prescribed by science". (Unah, 1998:345)

Largely, Ralph Waldo's Emerson's prediction that American prosperity "would go on to madness" seems to engulf the entire human-race. The techniques and methods of science have distorted the meaning and nature of man's origin and purpose in life. This, in itself exposes the helplessness of modern man amidst the forces of degradation. Man's attempt at self-liberation from the forces of nature has further enslaved and dominated him. Karl Jaspers' pessimism in this regard is very revealing. While acknowledging as overwhelming the great successes of science and technology, especially in the area of medicine, which campaign against diseases has improved the quality of life, human beings, he argues on another score, have been robbed of their immunity and opened to the cruelties of human intelligence and the works of man's hands.

The most dreaded of all human calamities; the Acquired Immune Deficiency Syndrome (AIDS) no less devastating to human life is today said to be a product of unnatural,

scientific artificial genetic engineering. Professor E K. Ogundowole exposes this long hidden secrets (facts) on this devastating phenomenon to human life (AIDS) thus:

Whereas American sources try ceaselessly to misinform the world that the virus which causes the disease originated from African green monkeys, a number of scientists of conscience have, however pointed accusing fingers at Pentagon (Ministry of Defence) of the United States of America as being responsible for sponsoring the research and cultivation of the culture-virus being part of its biological weapon development programmes (Ogundowole, 1998:386).

This assertion had since been confirmed by John Seal, a British scientist that AIDS was actually artificially produced in a laboratory as a biological weapon and that it was either spread "deliberately or by mistake". According to him, the virus that causes AIDS is almost identical to another virus called VISNA, discovered in 1945 and which occurred naturally in sheep, invariably causing death within 10 years. VISNA, he explained, has one gene less than the AIDS virus. He stated further that inserting an extra gene to a known virus in order to change its structure and thus bring forth a new type of virus is a routine procedure in modern genetic engineering.

Our position here is that, the manipulative techniques of technological medicine though preventive and curative, which results help to improve man's efforts for better healthcare and medicare, such attempts in form of research have produced very many damaging results which application has killed more than healed humankind. One ready example is the polio vaccine sent to Zaire from the United States of America in form of assistance to facilitate immunization of children against polio, but which turned out as a biological weapon against the innocent African population. Ogundowole supports this claim that "western medical investigators say they have traced the origin of the AIDS disease to the same location in which the vaccine was first administered." A similar investigation by the intelligence service of the then Soviet Union had claimed that it traced the origin of AIDS virus to the door step of the Defence Ministry of the United States of America – the Pentagon

(Ogundowole, 1998:387).

To this extent, science and technology which end is, serving man to convert reality to meaning and use, has turned out to be a source of enslavement and domination of man to whom it is meant to serve.

In the area of agriculture, the application of scientific technique has no doubt dealt with food and raw material problems, indeed, it has solved the food crisis and the ever increasing demand for industrial consumables, it no doubt not done without adverse consequences. Bertrand Russell (1961:717) puts it point blank that "food production in the present can be increased at the cost of food production in the future". Prophetic in tune and content, humanity is today, through the application of fertilizers and agro-chemicals using last reserves of possible extraction of fertility by artificial scientific means in such a way that we deprive the next generation of humanity, the minutest opportunity to grow its own food. Here, scientific technology is directed at promoting only the material aspect of human life to the neglect of the spiritual.

It is instructive to acknowledge the misuse of scientific technology, which results in agricultural pollution with its unfriendly social and environmental consequences. We are, here, referring to the environmental damage resulting from excess fertilizers and agro-chemicals carried to our bodies of water such as earth dams, streams and rivers by surface drainage, and in the body tissues of animals and plants. Onuobia has adumbrated the problems associated with this excessive application of fertilizers thus:

...the presence of larger than normal quantities of plant nutrients like phosphorus, can cause algal blooms and eutrophication of waters... (which) decreases aesthetic appeal and causes a loss of recreational potential... Nitrates (on the other hand) can cause a blood disease termed methemoglobinemia in infants up to 6 weeks of age... The same process can occur in the stomach of ruminants so that livestock can also be affected by nitrate poisoning. (Onuobia, 1991:162)

It is to be noted that chemical fertilizers are now required in large amount to sustain high crop yields though, they also represent appreciable source of environmental problems which not only dovetail into these areas of social problems, but also carries into these areas, problems that have today threatened the entire human race.

Similar environmental effects could be said of agro-chemicals. Largely applied to battle a myriad of fungi insects and other pests to reap the benefits of high food production, its uncontrolled, and or indiscriminate use has brought about incalculable disaster on humankind. For example, the chlorinated hydrocarbon pesticides said to be persistent in the environment have decomposition half-lives of ten to fifteen years, meaning then that they will be present in the biosphere in appreciable amounts for nearly a century. Onuobia further argues out the dangers of the persistence of these pesticides thus:

persistence pesticides often find their way into the aquatic environment. Surface run-off after rain or irrigation carries the pesticides to nearby lakes and streams where they are incorporated into algae and plankton, these are eaten by small fish, aquatic insects and other invertebrates in which the pesticides further accumulates. Finally, these concentrated agricultural poisons end up at the end of the food chain in the bodies of predatory animals, large fish and birds of prey which are likely to find their way into the human body system. (Ibid:164)

This means for us, a vicious cycle which implication paints a bleak future for humankind that patronizes scientific techniques without question and caution. Man, it is argued, must act within the principles of the ethics of right appetite which itself is the conformity of man's desires to his rational nature. This is to say then that, man's choice which results in disaster or self-destruction is at best irrational and so not in correspondence with the human rationality and does not, and cannot achieve the right end. What is, is that, technological goods and services are beneficial to the individual and the entire humanity only to the extent that they enhance human personality.

In his "Is Science Enough", Carl, W. Grindel (1964:194) argues authoritatively in

support of this position that, technological products must focus on man's rational end, and founded on prudence –the *recta ratio agibilium* (the right reason of doing things), “the virtue that assures that man will easily select the right means in order to perform acts that will lead to his end as man”. When, therefore, the desires of man are not controlled by right reason in the application and use of technological goods and services towards his ultimate end, then technology has assumed a negative sway.

Industrialization is one other area that the application of scientific technique is said to have benefited man and society most. This area of man's ingenuity on activity which expresses itself in the production of industrial goods and services has made tremendous impact and altered the circumstances of men and women both for good and for ill.

As argued earlier, scientific technology has made stupendous impact in industrialization, agriculture, marine technology and aeronautical engineering, it has however unleashed its woes on humankind so unreasonably that it has “ruined large numbers of skilled and industrious handicraftsmen, inflicting upon them hardships that they had in no way deserved and that they bitterly resented. Such is the experience Pope Pius XII observed in 1940 that “from the factory dead matter goes out improved, whereas men are corrupted and degraded”.

Translated into real life situation, machines replace men and women of creative ability, and so creates and continues to create large-scale unemployment and dislocation of a large number of able bodied men and women, which in turn has created frustration, disillusionment and discontent with society giving rise to all manners of social defiances and misconduct unprecedented and unparalleled in human history; the type never experienced in pre-industrial, pre-scientific communities (Unah 1998:350). This is at best the destruction of traditional values. Thus, while promoting and advancing the material and intellectual progress, the scientific culture remains less conducive to mental health and destructive of the

human person. As society undergoes scientific progress, it turns the individual into an 'automatum' who pays for his human failure with increasing mental sickness. He (man) is not in charge.

Perhaps the warning of John Dewey, the respected American philosopher reveals the disillusionment of humanity, but more the helplessness of man in a techno-polis. According to him, "a culture which permits science to destroy traditional values, but which distrusts its power to create new ones is destroying itself" (Dewey, 1973:22). It is, thus, common sight on our streets today, human beings who are falling apart. Life has lost significance with the human being himself becoming a thing among other things. This point is better presented analogously thus:

In many respects, modern man is like a wild animal, he is fed abundantly and protected from inclemencies but deprived of the natural stimuli essential for many functions of his body and his mind. Man is alienated not only from other men, not only from nature, but more importantly from the deepest layers of his fundamental self (Domenach, 1973:25).

Such orchestrated deprivation of what is best in humanness through the instrumentalities of scientific technology creates, and leaves for man an absurd way of life, the unreflected life which is not worth living. Most obviously, western scientific technology is in need of redirection, hence the conclusion that "western man will either choose a new society or a new society will abolish him" becomes the most relevant philosophy of right reason. The situation is better summed up by Paulos Mar Gregorios when he says: "the chariot of human development has gained momentum but seems to be running amuck without a charioteer". He goes on thus:

the environmental crisis, the economic crisis, the crisis of justice, the crisis of faith, the monetary crisis, the crisis of militarism... all these are symptoms that humanity has not yet become what it has to be, but also that it is on the wrong track. (Gregorios, 1987:201)

This is an argument to the effect that the emerging industrialized societies have successfully destroyed humanity; living the individual as the free and autonomous unit of

society, and to whom the sense of community has not only disappeared, but who has also lost his or her true identity. This, in itself, has resulted in the general deterioration in human relationships. This is aside from the phenomenon of stress and mental breakdown which daily haunts the modern city dweller, and the widespread use of hard drugs which is approaching epidemic proportion in some of the advanced societies, and even the high rate of suicide which are all symptomatic of this general deterioration of human relationships.

Another associated problem of the industrialized society is the mass drift of people from rural areas to the highly industrialized urban cities in quest of jobs in industries. This has produced negative changes in many aspects of social life like overpopulation with its associated problems of economic, social and political dimensions, the pollution of air, water and land with industrial waste. This situation is very vividly and lucidly portrayed by W. Friedman that, "at the present, the uncontrolled rate of industrial and urban development, the major rivers of the country will become, and many of them already are, incapable of sustaining marine life and unusable for humans." He adumbrates in particular;

By-products of gasoline operated cars and the generation of electricity, notably carbon and sulphur compounds, are poisoning the air... the enormous increase in the production of carbon dioxide is affecting photosynthesis and the temperature of the earth (through its effect on the atmosphere and the radiation of sun rays). Mercury and other industrial by-products are making fish unfit for human consumption. Non-organic materials such as discarded motor-cars and metal waste, plastic containers for beverages, and other consumer products, glass bottles, mountains of paper and the like are potential threat to life (Friedman, 1959:521-522).

The observation of the World Institute Report in respect of the environment pertinently reveals the crisis of scientific technology. It states:

Since the earth summit in 1992, human numbers have grown by roughly 450 million, which exceeds the combined population of the United States and Russia. Annual emissions of carbon, which produce carbon dioxide, the leading green-house gas, have climbed to a new high, altering the very composition of the atmosphere and the earth's heat balance. During these past five years, the earth's riches have also been rapidly and irreversibly diminished. Huge, areas of old-growth forest have been degraded or cleared – in temperate as well as tropical regions – eliminating thousands of species of plants and animals. Biologically rich and coral reefs are suffering similar fates (World Watch Institute Report, 1997:3).

Evidently, the west has a legacy of pollution from industrialization; excessive consumption and general over-abundance. Their industrial culture has made them, to consume about 86 percent of the globe's aluminium, 81 percent of its paper, 80 percent of its iron and steel 75 percent of its energy and 61 percent of its meat even though it account for only 21 percent of the global population. It is no wonder then that "they are responsible for the vast majority of the hazardous wastes created by the mining and smelting of aluminium and iron ores, the air pollution and building of greenhouse gases caused by fossil fuel burning and severe soil erosion found all over the land". Indeed their philosophy of mass production instead of production for the masses account for this misnormal environmental situation.

It may be argued perhaps that, some actions taken in the name of national economic interest invariably results in unimaginable woes on the human population. The exploration and exploitation of the abundant mineral resources is one such activity that comes to mind in which human activity has devastated the land and waters, and dehumanised the local population. In Nigeria, as elsewhere, oil exploration and exploitation that go on, the local population is forced to face the daunting task of saving their homeland from the local environmental ravages perpetrated by oil companies in collusion with the national government and multi-national oil companies. The people of the Niger-Delta region are a good example here. Their land and water have been defaced, polluted and devastated in search and exploitation of oil. Northern Nigeria is similarly and criminally degraded through mining

exploits which significant effects on the environment include the following: destruction of vegetation, defacing of the landscape, pollution of agricultural land, loss of ecological balance and death trap.

Similar actions as it relates to global trade in toxic substances make the industrial countries culpable for more than 90 percent of the 400 millions tons of hazardous waste produced globally each year and 70 percent of global emissions of carbon which is the main contributor to greenhouse gases. UNESCO science report graphically presents the situation thus,

Per capita carbon emissions in the United States are about 20 times higher than in India... Yet the average person in India has just as much right to a stable climate as the average American does. And people in India and most developing nations will be especially hard hit by global warming because their climate is already quite hot, making them highly susceptible to drought and desertification. Small island states, meanwhile, and the developing world's coastal nations, will have to face a significant rise in the level of the oceans with hardly any dependable infrastructure in place to deal with flooding. For developing nations in particular, the greenhouse effect could mean a crippling loss of cropland, the creation of millions of environmental refugees, and an expansion in the range of tropical disease (UNESCO Science Report, 1996:146).

Certainly, the by-products of industrial technology highlighted above are part and parcel of the scientific endeavour itself. But of particular concern is the fact that human greed, the idea that man and nature are opposed entities such that the former has to subdue, conquer, and exploit the later has done more to aggravate the problem which today produces destructive ugliness, giantism, normlessness, infantilization, conformity and non-identity. The industry not only creates robot-like interactions among people, but also has devastating effect on human being's vision of themselves. This situation has in turn conspired to rob the factory workers of their creativity, affectivity, spontaneity and responsibility, making them cogs in the industrial mega-wheel or turning them to Robopath, that is, human beings who are compelled by economic forces to produce goods in which they have no interest, which reduces them to

mere machine minders.

Another frightening dimension of the adventures by the genius of our most intelligent citizens find expression in the ammunition industry. Statistics and commonsense experience confirms to us that warfare is the most highly developed activity of the twentieth century humankind. An ABC (Television) Network Programme *News From the Earth* (December 26, 1988) reports that fifty-five thousand nuclear weapons are not only stored away in the arsenals of the world, but they are constantly oiled and tested. This is aside from other instruments of self destruction, from the smallest to the biggest; the gunpowder, bow and arrow, mark IV, hand grenade and the chemical and biological arsenals, anti-personnel mines and other inhuman weapons which include cluster bombs, blinding weapons, small calibre bullets, fuel – air explosives and hi-tech directed weapons.

In 1938 Otto Hahn and F. Strassman had successfully explained the general process of splitting the atom into more elementary particles in a process which they called nuclear fission. Such a process according to Irish and Meitner suggests that “a substantial part of the mass of the original uranium nucleus must have been transformed into energy, as the shattered nucleus flew apart at explosive speeds” (Unah 1998:354). This simple explanation argues further that by simply bombarding the atom one could ignite an explosive of devastating power.

Understandably, this discovery put in place an explosion that is twenty million times more powerful than the most powerful chemical reaction ever experienced. This means by implication that everything on the earth's surface including the earth itself would be reduced to dust by this quantum states that are far greater than the exchanges of terrestrial energy. Thus, with the discovery of the atomic energy i.e. in nuclear and sub-nuclear phenomena, the physicists are dealing with something outside the earth whose force or momentum is far greater than the earth's energy – the cosmic fire or volcanic eruption which according to Jim

Unah has not only been successfully tapped and stored, but has now been ignited. He warns here that:

Now if man allows the cosmic fire that he has tapped to erupt, then the dictum of the Christian obituary, "dust thou art and dust thou returneth" will apply to all humans collectively. Then man would have ended all life on earth by his half way cleverness that has crystallized as scientific technique (Unah, 1998:355).

Today, therefore, humanity is greatly threatened and terrorised by stockpiles of nuclear warheads, and biological and chemical arsenals. Men now live in dread of the hour, as no one knows when a conflict may arise between nations that may lead to the use of nuclear bombs assumed to possess the capacity of wiping out humanity in a twinkling of an eye. Uduigwomen rightly captures this fear and argues pointedly that,

The nations that have succeeded in acquiring this deadly weapon have become like children who, by some paradox of nature, have been bestowed with great power. They must therefore be petted, and flattered and coerced lest they destroy the whole of humanity at any venture (Uduigwomen, 1996:160).

A retrospection in the last two decades shows that our fears have been confirmed. There have been at least twenty wars in progress in various parts of the world. This is aside from the intermittent ethnic clashes and acts of terrorism, both offensive and defensive as are common in Northern Ireland, Britain, America, the Middle East, Algeria, South Africa, and Nigeria etc. perpetrated not only by the weak against the powerful, but often enough by the powerful against the weak. Such wars and or acts of violence employ the use of sophisticated arms, which when used, millions of lives are destroyed while many of those who survive are either displaced or reduced to the status of refugees, die of starvation or epidemics, or they remain physically or psychologically maimed for life.

Today, the result of man's progress in the ammunition industry has regressed human society back to the state of nature consequent upon which one third of the world's children are undernourished and 12.2 million die before the age of five every year, 95 percent of them from

poverty related illnesses (Jacobs, 1996:41) which itself results from war, or war related reasons. It may be added in justification of the above thinking that, a very large number of these children, who are affected by war are found on our streets (especially in developing countries), abused and damaged psychologically. Sister Doreen, a teacher in Southern Sudan beautifully registers this picture thus, most of them 'are wild, without manners' and it is difficult to discipline them, they "fight a lot, insult each other and use bad words". She states further that:

The presence of a teacher means nothing to them... they have hatred in them towards other tribes... children of one tribe join together to fight children of a different tribe... children do not usually have enemies, but these children do. They can talk freely of beatings, killings and molesting. I am sure they gather all these information at home from adults who are already dying bitter and wounded and, beyond healing. They have much bitterness gathered and stored in them. Most of these small children, ranging from three to six years, have painful stories, which put adults off. Most have encountered much hardship – born on the roadside when parents were on the run for safety, walking long distances on foot without food and water, sleeping in unknown jungles. They see all uncertainties on their parent's faces as they encounter attacks, shelling, having their homes burned, and always beginning again from nothing. Some have even witnessed the killing of parents, relatives or fellow-travellers. Added to these has been the lack of proper medical care, and long periods without education (Doreen, 1997:12).

The story of women during conflict and war is not different. Largely and truly the most hardworking population of the world humans, women are said to constitute half of the world population, but the most disempowered, without equal access to land, credit, technology, education, employment, food and political power. It is, thus, not an overstatement to argue that in every country of the developing countries, women bear the greatest burden of poverty translated in lower incomes, worse health, worse educational levels and longer working hours than men. Battof (1995:203) pathetically states simply that, "in developing countries, the number of poor women continues to grow in absolute terms and in relation to men. Poverty has increased by forty-seven percent (47%) among rural women as they often lack access to resources and much of their labour is not paid for; they have little opportunity to

pursue cash-earning occupations". It is, thus, an act of adding salt to injury when these overburdened and disempowered women have to contend with conflict and war made possible by the availability of arms. Such is, perhaps, why the Vatican II document argues against man's (negative) attempt to tap, harness and control nature and its forces to serve his personal needs.

...the arms race is one of the greatest curses of the human race and the harm it inflicts on the poor is more than can be endured. And there is every reason to fear that if it continues, it will bring forth those lethal disasters which are already in preparation (Vat. II, G.S. 81).

Perhaps, the story of the Gulf war may assist our understanding in this regard. Said to have emotional, personal and life-threatening dimensions of environmental degradation, the Gulf war instigated the largest oil spill.

Truly, dangerous armaments of extermination whose existence cannot even be defined has become the focus of modern technical endeavours. Hence any war involving weapons of mass destruction in our time is not only capable of wiping out all existing human values, but the very possibility of creating any further human values to replace them.

In the area of the socio-political, the creation of weapons has given the superpowers more facts for political bargain. The point of reference here is the arms race which has become a means of extending political influence forcibly to people who do not want to be part of it, thus turning the world into a theatre in which sheep and lion have to struggle for survival. Here, the empathetic and intuitive words of Woody Allen speak to us. He says: "More than any other time in history, mankind faces a crossroads. One path leads to despair and utter hopelessness. The other to total extinction. Let us pray we have the wisdom to choose correctly". (*The Theosophist*, July 1999:856).

Thus far, the negative impact of the ammunition industry on the entire material world seems to contradict Nkrumah's assertion that "growth in nature and in society is not possible without the conflict of opposites. Perhaps more fallacious is his conclusion that "evolution by

revolution is the Heraclitean touchstone of progress". Obviously, nuclear warfare, conflict, and war involving chemical and biological weapons does not and cannot engender harmony. Indeed the conflict of forces (or opposites) which may involve the use of nuclear bombs, chemical and biological weapons of mass destruction is more likely to end human existence than maintain peace. The Hiroshima and Nagasaki experience supports this position; in Hiroshima, 78,000 people were killed, and 10,000 others missing, while 37,000 inhabitants of Nagasaki were wiped out of existence. Today, scientists even say that a nuclear missile can be as much as thirty times stronger than that of Hiroshima and Nagasaki. The over forty years experience in operating nuclear power stations has convincingly shown their vitality, economic and ample ecological purity though, the atomic projects for peace and progress are also fraught with unimaginable hazards as witnessed by the aftermath of accidents at nuclear facilities in various countries. The three mile Island in the U.S.A, the several accidents at British nuclear stations, the Chernobyl accident in the Ukraine in April 1986 at 01 hour 23 minutes 43 seconds (Moscow News No 29, 1987:4), are but stern warnings reminding mankind that even tamed for peaceful purposes, nuclear power possesses a formidable destructive potential. Today and primarily, people in Belarus, Russian Federation and Ukraine continue to live with the consequences of the nuclear accident. Apart from displacing well over 210,000 people within the region, 237 people were admitted to hospitals and 134 were diagnosed with acute radiation syndrome, 42 died within the first three months with as many as 800 children diagnosed with thyroid cancer by the end of 1995. Oyeshola (1998:58) reports that "the radioactive contamination of the vast area has impeded normal industrial and agricultural production. The psychological stress of residents in contaminated areas is characterised by high anxiety, irritability, general feeling of hopelessness, fear about the future and inability to adjust, *thus impacting negatively on their economy and resources for health care.*

Most obviously, the thought of the Italian fascist, Mussolini who is said to have insisted that "the man who says there should be no war is a shameless coward" and that, "perpetual peace was neither possible nor desirable", and that "war is to man what maternity is to a woman" could be described as brute hostility and insensitivity to humanity. Such are expressions of ignorance of the values of cultural heritage, and the dehumanising aspects of modern scientific achievements. Such a person, it could be said, is a victim of the fallacious prestige of technical civilization.

The science of electronics, which today has caused a great revolution in electronics has given us radio, television, the tape recorder, the video recorder and has similarly enhanced digital communication via the satellite communication systems. With the discovery and production of the electronic computer too, the area of information technology came to be acknowledged as the backbone of technology. Said to travel at the speed of light, the super machine is today said to be endowed with "artificial intelligence" by which they could think for themselves (McNeil 1990:43).

Such revolutions in informatics and communications compel the World Bank in its 1998/99 report to adumbrate that, "information is becoming at least as important as land or capital ownership in the economy that is growing based on knowledge". The report reads further that "in the future the distinction between the developed and underdeveloped countries will be that between those who are able to use information quickly and those who use it slowly, between countries covered by the world information network and those isolated therefrom.

Through the Satellite communication system, an African who has access to the internet can see German or Japanese video films, U.S. television programmes, listen to Deutsche Welle, Radio Nigeria, and retrieve information in a Washington library. The same process avails the European and westerner the opportunity of reading Nigerian newspapers and

viewing the programmes of South African *Channel O*, The Nigerian *African Independent Television (AIT)* and *Minaj Broadcasting International (MBI)*.

The question of grave concern is whether the African, European or Westerner, concerned for his own problems and aspirations needs this information, and to what extent. Professor Alexei Vassiliev adds his voice here, that, even if he needs a part of it, he is its consumer, not producer. He asks in particular, "what about the common Africans, who have to consume the spiritual food that is of little or no use to them? (Vassiliev, 1999:17) It means here that such transposition of cultures via the use of global information systems help to corrupt other values and since Africa is at the receiving end, it argues against her that the African cultural heritage is affected most. A statement of the Catholic Bishop's Conference of England and Wales fully exposes the negative effect of the mass media that;

While Britain continues to enjoy standards of broadcasting which are rightly admired elsewhere, those standards cannot be taken for granted. There is for instance, a constant drift towards more screen violence greater use of obscene language and ever more explicit depictions of intimate sexual activity (The Common Good, Feb 1997:25).

The argued position here is that, globalization in the field of information opens new chances for developing countries (but African countries in particular), but involves new challenges and dangers. Most of what is given to the public as objective knowledge and or scientific technique portends health risk or utter destruction due largely to public ignorance on the part of the consumers, or greed on the part of the inventors. The American Journal of Medicine is reported to have given a clean bill of health to cellular phones (most obviously influenced by greed economics), but recent studies in 1999 by Joseph Kallol has established a relationship between the use of cellular phones and brain damage. A Science News Programme monitored on VOA (January 27, 2001) argues that there exists a genetic damage resulting from the use of cellular phones, and that in children cells and bones tissues are affected most due to radiation.

Understandably, it cannot be argued that broadcasters are merely responding to changes in public taste, as they play a major part in shaping that taste. Information technology, specially the hi-tech of the western world creates and maintains its market share which accompanying foreign cultures have downward taste implication for Africans rather than upwards, thus, resulting in the decay of public standards, dehumanisation of the mass population and decline in regard for the common good.

Revolution in informatics and communication no doubt thinned the world and made the world a truly global village, it has also fairly made knowledge a universal commodity, but, it has also rubbished human dignity in this universal beneficence. This picture is more eloquently stated by Professor Alexei Vassiliev thus:

The western media impose their own problems, their own world vision, their own system of values, their own ethical and religious approaches to the Africans to whom they are totally alien by and large... The inflow of show business and mass culture from the west breaks the earlier ideas, distorts the population's system of values and life orientation. It implants the consumer ideology, sexual licentiousness, violence, worship of the golden calf, material success at whatever price (Vassiliev, 1997:17).

Nothing could be added more than a statement of the fact that, combined with mass (foreign) culture and advertisement, the mass media both western and African, dictate people's taste and behaviour, form their political, economic, religious and social likes and dislikes, inculcate evaluations of events and facts. Our university campuses and urban towns have become show rooms in this regard. It is not an exaggeration to say here that when the television demonstrates an imaginary event, it becomes a fact that affects reality, though haven happened in the visual world. Such is the state of mental slavery which modern technical endeavour has afflicted on developing nations, but Africa in particular, which is yet unable to overcome.

The paradox here is that, though surrounded by innumerable spiritual forces and littered with abundant resources and fertile land-mass, and endowed with the capacity to turn

its many rivers into good and clean drinking water, Africans still look to foreign lands to satisfy their religious ecstasy, they still depend on genetically engineered food in form of aids to feed its teeming and ever growing population, and struggling to deal with the AIDS, migration, orphan-hood and refugee problems resulting from terrorist and ethnic conflicts.

While all these are problems which should engage the intelligent mind of the African, he still overlooks such problems in place of foreign television or internet programmes which inspire his interest most, either to watch football, Michael Jackson or to source for more information about the latest fashion style or video CD from the Hollywood, even when clean drinking water is not available within his immediate environment.

The suffocating impact of this digital information technology on the developing world (but Africa in particular) is best described by Ngugi Wa Thiongo as a *Cultural Bomb* which effect is to annihilate a person's belief in his cultural heritage and ultimately in himself. He says:

The effect of this cultural bombs is to annihilate a person's belief in their names, in their language, in their heritage of struggle, in their unity, in their capacities and ultimately in themselves, including their thought process (Wa Thiongo, 1986:4).

Similar attempt to promote balanced and professional use and development of information technology in the areas of economics and information management has been far reaching. While the development of information and communication technology has brought into being products of global standard that have the capacity to solve human problems, as is the case with computer application, it has on the other hand compounded many a human problems.

Through the electronic banking, both buyers and suppliers are assisted to reduce risk, and increase speed without much trouble of going through cashiers, and in the comfort of their rooms or offices. Designed using Public Key Infrastructure (PKI) technology, customers and buyers in the banking business are assisted via a device (electronic transaction services)

offered by COMPAQ, to validate their transaction via a major bank in a matter of seconds. Said to be anchored on trust and security, this innovation; the e-commerce is said to be supported by more than 10 of the world's largest banks. *The Post Express* PC clinic attractively presents its benefits thus:

Compaq indentures solution also includes key technology products and services to allow financial institutions to seamlessly integrate existing applications with a new web enabled front end handling business banking services, such as trade payments factoring and cash flow management (The Post Express, April 6, 2000).

This is, no doubt, an achievement of no mean measure. It is, however, another thing entirely to argue in its favour as to whether the human person for whom the service is meant desires it, or his essential purpose is served. In all honesty, science or technical device achieves its aim most when it serves man not when it helps to dehumanise him. The technique of Compaq indentures – ready solution for verification infrastructures, which functions where, and when man should, takes over man's usefulness and relevance, and thus renders him useless and irrelevant in the world, and without human value. Such consideration, it is our argued position breads self-destruction.

Besides, such human tendency to “force things to appear”, kills rather than heals humanity. Human nature is in harmony when it acts in the satisfaction of its essential needs. Such it is that, it is bad culture to say that “we must live to eat”, instead of saying “we must eat to live”. It must be said here that much of today's goods and services which result from our intelligent minds and works of our hands are least needed. They result from the unhindered access to information technology, which creates in us a culture of consumerism. Today therefore “people live to eat even when they are not hungry; they live to consume, to produce more in order to consume more. All these, according Pope John Paul II (1988:33), constitute the intrinsic contradiction of a development limited only to its economic element. Such development, he says easily subjects the human person and his or her deepest needs to the demands of economic planning and selfish profit.

It remains to be seen what has become of Africa and Africans, in, and out of this global phenomena. Commentators have said that the present situation is much more serious. They have argued unanimously that Africa's civilization and cultural identity is in danger at the turning point of the epoch. Globalisation, understood as internationalisation of interaction of both human and material resource portend universal blessing with unaccountable wealth though, still remains a distant social reality in Africa. In all areas, whether health care and medicare, agriculture and industry, military technology or the information and communication technology, the west remains a dominant overlord whose mass culture destroys the achievement of other cultures. Thus, the dreamed global culture was and remains an ideological fiction of neoliberalism rather than a social reality. It has advanced the criminal and immoral interest of the west more than it has promoted material welfare, spiritual upsurge, health and access to education, and human right and dignity.

According to Pope John Paul II, western countries "have betrayed their democratic principles and are moving towards totalitarianism, and democracy has become a mere myth and a cover for immorality" (John Paul II, March 1995). Perhaps the Pope was speaking against the backdrop of injustices and dehumanising legacies of the west, which brought more curses than blessings to Africans. In Africa, and for Africans, globalisation of the world economy in relation to all technical endeavours, pushed ahead by the forces which demand national boundaries be opened for trade and movement of capital, scientific knowledge, technology and information and communication techniques, proved useful to some people and marginalized much more other people, augmented inequality both within the nations and among them. In what particular ways, and to what extent Africa and Africans have been affected by the modern globalizing world is the question that shall be answered in the next segment of our discussion.

5.4 The Paradox of Scientific Technology and the African Predicament

Western science and sophisticated techniques have no doubt made an explosive and tremendous impact on human society. Such explosive impact has far reaching consequences; consequences that spell good and evil for society; consequences that snatched humankind out of the cruel forces of nature and yet threaten them with collective suicide. The expression Paradox of Western Science and Technology means here that the many advances of science and technical endeavours have improved the quality of human life, and are destroying life as well. This increasingly paradoxical dimension of western science and technology most obviously endears Einstein's comment that, "concern for man himself and his fate must always form the chief interest of all technical endeavours... in order that the creations of our mind shall be blessing and not a curse to mankind" (Nwagwu, March 26, 1998:22).

But such right conception of the ends of life, which itself is wisdom seems not to part of the defined project of western science, for while there is tremendous increase in knowledge in scientific civilization, it is not accompanied by increase in wisdom. Today therefore, our scientific civilization kills, destroys and dehumanises largely, hence science and technology have demonstrated that they constitute a double-edged sword. In their paradoxical dimensions, they have assumed more purposeful and purposeless, more meaningful and bizarre, more useful and destructive, and while achievements in the enclave of science and technology have served to prolong life, they have also served to provide resources through which the foolish application of scientific techniques, man would be exterminated from the surface of the earth. It is a curious fact that the Age of Reason ushered in so confidently by the philosophies of the eighteenth century has given way in the twentieth century to the age of anxiety. The extension of reason through science and technology, the ever-increasing mastery of the human environment while it has led to unprecedented human power on the hand, has led to the diminution of individual freedom and human dignity.

These bundle of paradoxes of science and technology are said to be part of the mysterious nature of man himself, the *homo faber*, who, within his same nature, has the power to degenerate into lower forms of life which are brutish, but who also has the power to be reborn into the higher forms which are noble. Thus, with the conquest of land, sea, and outer space, science not only offers a one-dimensional image of the person, but also presents the human person with the temptation to and self-deification, self destruction to the detriment of the divine nature of man. One is thus inclined to assert the paradoxical nature of the human person that, ours is an age that is marked by embarrassing contrast between the spectacular scientific and technological achievements on the one hand, and a shameful degradation of the human person on the other.

It is perhaps this unprecedented achievement of science in modern times that has lured the African into the fool's paradise, where he or she is unable to recognise his or her nature as a paradox. Though richer materially, Africans have become morally and spiritually poorer. It must be made clear here that, though efficiency and speed form the index of the hi-technology which the African too is a beneficiary, the African continent is yet to experience progress and development which are said to accompany such technology. In Africa, abject poverty cohabit with stinking wealth, there is the phenomenon of starvation on the one hand, and what is referred to as 'influenza'. The new scientific and technological values have destroyed the African humanistic value system. Today, Africans are no longer their brothers' keepers. Though we live within the world of enormous wealth and unbridled luxury of a few, a greater majority are experiencing utter poverty. The western scientific and technological mindset has further destroyed African values which today allows humanity to destroy or to squander goods that other people need for their lives. Ehusani very vividly captures this neo-African spirit thus:

whereas the "Structural Adjustment Programme" embarked upon in the last few years by African countries including Nigeria, has condemned thousands of the peasant population to death by hunger and starvation, African millionaires have multiplied their ranks, as is evident from the swelling account of individual Africans in European and American banks, the number of ultra-modern mansions now springing up alongside shock and thatch huts in African towns and villages, and the fleet of expensive foreign cars which now ply the scarcely paved roads that run through these towns and villages. (Ehusani, 1991:11)

It may be said, here, that the atomistic view of western scientific technology and its reductionist view of reality has encouraged and promoted collective selfishness of one class of people against another, thus, reducing a vast segment of humanity to the culture of the ghetto, making them more vulnerable to diseases and epidemics, drug addiction, crime and countless social and psychiatric problems. At best, the legacy of western scientific and technological civilization for the African could be summarised in what Thoreau says is an "improved means to an unimproved end" (King Jr. 1968:172). The men and women of Africa have been empowered with every technique of information and communication, yet they remain unschooled ignoramus in the experience of communion. We have perfected and erected bureaucratic structures where communication thrives and communion is nonexistent; and so "every improvement in communication makes the bore more terrible" (De Marco, 1982:61). It is no wonder that today traditional African society experiences intense loneliness and alienation, and the modern city dweller suffers while in the midst of many, and city life in Africa is, millions of people being lonesome together.

These paradoxes of human nature, but in particular, those which prevails in Africa, appears to inform the thinking of Vatican II when it says that; "there appears the dichotomy of a world that is at once powerful and weak, capable of doing what is noble and what is base, disposed to freedom and slavery" it continues: Man is growing conscious that the forces, he has unleashed are in his own hand and that it is up to him to control them or be enslaved by them. Here lies the dilemma (Vatican II, 1973:105).

The African predicament lies truly in this dilemma in the fact that the creations of man (science and technology), have been more of a curse than a blessings, while Africans never cease to speak of noble ideas, they watch the continent, as it were, helplessly degenerating in humanity. The many wars, terrorist activities, ethnic and religious clashes in which sophisticated weapons are freely used attest to this. Dr. King Jr. exposes what could be described as the true African situation that, the African Heads of State continually issue calls for world peace, yet, "they come to the peace table accompanied by bands of brigands each bearing unsheathed swords". On leaving the disarmament talk table, they go directly to launch latest nuclear missiles (King Jr. p. 182).

Perhaps, the most devastating blow to the soul of Africa is located in the nineteenth century when most of Africa was colonized by various European powers. The several years of colonial experience sapped the African heritage, which involve both material exploitation, cultural expropriation and anthropological impoverishment. Though highly certificated in the disciplines of western thought and knowledgeable in the technique of the west, the African suffers gross ego distortion. In general terms, the African continent has become the most bastardised and misused continent, and they themselves have been milked of their self-confidence. In one word, they have been dehumanised.

Perhaps the account of an American journalist reveals the African experience in more greater details.

The colonialists left behind some schools and roads, some post offices and bureaucrats. But their cruellest legacy on the African continent was a lingering inferiority complex, a confused sense of identity. After all, when people are told for a century that they're not as clever or capable as their masters, they eventually believe it (Lamb 1986:140).

The implication here is that, the clashes of the two world views; western, macrocosmic "superior" new world meant a displacement of the smaller "inferior" old order, in place of which the new western "superior" order that succeeded it became a disaster. In the language

of Chinua Achebe, "the 'whiteman' has indeed put a knife on the things that held Africans together and they have fallen apart". Western scientific and technological civilization thus means for Africa, the collapse of a whole vision of life, of all beliefs, of every authority, the loss for a people of their identity, i.e. the collapse of African humanistic heritage.

This neo-technical culture has engendered wars and terrorist activities, tribal and communal clashes in which lethal weapons are freely used. Today too, our towns and cities are being brutally terrorised by armed robbers, hired assassins, thuggery and banditry. African citizens have become prisoners in their homes, with high walls, iron bars and metal gates. Africa has become a battleground in which every body is fighting everybody. Ehusani captures this ugly scenario most vividly:

Thirty-years after independence of most African nations, not one of them is yet to boast of political stability. As one country launches a return to democracy another reverts to military dictatorship; as one country begins a national reconstruction after a bitter civil war, another declares the onset of a religious war, and as the workers of one country return to work after a period of total strike, the students of another country go on the rampage. Africa now records the highest number of refugees, most of whom are not being displaced by natural disasters but are rather on the run from totalitarian regimes, military dictators or rural ethnic militia. It is a continent in turmoil (Ehusani, 1991:20).

The question to be answered here is whether the loss of humanity by Africans has got something to show for it. Africans want scientific knowledge and technical know-how. Though they have traded out their humanism, they have not been able to gain what they want; scientific technology. They have lost their humanity, and so have become children without heirs and so slaves of the creations of their minds.

This scenario is best described by K. C. Anyanwu as the crisis of science which entails the crumbling of man's beliefs, assumptions, and ideas about reality, a situation that portends grave consequences on human conduct.

It means that reality no longer fits into our presuppositions about it, and this crisis has profound consequences on our conduct... It means that we are no longer able to determine the direction of change, to control events and to know how we are related to the world (Anyanwu, 1983:70).

Perhaps, this state of affairs of science means also a crisis of perception i.e a condition which prevents humanity from having a holistic view of reality that would enable it to organise its actions positively; to determine the line between the permissible and the forbidden, order and disorder, so as to deduce the principles of human association and determine the standard of our values. But in particular, the crisis of western science is founded on the mistaken assumption that there are absolute authorities in cultural modes of thought, and that the Europeans and, or the west are dictators in this regard, who must lord it over the rest of the world. In human situations, it must be said, all our cravings for truth, all our disputes about knowledge and quarrels about conscience are cultural activities or cultural quests, and they have all arisen from our desires as human beings to fulfil ourselves. This, Macneile Dickson argues, is why "all reasoning is in a manner biased, and the bias is due to the nature, surroundings and education of the thinker". He posits further that,

There are in the realm of thought no absolute authorities, no dictators. No man, living or dead, can claim oracular powers... All philosophies are in the end personal... systems of thought are the shadows cast by different races, epochs, and civilizations (Dickson, 1958:13).

It is, perhaps this attempt by westerners to superimpose their knowledge, systems and modes of thought on the nature and surroundings foreign to their cultural milieu that brings about a crisis in science which frontal offensive has produced today the destruction of the African states, cultural, economic and social institutions alongside its local elites, who are either destroyed or integrated into the western (or international system), but who have lost their responsibility for their nation, all in the name of progress.

Thus far, the negative impact of science and technology does not any longer portray them as unified explanatory pattern of the world. The UNESCO science report says this much when it states that, "faith in science that it makes clarity on all and makes all the universe intelligible, according to a coherent order of the causes and effects has lost its strength".

(UNESCO, Science Report, 1996:214).

Hans Zehrer is more forceful and vivid in his argument that not only has science brought about the collapse of the European worldview, his world is undergoing reconstruction. He says convincingly that:

Not only are we in the midst of a crisis of science today, but we have come to the end of that scientific attitude which dominated the epochs of modern Europe.... We can lay it down that scientific attitude which began to establish itself upon the Greek model at the period and which determined the achievements and successes of that historical period was faced with a reality in face of which it gives up, and in face of which its methods prove ineffectual; and we begin to grasp that this attitude of mind has played out its role and can attain no more success. If science be understood to mean what occurred within this epoch, then science is played out; we are at the end of it today. (Zehrer, 1952:257)

Surely, the situation is worse in Africa, a continent which is outside the scientific culture of the west. While there are still more discoveries and breakthroughs, the crises in science still persist and human consciousness would not grasp their realities. Science has power and knowledge, but lacks wisdom to use the power and knowledge properly. The issue here is that, the basic assumptions about reality, the principles of its understanding, its worldview, its methods and standards have collapsed. So, science and technology, which are said to be architectonics of progress are, themselves no longer regarded as sources, in themselves, of benefits to humanity. In reality, they are the causes of new forms of evil variously expressed in degradation of the environment, effects on human health, the dehumanising and the robotizing of society, the deepening of social and political inequalities. Put paradoxically, modern science, having endowed man with unrivalled powers of transformation of the world has, at the same time, conferred on him an unrivalled potential for the destruction of the planet. The human being has the capacity for good as well as for evil, for hate and conflict, as well as for love and co-operation. In the present chaotic world of technology and mass culture, these mixed qualities of humanities have been too freely exercised that the individual too often feels lost and meaningless.

5.5 Conclusion

The more knowledge makes progress, the more it understands why it cannot come to anything. Whenever we have the feeling to make progress in knowledge we see that it raises other problems... knowledge becomes convinced of its disability (Claude Levi-Strauss, 1997:45)

The quip above best expresses the paradoxical nature of science and technology. Most obviously, it posits in very clear language the crisis of science, which undisputed achievements, though, still has to contend with other resultant problems that defy scientific solutions. We have argued thus that, science and technology though beneficial in many ways, have conferred on man the power to destroy himself and to destroy the environment in which he finds himself. Although Science and technology have triumphed, they have simultaneously raised doubt as to their value. Such is what we have argued is the crisis of scientific technology which results from the fact that modern science and technology has developed losing sight of the original foundation on which they had been erected.

We contended further that such misguided direction of science and technology stresses 'one dimensionality' developing in its process on oppressive consumer society thus man's blinding his vision of a good and humane society, and alienating him from his fellow man. While not arguing that there is no apparent solution, our modest proposal is that, change in human orientation is most likely to engender development and promote best the essential desires of man.

But the question still remains as to whether the loss of humanity by Africans could be so regenerated. It is a fact that many Africans have virtually lost their human dimension to life and have so, become children without heirs and slaves of the creation of human minds and works of his hands. By the same margin, they have become dysfunctional human beings, having lost their humanity, which essential characteristics of personalism, hospitality, wholesome personal relations and the overwhelming sense of the sacred, has been infested with the cankerworm of western materialism and individualism. Our argued conclusion is

that, all systems of thought are the shadows cast by different races, epochs and civilizations, and only a proper re-integration of same that could engender human sustainable development which here means a shift from the materialistic (western) to the humanistic (African) which integrative evaluation shall form our discussion in the next chapter.

CHAPTER SIX

6.0 WESTERN THOUGHT, AFRICAN CULTURE AND HUMAN DEVELOPMENT: AN AFRICAN HUMANISTIC HERITAGE

6.1 Introduction

A respected African scholar once said that the empirical orientation of African thought, expressed in proverbs, names and songs etc, bear some philosophical content addressed or resulted from reflections on specific situations, events or experiences in the lives of the people. According to him, "even such a metaphysical concept as destiny (or fate) was reached inductively, experience being the basis of the reasoning that led to it" (Gyekye 1997:26). Implicit in this thinking is the idea that, observation and experience constituted a great part of the sources of knowledge in African traditions. In Africa and for Africans therefore, the empirical basis of knowledge had immediate practical results in such areas as agriculture and herbal medicine, crime prevention and remedy among others. Gyekye further acknowledges the presence of science and technology in the cultural traditions of Africa in the areas of agriculture and herbal medicine thus,

our ancestors, whose main occupation was farming, knew of the system of rotation of crops; they knew when to allow a piece of land to lie fallow for a while; they had some knowledge of the technology of food processing and preservation; and there is a great deal of evidence about their knowledge of the medicinal potentialities of herbs and plants – the main sources of their health care delivery system long before the introduction of Western Medicine. (Even today there are countless testimonies of people who have received cures from 'traditional' healers where the application of western therapeutics could not cope) (Gyekye, pp 26-27).

But such intellectual pill is too hard to be swallowed by the western experts to whom science and technology depend on the adoption of a linear monistic conception of reality, which goal is rationality and objective certitude demands the use of logic (mathematics) i.e. analysis and demonstrative procedures. Such conception of reality is what we describe here as western scientific thought.

As a systematic body of knowledge whose goal is to explain and rationally justify the laws according to which nature works, and to disentangle the profound relations that exist between different features and events that occur in the world, science and scientists follow a defined approach i.e. scientific method. It is, thus, this instrument of scientific method that the scientists study facts and phenomena in a given society.

The problem, however, is that when a phenomenon in a given cultural milieu is studied from the without, there are bound to be problems. Using the western approved method of science by a westerner or an African with a western mind-set to study the structure of reality (in African culture) is most likely to come down to a crisis of cultures. Even in the western society, the absence of a monolithic culture argues a thesis in support of the crisis of science in present day society. Thus, to imply that western scientific thought (knowledge) is objective; not subjective, that it is 'rational' not 'emotional', that the truth claims of western scientific thought is 'factual' not 'metaphysical', that it is 'empirical' not 'speculative', 'particular' not 'general' in contradistinction to African culture is nothing but a service in the promotion and protection of ignorance and scepticism. Western scientific methodology, accepts only the facts that fit into the scheme of western scientific thought and regards same as "true" facts. "The western scientific mind rejects all other facts that cannot be subjected to scientific treatment, and calls them "irrational", "superstitious", "religious". The fact of the matter is that the western mind essentially discriminates between "relevant" and "irrelevant" facts, depending on its own interests, but nature itself makes no such discrimination. In relation to African culture, K. C. Anyanwu illumines this point when he syllogistically argues that :

Science is not a fact in the world. Rather it is man's mental attitude toward object of knowledge. Therefore, science does not say anything. It is man who makes what he calls a scientific statement, and he alone must accept the responsibility for the truth and error inherent in science (Anyanwu, 1983:68).

As an endeavour which begins not only in sustained observations and investigations into natural phenomena, but also in the ascription of causal explanations or analysis to those phenomena, science is understood here in a social context whose principles must be self-limiting, in terms for instance, of size, speed, and violence without which it acts like a foreign body.

As argued in the previous chapter, heirs of western scientific thought are not candidates of this humanistic tradition. Rather, its underlying assumption is that reality is a material process in space and time. However, such assumption is not held by all cultures. Borrowing from K. C. Anyanwu's thinking we shall argue that western experts cannot then hide themselves under the mask of scientific methodology and thereby claim immunity from error or try to persuade any one that their "objective consciousness" has conferred on them with authority in African culture. We shall argue that every culture has its own science, that is, its own basic assumptions about nature and the method that the owners of the culture used in arriving at what they consider the trustworthy knowledge of reality. We shall thus argue in conclusion that scientific technology must of necessity have a human face, i.e. it must possess the virtues of being self-balancing, self-adjusting, and self-cleansing. This scientific technology, instead of making human hands redundant, helps them to become far more productive than they have ever been before. Such is which argued symbiosis of western scientific technology and African culture, is ere called human development.

6.2 Western Thought, African Culture and Human Development

(i) Western Scientific Thought

Eric Hobsbawn in his *The Age of Extremes*, succinctly captured the global crisis thus:

The future cannot be a continuation of the past and there are signs... that we have reached a point of historic crisis... we do not know where we are going. We only know that history has brought us to this point (Hobsbawn, 1996:584-585).

Truly, the signs of the time seem to point to an exhaustion of wisdom, but an escalation in knowledge which results from scientific researches, kill rather than heal, and which destroys, rather than build. Such is what we argued above as the crumbling of man's beliefs, assumptions and ideas about reality. The crisis of western scientific thought here refers to the new image of science which tend to be more materialistic and mechanistic, and not humanistic and creative. This attitude of science has led to a sharp separation between subject and object. Perhaps the postulation of K. C. Anyanwu more expressly captures this problem;

Democritus' atom made the western world safe for rationalism and made it possible to believe in the power of consciousness to grasp reality; and Descartes later established it as the basis of existence. But the atoms of contemporary science destroyed rationalism and the belief in human consciousness to grasp reality independent of the ego" (Anyanwu, 1983:70).

It does appear to us that, the modern world image is undergoing profound transformation, approaching dissolution, but without any new world image to replace the old one. Today, humanity wants progress, but which meaning it does not understand. As a being in space, time, and motion, humanity can make infinite progress, understood here in terms of the annual or periodic increase in money or in GNP and excess production and consumption etc. This, as we have argued elsewhere above, is not only the collapse of consciousness of infinity but also of the lineal view of history. This, by implication, means the collapse of the European worldview and the worldviews e.g. beneficiaries of its scientific tradition.

In our time, we stand in extra-ordinary openness and danger, which result from the crisis generated by western scientific technology. Yersu Kim briefly introduces the problem when he writes:

The forces of the techno scientific economy are threatening the very foundation of human life, even while they create unheard-of material bounties for a minority of humanity. These same forces are giving rise to ever more complex social, political and moral questions... the old ideas and institutions that had served humanity so well over the past several centuries in its task of survival and flourishing seem increasingly irrelevant, unimportant or even counter-productive. (Kim, 1999:1-2)

In what could best be described as the Khunian paradigm shift, people are abandoning old loyalties and building allegiance shaped by rapidly shifting ideas and hopes. Perhaps the twenty-first century could be described as an era of "decomposition, uncertainty and crisis". It is this bleak future that may have informed the inquisitive mind of the Nobel Laureate Jacques Monod to ask,

Could modern societies master indefinitely the fantastic powers that science (and technology) has/have conferred on them, on the criterion of a vague humanism tinted with a kind of optimistic and materialistic hedonism? Could they on those basis solve their intolerable tensions? or are they going to collapse? (Monod, 1997:75-76)

While not ignoring the direct benefits of science and technology which have helped man to free himself from direct material constraints imposed by the search for security, man has been similarly conferred with the knowledge and power to destroy the delicate network in which he is himself, as a creature of the nature, involved for better or for worse. Ahoyo (1997:76) more forcefully put it, "to that effect, he has stored in his armouries forces of nature which, if they escape his control, could annihilate the whole of mankind".

Suffice it to say that, the crisis in science generates for today's humanity, a great deal of serious and burning problems which require our attention and which, due to their planetary nature, necessitate a new culture to humanise modern science and technology. These problems, three of them;

- (i) The ecological problems entail the mass technological activities, especially in the industry, and which industrial waste pollutes our air, water and poisons our soils, which effect threaten our lives.
- (ii) Over-use and exhaustion of the natural, non-renewable raw materials and the problems of a long term decrease in the available energy for future generations.
- (iii) The problem of mass production instead of production for the masses, which makes humanity starve in the land of plenty -- increase in productivity though, which does not

benefit the great majority could endanger peace and human existence if we do not tackle them firmly.

Most obviously, the 21st century has a global crisis at hand; the crisis of science and technology which, expressed paradoxically means, more knowledge, more progress, more problems, but more disability. This paradox results from the fallacy of positivism whose position is anchored on the philosophy that knowledge as it is (science) deals only with facts which are founded on experience as the only source of reliable knowledge about the world, as removed from some metaphysical, assertions about supernatural entities and essences of things. Proponents of this philosophy posit that any proposition that cannot be proved in practice is meaningless. Metaphysical religious and ethical proposition belong to this category, which must be committed to the flames.

This fallacy has its fundamental basis in the theory of natural evolution which posits that man evolved from matter, but which could not explain consciousness, spiritual values, cultural creations. For it is from the present human culture or from the standpoint of the ego that we have to commence our quest for knowledge. The failure of the west to acknowledge this all important truism excludes Africans as candidates of scientific technology, and limits the consciousness of the west to avail itself of a wholistic scientific culture. Edmund Husserl (1859-1938) supports this assertion that, "the crisis of modern science stems from the positivist reduction of science to mere "science of facts", the crisis of science means the loss of its importance for life" (Husserl, 1976:9).

What this assertion means is that, the marvellous powers of science and scientific rationality and competence, have served in the promotion of the human person though, they are today used against humanity. Such aspect science and technology find expression in Lord Keynes when he speculated on the economic possibilities for our grand children. He concluded once that:

the day might not be all that far off when every-body will be rich we shall then, he said, 'once more value ends above means and prefer the good to the useful'. The time for all these is not yet. For at least another hundred years we must pretend to ourselves and to everyone that fair is foul and foul is fair; for foul is useful and fair is not. Avaries and usury and precaution must be our gods for a little longer still. For only they can lead us out of the tunnel of economic necessity into daylight (quoted from Schumacher, 1979:22).

The point canvassed here bothers on the collapse of morality in public life, but largely a statement of the fact that ethical considerations in social relationships are not merely irrelevant, they are an actual hindrance, "for foul is fair and fair is not". But more importantly, Keynes proposition argues out three salient points. The first being that, universal prosperity is possible, and secondly that, its attainment is possible, on the basis of the materialistic philosophy of, enrich yourself, and thirdly, that, such behaviour is the road to peace.

It is to be understood here that, apart from drawing the conclusion from false premises, a conclusion is bound to be necessarily false, the practical relevance of the proposition is in doubt. The attitude of consumerism embellished in scientific culture which spirit argues for mass production instead of production for the masses negates the defined philosophy of scientific endeavour i.e. the satisfaction of the essential needs of man. Further to Keyne's proposition is the fact that, rather than being a road to peace, the greedy culture of science and technology has the capacity to engender conflict and war. E. F. Schumacher's comments here, are relevant:

over the whole thirty-four year period, the world would use 425 million tons of coal equivalent, with the rich using 321 milliard or seventy five percent, and the poor 104 milliard or twenty-five percent. Fuel resources are unevenly distributed, and any shortage of supplies, no matter how slight, would immediately divide the world into 'haves' and 'have-nots' a long entirely novel lines. The specially favoured areas such as the Middle East, North-Africa (and Nigeria) would attract envious attention on a scale scarcely imaginable today, while some high consumption areas, such as western Europe and Japan, would move into unenviable position of residual legatees. Here is a source of conflict if ever there was one. (Schumacher, 1979:25-26)

Perhaps, it is because science has for long been associated with the idea of progress that it has found itself in the present situation. To understand science and its aim "we must first free ourselves from the view-point of progress" for modern science had developed losing sight of the original foundation on which it has been erected. Such new culture of science is responsible for its crisis. At best, the culture of science means growth, without development. While growth entails material abundance, it is not rationally tailored to provide for the essential desires of man and society. While it satisfies the physical needs of man, it also ignores the spiritual nature of man. That is why humanity is today experiencing the paradoxes of want in the land of surplus, poverty in the midst of bountiful wealth, loneliness in the community of humans, and above all, the absence of communion within the very many sophisticated communication system world wide, and highly sophisticated weaponry which aim is to engender peace, but which are constantly used to annihilate humanity. In some instances, such phenomenon has environmental implication with its multiplier effect. Breakthroughs in the areas of technological medicine, and food and agricultural technology have combined to bring about growth in human population though, it has unfortunately too brought about expansion of cities, consequent upon which farmlands and orchards have given way as people needed more space for living, working and playing. Similarly, advancements in the construction industry which led to proliferation of industries and factories house, settlements, roads and development of recreational areas have, rather than improve the quality of life index, devour the environment and jeopardised the majority of human population. Thus, blinded by materialism, poisoned by consumerism, enslaved by greed and humiliated by aggressions, human being today appear to have lost their sense of meaning and purpose.

Such state of affairs necessitates a formulation of a new vision of reality, a world view that is holistic, functional and humane, which perhaps may be properly called development *sui generis*. It is anchored on the "African humanistic value system", a value system which

restores meaning and wholeness, not just in the human community, but in the entire cosmos. For creation has meaning only in the human person, and when the human person loses his or her sense of meaning and purpose, the rest of creation is subject to futility and groans in utter travail (John Paul II, 1979:316).

But before we discuss this humanistic philosophy, it will suffice to evaluate the corpus of African culture which is the architectonic of this philosophy.

(ii) *African Culture:*

Culture, like every other word in common use, can be variously defined. It entails a people's integrative conceptual framework of reality. It is the totality of knowledge and behaviour, ideas and objects, that constitutes the common heritage of a people. This understanding of culture so described means a people's world-view or outlook, which conceptual model of reality enables the owners of the culture to develop a strong sense of belonging to a community of shared beliefs i.e. religion, politics, economics arts, morals, science and philosophy etc.

Understood as such, African culture is the outlook of an African on the created world. It is the African conception of reality as subsumed in African religion. This is to say then that African culture is a religiously based culture which conceptual model of reality is religiously based, and from which every other life index find its bearing.

African culture variously interpreted by others as African thought, or African philosophy, and even by some as African religion, is a product of the African experience in the world as distinguished from the experiences of other peoples. Such distinction, properly defined, constitute what is described as the African mindset, which, its modes of perception, its normative theories and social organizations contra-distinguish the western modes of thought (scientific thought).

The African reality has a unitary view, so, man is man because of other men, and life is

only life with others. Unlike the western civilization of analysis, mathematics and mechanics which translates to the individualistic conception of man, the African treasures moral and spiritual well being which quality of human life find self fulfilment in the community. This, perhaps, is the basis of the whole structure of the African's cultural life i.e. the idea of communal responsibility and interdependence. In what appears to be a summation of the corpus of African cultural identity as distinguished from the west, Ezekiel Mphahlele writes:

Africans gravitate toward people, not toward things as Europeans do... External nature exists as a symbol of the deeper meaning of life. It is not there to be tamed or be looked at for any lofty purpose, but to yield what it can for man's subsistence (Mphahlele, 1972:112).

This understandable element of African culture most obviously defines in very positive way how the African relates with and uses nature. Man and nature are important to each other although, nature exists for the good of man and remains so. When therefore man construes his leadership of nature as a manipulator who dominates nature, he destroys himself and the entire earth. This is not in the character of African culture, undergirded by the philosophy is holism; man is what he is because he lives in the company of others and in harmony with nature. In this characteristic African thinking, any conception of our environment that perceives only ourselves, and our dispositions is necessarily flawed from the point of view of essential human nature.

This position suggests that reality is culture bound. This is what K. C. Anyanwu calls *Cultural Standpoints*. Generally, he says:

there have been cultures that developed the religious or the spiritual aspect of life, or the material aspect of it. But no culture seems to have developed the spiritual and material aspects of life all at the same time (Anyanwu, 1983:55)

The reason here is that, the manner in which each culture consciously or unconsciously approaches the contradictory factors of human experience would determine its mode of thought and normative theories. So it is that the western, Eastern, Asian, and African culture

differ from each other according to how each of them approach the duality of experience i.e. the contradiction between the self and the world, the contradictions we experience in life, the contradiction between freedom and determinism, reason and sentiment, the one and the many, individuality and universality arise from self-contradiction. This duality of human experience more readily find expression in the thought of the westerner whose cultural assumption posits that the subject and object are two separate entities, hence the self and the world body and mind are two separate entities. K. C. Anyanwu further posits that:

The west reduces the duality of experience to a dualism, that is, to two incompatible realities. The world is said to exist independent of the ego and the ego to exist independent of the world. Man is separated from nature on the one hand and subordinated to material process on the other (Ibid, 58).

This typical expression of the western mind-set promotes and protects an ideology of either/or theory of reality which today is found in the subjective and objective divisions of reality prevalent in the western culture. Thus, reality for the west is either subjective or objective, mental or material, empirical or rational, and scientific or metaphysical.

The African mind-set, for which culture is holistic makes no such clear-cut distinction between the ego and the world, and assumes that man is inseparable from nature. Like Protagoras of Abdera, the self for the African is the centre of the world, it animates the world, and the spirit or mind becomes in some way the spirit or mind of the world. Reality is here said to depend on personal experience, and the world has meaning, order and unity by virtue of the living experience of the ego.

It must be restated here that human experience is the determinant of our standpoints. That is why the European or western mindset approaches and promotes reality in a way that is diametrically opposed to the African mindset. Thus, science, that is, material science is nothing but the manner which the European culture intellectually perceives the world, and that the materialistic and rationalistic assumptions governing it did not originate in all cultures.

It is thus argued here that scientific alternative is neither superior nor inferior to African humanism. Rather, they are two distinct literary cultural endeavours, and each is valid and inevitable for human development. But this is only to the extent that the two spheres interplay, which activity, the scientific endeavour is subordinated to serve the human sphere. Such is perhaps why Oluwole states unequivocally that:

To adequately interpret nature and experience and relate these to human interest and existence, a vast and thorough knowledge of the nature of man and our experience are imperative while the terms in which factual knowledge and their understanding are expressed are not determined in any apriori fashion, no interpreter should feel safe threading on undefined, unanalysed, or unknown ground (Oluwole, 1996: 121).

The next step is to recast the true African humanistic heritage, which understanding and resourceful benefit will act as an important "better half"; as an underpinner, alongside western scientific thought to bring about desired development. Here again, Oluwole adds her voice that, the western pursuit of science has yielded results that no nation in the world can dismiss or ignore if that nation truly wants development. So also the African pursuit of humanism as a concern for human behaviour and existence is its greatest cultural heritage to the whole world. If it is underplayed and ignored because it does not follow the fashion of science, then we misunderstand it and so miss the important better half of what it makes human existence meaningful. The two are necessary for human development.

What then constitute African humanistic heritage, and what is African humanism, what is human development? These questions determine the tenor of our next discussion.

6.3 African Humanistic Heritage

Western scholars have very unfairly described Africans and their culture in most derogatory terms. Africans were constrained as a people who elevated magic, sorcery, conjuration (or voodooism) and animal or human sacrifice as the essence of their religion, Africans were said to be a people without a history, philosophy and or a literature. Richard Wright presents a representative view here when he writes:

It is only with reluctance that non-Africans give up their mistaken stereotype views of Africa and Africans; most think of Africa as in the Tarzan movies, one big jungle filled with all sorts of harmful creatures; most conceived of Africans as "savages" living in grass huts, left behind by all that is valuable in the world (Wright, 1984:xiii).

Such conceptualisation of Africa in negative presupposes an argument and conclusion in favour of the west that theirs is a house of civilization, (scientific knowledge, history, literature and philosophy etc), as against the African continent which is a home of wild cultures (Oguah 1984:213). This amounts to a denial of a philosophical thought to the Africans which itself implies that they are unable to make philosophical sense or conceptualise their experience. This, in effect, denies Africans their humanity. All such misrepresentations are now dated. Today, Africa is said to bestow to the world a humanistic heritage, which the entire world order could only ignore to its peril. It is sensitive to human feeling, proceeding from a mind-set unique to Africans, and largely existent in literary works such as oral traditions; proverbs, names, folklore and songs among others, but without identical beliefs about every aspect of human life and experience.

This humanistic spirit is foundational to everything African: whether it is politics, religion, economics or social relationship, there is an acknowledgement of the unique personality of the Africans whose family and kinship values, along with their cosmology and historical evolution should be taken into consideration. Kwame Nkrumah (1969, 1970) talks about *African Personality*, Leopold Senghor (1971) calls it, *Negritude*, for Julius Nyerere (1971) it is *Ujamaa*, while Kenneth Kaunda (1966) more frontally calls it *humanism*. On the whole, African humanistic heritage parades a man-centred philosophy of life which argued position is that the dialectics of social engineering is aimed ultimately at achieving true dignity and development for the whole of humankind. Julius Nyerere captures succinctly this idea as he beautifully states the expectations of Tanzanians. In his words, "to the extent that we in Tanzania succeed in the struggle to which we have committed ourselves, so we shall be taking

our place in the match of humanity toward peace and human dignity" (Nyerere, 1971:34).

This indicates that the human person is the paramount creation from whom everything begins, and to who everything gravitates and in whom all things in the world have meaning. Thus, unlike western humanism (or shall we call it existentialism) which acts as an alternative to the supernatural interpretation of life, African humanistic heritage essentially interprets nature and experience and relates these to human interest and existence; it preserves the African person - centred society. As Kaunda himself argues, "the human being is above ideology and above institution... we must continuously refuse to tie the human being to anything... society is there because of the human being, and whatever we undertake to do, we have got to remember that it is the human being that is the centre of all human society". He declares further:

The high valuation of MAN and respect for human dignity, which is a legacy of our tradition, should not be lost in the new Africa. However modern and 'advanced' in a western sense this young nation Zambia may become, we are fiercely determined that this humanism will not be obscured... for it is in this regard that what might be described as African civilization is embodied and indeed if modern Africa has anything to contribute to this troubled world, it is in this direction that it should be (Kaunda, 1979:103).

It is to be acknowledged here that such fundamental principles as are found in traditional African society, which we here refer to as African humanistic heritage, remain the greatest cultural heritage to the world. As earlier on posited, if it is underplayed and ignored because it does not follow the fashion of science, then, we misunderstand it and miss the important better half of what makes human existence meaningful.

Fundamentally, this is the issue along which African philosophy teaches the world order to live according to divinely established values, that holism is the cardinal principle of the biosphere. Our well-being spiritually, economically, and physically, is determined by our awareness of the quality of our relationships with animals, plants, the soil and the whole of

nature, as well as with each other. Life is one, and even its humblest forms enshrined in divinity.

The underlying mentality here is that our (African) ancestors developed religious traditions based on a largely symbiotic relationship and spiritual communion with the natural world. This itself is founded on the fundamental assumption that every existing thing or reality is a life force or that every reality possesses life force. As a result, everything has something in common by virtue of life force. Anyanwu justifiably posits here that, "the African maintains that everything is similar and shares the same qualities in spite of visible differences as well as an endless multiplicity of forces" (Anyanwu, 1983:62).

It, thus, means for the African that, the interaction of one life force with another life force should be done in the spirit of live and let live. This is also to say that African humanistic heritage instructs a wise and gentle use of the earth's creation (i.e. the demigod powers). Science and technology, with their argued philosophy of neutrality, dismiss reverence for trees, animals, the soil and waters etc as pagan pantheism – use these powers to recreate the natural world into its own image of industrial utility, communication and information super-hi-ways, directing the evolutionary process of earthly creation to satisfy man's own pecuniary ends. Such secular materialism; the mutant belief system which turns *homo sapiens* into homo technos: technocratic man, kills nature and humanity. This is a legacy of Aristotelian rationalism and Cartesian dualism.

African humanistic heritage acknowledges creatures on earth as sacred entities and processes, and not a collection of potentially exploitable objects and resources. Today, the side effects of the activities of the technocratic man are almost always visibly everywhere. Humanity now rules over a dysfunctional, technologized world where the life-support system of the planet – its atmosphere, its climate, oceans, forest, and life-sustaining soils and ecosystem are becoming dysfunctional and starting to deteriorate. Further more, as biological

diversity is obliterated by industrialism, so cultural diversity is lost in the homogenizing process of global consumerism, with the consequent effect of the disintegration of the global economy, security of nations and integrity of communities.

As stated above, African pursuit of humanism as a concern for human behaviour and existence is, and remains the greatest cultural heritage to the whole world. Perhaps, we may add that the promotion and protection of African cultural values is and remains that which makes life meaningful and without which humanity suffers from the diseased condition – of crime, violence and a host of diseases – physical, and mental. It is to be said here that the sickening condition of the natural world mirrors the human condition and is a product thereof.

This attitude of the technocratic man underscores the question of “what is the human person in relation to the power that rules the universe?” This question is central to the corpus of African humanistic heritage.

To this question Bolaji Idowu in his *Olodumare, God in Yoruba Belief* (1962:171) acknowledged the presence of ‘*ori*’ the inner person in the human being and that the inner principle in the human being is ‘*orisa*’ the ‘Head source’ Olodumare (God) himself. This identification of the human personality to Being, itself, underscores the exalted place the human being has in the universe. Such etymological identification of the human person to Being as acknowledged by all ethnic groups in Africa is perhaps the greatest contributions Africa offers towards human understanding and development. J. S. Mbiti is more explorative in his discussion of the place of the human person in creation. He says that “Africans have their own ontology... but it is an extremely anthropocentric ontology in the sense that everything is seen in terms of its relation to man” (Mbiti, 1970:15). The human person is the champion of the religious universe. God is seen as the originator and sustainer of the human being; the animals and the plants and their natural phenomena constitute the environment in which the human being lives. This same idea is very lucidly expressed in Tiv tales with

animals given roles that interplay with human beings in the achievement of the common good of natures. So it is, that the Tiv would say humorously that *Aondo Gba banyam man u umache sha a chi u ve lu omuv mba dyako mba tar ne* i.e. God created human beings and animals as heirs of the created world. This piece of orature implicitly commands the human agent who is unarguably the master of God's creation to treat animals humanely, giving them citizenship legally and morally because they are part of the same life community and creation as we and are thus worthy of equal and fair consideration.

While not slipping back into the Asian spiritualism which argues that the material world and life in this world are illusions, and that the real is the spiritual, not the individual spirit as such, but the universal spirit or mind which the individual can embrace through ascetic discipline and meditation, the African humanistic heritage whose key principle is *human feeling*, offers the key to new ways and new days by pointing us away from the nemesis of *Homo technos*, and toward the way to heal ourselves by healing the Earth soul or *anima mundi*. Such is the role which the African plays that qualifies him/her as the centre of the universe. Mbiti's work acknowledges this role thus:

African people consider man to be the centre of the universe... He sees the universe in terms of himself, and endeavours to live in harmony with it. Even where there is no biological life in an object, African people attributes (mystical) life to it in order to establish a more direct relationship with the world around them. In this way the visible and the invisible parts of the universe are at man's disposal through physical, mystical and religious means (Mbiti, 1975:39)

Placid Tempels, more critically captures this philosophy in his identification of the *Muntu* as the centre of Bantu thought; the idea which include excellence, plenitude of forces etc. He writes:

The Bantu see in man the living force; the force or 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 decrees only for the assistance of the higher created being, man. (Tempels, 1959:66)

Our analysis so far reveals that, there exists a “river between” the western scientific thought and African humanism. Unlike western humanism, African humanism is not anti-supernaturalistic. Human beings are exalted creatures, they are what Gyekye describes as *theomorphic* beings because they have the spark of God in them.

Thus argued, it may be said that our evolving intelligence has taken us to a new threshold: a new horizon with two paths. The one of reverential and co-creative participation, which is signposted by the African humanistic heritage. The other path of rational egotism harbours the likes of Aristotle, Francis Bacon, Rene Descartes and Ayn Rand. It is also the path signposted by contemporary economists, scientists, and industrialist, and legions of other rational instrumentalists. It bestows an attitude of dominance, vengeance and belligerence. This path kills rather than heals. It encourages and leads humanity to a technocratic dystopia, rather than some hoped – for emphatic utopia, where the means to the meaningless end of materialism is total over consumption. Such a path also serves the interest of the reductionist, the logical positivists, “the moral relativists and dualists, as well as the therapists who are not environmentalists and the doctors who are not priestly healers of the soul and the Earth” (*The Theosophist*, July 1999:853). This is the path initiated, advanced and sustained by western scientific thought, which has today shown symptoms of uncertainty and crisis globally.

African humanistic heritage which seeks to make human existence meaningful, posits its inherent virtue that, for benefits to be realized, allocation and distribution of resources require some ethical orientation in the light of near universal shared aims and values which are said to be “wholesome human relations among people; respect for elders; community fellow-feeling... hospitality, (Sofola 1973 chapt 4), and concern for the Earth.

Elements of these humanistic heritage are richly found in abundance in African names, proverbs, songs etc which reflective attitude hinges on the fact that life is only life as it is lived in association with others and with nature i.e. the individual's identity makes no sense except

in reference to the community. Perhaps, this idea distinguishes the African view of man from the view of man found in western thought. Menkiti says of this that,

A crucial distinction (thus) exists between the African view of man and the view of man found in western thought: in the African view it is the community which defines the person as a person, not some isolated static quality of rationality, will or memory (Menkiti, 1984:176).

Any act of man by commission or omission therefrom, resulting out of his intelligence or works of his hands that affect humanity and nature negatively, is anti-African humanistic heritage. Elements which are discussed above find more detailed documentation, analysis and interpretation in the oral corpus of the African peoples, whose underlying philosophical motif or wisdom ideal is the immense dignity and overwhelming superiority of the human person, over and above material wealth, and his or her central position of honour amidst the rest of creation.

In carrying out this task of analysis and interpretation of African humanistic heritage as found in oral texts, we are mindful of the fact that today, the western synthesis of ideas and values seems no longer able to offer a sure guide to human survival and flourishing. They seem unable to deal with the growing impoverishment of much of the developing countries, as well as with phenomena of mass unemployment and growing pauperisation of a significant segment of the world's population. And that today, the largest portion of the budgets of many third world countries goes toward servicing their loans, some paying up to 70% of their GNP for this purpose, while one third of their population live in absolute poverty. Quoting the UNDP Annual report, the international **Herald Tribune** writes that, even in the richer countries, more than 100 million people live in poverty, and the ranks of the poor are growing (Sept 10, 1998).

These global problems today call for solutions that draw on the resources of different brands of thought including African humanism, which is why our proceeding analysis and interpretation is of relevance. A recourse to Professor Oluwole's advice may most obviously

serve our purpose, that, "if we want progress in all regions of human endeavour, we must learn that civilization consists in terms native contributions and outside borrowings" (Oluwole, 1992:122). This, according to her, can happen only if aid or contributions are fully appreciated for what they are. The pursuit of humanism as a concern for human behaviour and existence is Africa's greatest contribution to the whole world order. The essential details of such contributions as are found in oral texts remains to be known.

6.3.1 African Humanistic Heritage in Oral Texts

The Tiv wisdom literature argues out a philosophy of life thus, *uma ka orjime*, that is, life in its existential meaning is human fellow-feeling. Expressed as such, the Tiv oral corpus presents a representative philosophy which holds that, life for the African is solidarity among persons. The whole existence, from birth to death, according to this philosophy, is organically embodied in a series of associations, and life thus appears to have full value only in those close ties. John Mbiti describes this idea of community as one of the most vital features of the African heritage. It is perhaps in the same spirit that Chinua Achebe writes that:

A man who calls his kinsmen to a feast does not do so to save them from starving. They all have food in their homes. When we gather together in the moonlit village ground, it is not because of the moon. Every man can see it in his own compound. We come together because it is good for kinsmen to do so (Achebe, 1959:55).

It is to be said here that the idea of community living prevalent in Africa has intrinsic value; it is a product of African humanism which is concerned with the preservation of life because life is his or her ultimate concern, and that life can only grow in relationship. This ultimate concern for life very vividly find expression in African orature; names, proverbs, songs folktales and legends among other traditions and customs.

(i) Names:

In names, the Shakespearean rhetorical question "what's in a name?" is most likely to be proudly and authoritatively answered; "Everything". Names in Africa teach, instruct,

motivate and inspire generations after generation in the religious and philosophical truth that help in the promotion of human development. In the words of Sofola:

To us (Africans) names are cultural. They tell us who we are, what our thoughts and aspirations are. They express our relation with our maker. Above all they represent our attempt to understand the universe and ourselves, our place in the universe and our attempt to achieve order in our human midst (Sofola, 1973:117).

Names give meaning to existence, and so like other elements of African oral tradition, they are expressions of the wisdom and knowledge of elders which are used in small or large measure, consciously or unconsciously in the formation of their religious attitudes and behaviours, in working out their scale of values and in making their every day choices. It means then, that, ones name constitute who one is; without which one is not a person. Thus, African humanism is truly expressed in names; the product of African humanism. Kenneth Kaunda justifies this assertion thus:

(the people of Africa are rich in names) It is the product of their humanism. To be known by name is to be dependent, linked with the one who utters it, and to know all a man's names is to have a special claim upon him. (Kaunda, 1979:45).

A classical example is found in the *shona* name *purombomunhu*, meaning *even the poor are human beings*, which is an expression of African humanism at its peak. It tells the story of a poor, barren, fifth wife of a *shona* man who is an object of abuse and derision from the hands of other women. Whereas other women have a wide choice of children to use in the name-game, her only possession is a dog, which she defensively calls *murombomunhu*. This is no doubt reminiscent of the most cherished principle of the sanctity of life. That, life originates from the divine Being, and that, life which makes a human being, argues out the equality of human beings; rich or poor, with or without children.

Among the Tiv of the Middle-Belt of Nigeria, names not only express the dignity of the human person, they in fact express life itself. Such names like *Uma* (Life), *Ishima*

(Heart/Life) among others, express a very comprehensive philosophical notion of human life which, on the one hand includes the world, the universe, creation, with all its grandeur, including the non-physical forces which constitute the cosmic reality. On the other hand it refers to human existence and ultimate meaning. Similarly, the name *shaagee* (By-Power) is rooted in the Tiv understanding of the uneven struggle between God and lesser beings, for human existence which the understanding of the human person as the master-piece of God's creative genius, the crown of creation, who gives the entire cosmos and all it contains, cannot surrender. The implication here is the overwhelming power of God amidst lesser spiritual and physical beings, whose attempts to devalue or undermine human existence cannot surpass. Thus, the Ebira will sum up this philosophy of life as OZOVEHE (oza o vi ehe ni) meaning the human person is life (Ehusani, 1991:143).

Similar names with deep human fellow-feeling and or supremacy of life abound in Africa. The Yoruba have such names like, *Omololu* i.e. children are supreme/children are lords, *Omolade* i.e. children are the crown of life, *Owootomo* i.e. Money is not as valuable as children etc. Among the Igbo, such names as *Maduka*, i.e. the human person is greatest; *Ndubuisi* i.e. Human life is first; *Ndubueze* i.e. Human life is King; etc most prominently express life as man's essence; an order from the supreme Being. The Etsako people have similar names like *Oyone* – the human person is greatest; *Oyarebu* – the human person is strength; *Omoyetse* – children are the essence of life etc.

Clearly, life cannot be quantified or compared with some other material thing(s), and so any material gain(s) of whatever quantity or quality is not, and cannot be a substitute for life. Life for the African is great and another life in addition (children) confer glory (Omoleye) and so the crown of life.

(ii) *Proverbs:*

Proverbs are another aspect of African oral texts which serve as the store house, and medium of African humanistic heritage. This form of African wisdom literature expresses the people's observations and reflections in condensed form on human life, human relationships, human society and human destiny. This conclusion is reflected in Orji's work on Igbo proverbs when he writes, "the proverbs tell bitter truth about us, our lives, unsavoury events and situations which have been transferred to humour and summarised into philosophy of which depicts the attitudes and beliefs of Igbo (African) people and their outlook to life" (Orji, 1984:v). Whether it is among the Yoruba, Igbo, Tiv or Edo, proverbs are channels through which human communion and communication is made possible, and hence proverbs are like horses for searching for truth, and meaning in existence. Human life or existence find expression in proverbs as supreme in the divine creative act. So it is that human fellow-feeling in relationship is cherished above any quantity and quality of material acquisition. Thus if one has to put up with stupid or foolish neighbours, that situation is a lot better than the misery of living alone.

Among the Ebira therefore, such humanistic expression find relevance in the following proverbs (Ehusani 1991:156).

- (i) *Irehi ondu o dahi hu irehi avuta ni*
(a house of fools is better than a house of lizard)
- (ii) *Oza o ma si oza mo enyi re*
(one does not use a human being to measure a river)
- (iii) *Eyi Ozas goro-goro vi uhwo*
(the very presence of a person is a knife/sword)

In these and many other proverbs that abound in Ebira land, human beings are understood in unmeasurable quality with material things. Life is here said to be worthless and meaningless without other human beings. Thus, the human being is uniquely important and so must be guarded and not to be used as a means to the realization of an end, no matter how

glorious or desirable the end might be. Such is perhaps why they say the human person has something that even the lion and the elephant do not have – the human person is a spiritual force, he has a divine spark in him.

The Yoruba of Nigeria similarly recognise human worth above any thing else and express same in proverbs. They say

(i) “*Fifun ni owo fun, ko to enia iyi*”

(Money and material may shine and glitter, but they do not amount or match human worth).

(ii) “*Amo rere ni Olorun fi mo awon eda*”

(It is good clay that God used in moulding human being)

Among the Tiv, “*Or u kpila uon kpe ga*” meaning, one surrounded by a multitude of children never dies”. While for the Igbo man, life means interaction between himself and his fellowmen, among the living, the dead and the gods as well as the interaction between other animate and inanimate forces of nature. Thus, reality for the Igbo consists in the mutual interdependence between natural and supernatural forces in which man must find a peaceful place if he is not to endanger his own existence. Using the symbolic breaking of the kola nut which for the Igbo is life, man calls all beings and forces to communion by saying:

He who lives above, the giver of life, we thank you, Ani (the earth Goddess) come and eat kola nut, Amadioha (God of thunder), come and eat kola nut, may the river not dry up and may the fish not die; we shall live (Momoh 2000:372).

All these expressions of the Africans are deliberately guarded acts intended to manure human society for unhindered human development. The Tiv of Nigeria proverbially put it.

Or u been Yor (Tamen or) Kpen ga kpa ov a ov u wan kilim sha achi u mzehehen u tar. (The passage (death) of an aged man is like a fungus that has outlived its usefulness. It dies off to manure the younger ones i.e to rejuvenate society which has grown in its place).

Life understood here is like an indestructible atom, and beyond everything. It is like a stream that flows out and flows back. When it flows out, we call it death, when it flows back we call it rebirth. A stream that does not flow out and flow back becomes a stagnant pool full of impurities that threaten good health. Without death, there can be no rebirth. Death carries us away; rebirth brings us back. We die as invalids, but return in new found health (Oluwole, 2007:33-34). Variouslly called the soul, mind, the Igbos call it *Mmuo* the Yoruba speak of *Emi* while the Tiv say it is *Uma* (heart or soul) whose departure from the body brings about death. Not regarded as definite entities that are immortal or that go to heaven or hell after death, the soul is said to dissolve into collective immortality of the living, into what the Bantu call *Ntu*; the cosmic universal force, a “thing in itself”, which has the capacity to be reborn into another life.

This idea of life argues that any negative behaviour or action on the part of the individual can affect collective living, which will spell doom for the entire human race – there is no individual immortality as such because there is no isolated force. But there is the immortality of life force in which the individual life force participates in the advancement of the general common good. The understanding here is that, “life is real, more meaningful when we interact very closely with other human beings. Such is perhaps the informing African philosophical dictum, “I am because we are, and since we are therefore I am” which find relevant expression among the Tiv Thus:

Inyon Purugh Kperegh Mon ga.
(A bird does not fly using one wing).

Other forms of African humanistic heritage found in oral texts include songs, folktales, art form and the general African customs. Like names and proverbs, these channels of African humanistic expressions are unanimous in summarizing their basic philosophy, their yearnings, and their scale of values into a single proposition, that, life is on the top level of their scale of

values. They yearn for life; they are alive to live and live to the full in the advancement of the entire biotic community. In general terms, the African ethical sequel was, *Let us therefore behave well towards one another – in – community*. This communal spirit finds expression among Africa's numerous communities thus;

If you at peace, so am I
But if you are in trouble, so am I

- Zimbabwe and Mozambique -

Ihye imom ngi ov ga
(A single bracelet does not jingle)

- Tiv, Nigeria -

When minds are the same,
that which is far will come

- East Africans -

When spider webs unit,
they can tie upon a lion

- Ethiopians -

Sticks in a bundle are unbreakable

- Bonder of Tanzania -

These communal traits are grounded on the logic of solidarity and subsidiarity and intent at promoting the well being of each individual, of the whole person and the whole community. This most obviously explains why long life is seen as a blessing, and any threat to life is viewed as an aggression against the entire community that must be squarely tackled.

We may thus argue like Ehusani (1991:188-189) that,:

- (i) for the African, human life is the ultimate reality and meaning in creation, and therefore it is something sacred, something to be loved beyond everything else.
- (ii) the dignity of the human person in the African perception derives from his or her unique relationship with God (the supreme Being who has sent him or her as a gift to

the world), and with the rest of creation, including the non-physical realities.

- (iii) Africans believe strongly in the immortality of the human soul – a belief that is authenticated by the dynamic relationship the African maintains with his or her ancestor.
- (iv) the African is prepared to make incredible amount of sacrifice to bring one more human person into existence, to protect a threatened human life, or to share the often scarce spacio-material resources so that one more human person may be.
- (v) the litmus test of all human behaviour and activity is: “does it promote life or does it threaten life?”, and that human achievement is measured by how much life a person has given, promoted or protected.
- (vi) making allowance for certain negative elements of African culture and tradition. Such as the treatment meted to childless couples, the fear of, and lynching of witches and wizards etc, would generally find explanation within this preoccupation with human life.

It is our belief that the treatment above affords us the philosophical basis for the claim that traditional African culture is decidedly *humanistic*. We may add here that, this humanism is buried so deeply in the African psyche that though the raping and pillaging of the African continent in the wake of the slave trade, colonialism, western expansionism and Christian and Islamic evangelism have left contemporary Africa surely wounded, these forces have not succeeded in destroying the humanistic world view of Africans.

Perhaps, it is the promotion of the western static metaphysical world view that threaten to destroy humanity and the environment even in the midst of the availability of material abundance on contemporary human societies.

Our position in the next section is that African humanism can promote genuine (human) development. Human development is not, and cannot be measured simply in terms of

material things, market economy and bureaucracy; rather it is development of the human character which determines competence in the management of human affairs. This index is more important than western technology which tends to promote acquisitiveness. The affluence, which the latter promotes, is seen as the bane of social inequality and injustice. True human development entails a shift from the materialistic to the humanistic and holistic approach to life.

6.4 Western Scientific Technology and Human Development

A restatement of Professor Oluwole's (1992:122) thought, in "Africaness of a Philosophy" may serve very useful purpose as a starting point here that the western pursuit of science (and technology) has yielded results that no nation in the world can dismiss or ignore if that nation truly wants development. The African pursuit of humanism as a concern for human behaviour and existence is its greatest cultural heritage to the whole world. If it is underplayed and ignored because it does not follow the fashion of science, "then we misunderstand it and so miss the important *better half* of what makes human existence meaningful".

We are here confronted with two brands of thought. On the one hand, it is that which advance the culture of writing, science, technology and analysis, and which depend on the adoption of a linear monistic conception of reality. This brand of thought cannot be treated as undeniably true. On the other hand, we have African humanism which promotes and protects concern for humanity. Life is the ultimate reality and meaning.

While Africans are not strangers to such a metaphysical and anthropological division, they are complete strangers to both the metaphysical and anthropological dualism that seem to constitute the subterranean structure upon which western philosophy and science have been built. For the African, both the physical and the spiritual forces of the universe intersect and co-exist in harmony. As Molefi Asante alludes

The African is constantly engaged in the search for harmony and equilibrium among these forces, and sees ill-health, epidemics and natural disasters, as the fruit of discord in either the anthropological or cosmic order (Molefi, 1988:65)

Perhaps, such concern for the restoration of equilibrium among the physical and visible, and spiritual and invisible forces may have informed the wise declaration of African sages that, the traditional African may be simple and unlettered, but that he or she inhabits a larger world than the sophisticated westerner who often neglects the dimensions of the spiritual.

Unarguably acknowledged to have made tremendous achievements in the twentieth century, and thus reduced our world to one global village, western scientific technology with its static metaphysics has gradually promoted and protected a one dimensional ideology and rejected every other knowledge and reality that does not fit into its defined parameter with more and more technological 'fixes', with the technocratic man busy creating a global industrial technopolis. As he unconsciously but determinedly mutates into *homo technos*, he makes science his religion, and the technology his authority, parent and provider. And so, through such transnational organizations like the General Agreement on Tariffs and Trade (GATT) the World Bank (WB), and World Trade Organization (WTO), the biosphere or natural world is being turned into an industrial wasteland. The Report of the 8th Conference of Africanists titled "Africa: a stepchild of Globalization" very emphatically supports this conclusion. It reads:

The reality demonstrates that globalization of the world economy is a chance to take advantage of the accelerated economic development and transition to new technologies for the highly developed countries that have entered the post industrial stage, first of all the U.S.A. as well as other western countries. Yet globalization exhausts Africa and other weaker countries and regions more and more. The advanced branches of the western economy, which consume capital and scientific achievements, enhance their labour productivity and skills of their personnel, which widens the gap between them and African and other developing countries, whose advantage is their possession of raw materials and cheap manpower (Alexei Vassiliev, 1999:8)

Taken as the foundation of development, western metaphysics is essentially faulty. Its static character promotes fanaticism and violence. It is not susceptible to change in the face of even superior arguments. But such metaphysics cannot stand erect before the human court of reason because it ignores the better half of what makes human existence meaningful i.e. the spiritual needs of man. Development must be a synthesis of the physical and visible, as well as the spiritual and invisible needs of man combined. As it has been argued above, civilization consists in terms of native contributions and outside borrowings. This is a synthesis of different cultural literary attitudes. It substitutes one dimensional society in which unfreedom prevails, and human values obscured by the exaggerated materialism and secularism and disintegration of the human society, and family values in modern society.

Development, which makes man its central focus, is based on the premise that the purpose of economic and socio-political reforms should be the improvement of the standard and quality of people's lives. Democracy and human rights, freedom and liberties must be respected, and traditional rationale and contents must be sustained even as society attain a higher industrial status and turns more technological in outlook. Yersu Kim looks forward to such a framework as a standard human behaviour of the 21st century *homo technos*. He suggests that:

It should be an explicit policy objective to ensure that all have enough to eat, adequate housing and decent employment, that no child goes without education, that no human being is denied access to health care, safe water and basic sanitation. We must simply live in order that others may simply live (Kim, 1999:45).

Such is the framework that can ensure human well-being, world peace and an ecologically sound, sustainable and equitable global economy; it is development per excellence.

A good example in this regard is Tunisia, which, within the last twenty-five years achieved considerable progress in economic and social development, which sustained

development has resulted in reduced unemployment on the one hand, and increased quality of life on the other. As justifiably argued by Alexei Vasseliev, (1999:16-17), the main reasons of Tunisia's success are the development and fulfilment of economic reforms, closely connected with social programmes as follows:

- (i) the quality of the human capital has improved as a result of the development of education and health care.
- (ii) capital was invested into the economic and social infrastructure.
- (iii) the reforms were aimed at improving life standard of the poorest strata.
- (iv) the political leadership and administrative agencies strove to find a support of their programmes and actions among the population.
- (v) the traditionally strong state persisted, its efficiency was improved, corruption was checked and the elements of feedback from the population to the state machinery were preserved (Vasseliev, 1999: 16-17).

He adds further that, all this was combined with real measures aimed at the attraction of transnational corporations without giving up the national interest to them. It is to be added that the case of the Asian 'tigers' is comparatively higher and thus gives us course to argue in conclusion that, development, which acknowledged philosophy is anthropocentric must submit (or subject) its parameters to the critical examination of the human court of reason; to make life more fulfilling and more meaningful. As already argued elsewhere above, human development which itself makes meaningful life entails an openness and dialogue with the cultural space that surrounds every individual, it needs cultural values as architectonics, and which preponderance of emotion impairs our ability to think properly about the possibilities and consequences of choice though, exclusive emphasis on reason tends to make humans cold and calculating. Thus, thinking and feeling should be seen as compliments, mutually enriching each other.

Human life has its origin in God. This dogma of African traditional religion understandably acknowledges that the supply of the essence of life remains with the supreme Being. This is to say then that the human person transcends the merely physical and material world. Endowed with spirituality and more like the creator than fellow creatures, he or she maintains a mystical communion not only with the creator, but also with the elements of "the world in-between."

This dual character and quality of the human person, similarly demands a developmental attitude that rhymes with it, that is, the employment of the instrument of science with humility, compassion and non-violence. It is most obviously this informing drive that Yersu Kim argues thus:

Since a human person is possessed of both mind and body, requiring both spiritual and material fulfilment, pursuit of wealth must be tempered by the cultivation of a mind. Outer satisfactions of material kind should be enhanced by the inner satisfaction of the mind and spirit, and vice versa. (Kim, 1999:43).

This is what, to our mind, qualifies as human development, which James Sands sees as the solution to the problems of development and environmental degradation. He calls it sustainable development, which for him means

the progressive economic and social development of human society through maintaining the security of livelihood for all peoples and by enabling them to meet their present needs, together with a quality of life in accordance with their dignity and well being, without compromising the ability of future generation to do likewise (Sands, 1993:102).

While not denying that this conception of development may be a very good one, many issues still remain to be clarified, such as; what progressive economic and social development mean? in what social milieu and in what context? What constitutes the security of livelihood for all; is it security of jobs, basic necessities of life, freedom from molestation and violence etc? The question of who decides the quality of life, and whether the present resources match the world's population, and whether the lifestyles of people from different regions, are in

accord with the integrity and the nature of creation, are all issues of grave importance in understanding what human development is all about. Clearly development requires much more than economic and social index. Growth as it were must exceed the capacity of the larger system to regenerate resources and absorb waste at sustainable rates, and without disrupting other vital natural services such as photosynthesis, nitrogen fixation etc.

Human sustainable development prioritises economic growth, which in turn fuels not only the engine of biospheric destruction, but also relegate to the background the *mysterium tremendum*; our awareness of a creative process beyond our comprehension. Jacobs sums it up as:

...the existing processes of economic development cause poverty even as they generate wealth... Human suffering and injustice can no longer be tolerated on the ground that 'progress' will gradually eliminate them. General aid for economic growth is now morally inadequate. It has become imperative rather for the rich nations to tackle poverty directly, in particular by addressing those aspects of their own international economic policy which contribute to it. (Jacobs, 1996:43).

Much of what is said to be development is simply growth – material excesses which itself creates a consumer society, which in turn degrades the environment and dehumanises the person. What, then, counts as development (human development) entails reducing the consumption levels of the consumer society, and tempering material aspirations of the human person.

For the African, such a model implies that, society is a spiritual-material environment for the strengthening and fulfilment of life, not the individual life, but the whole society. This understanding means that society does not exist for the individual but for a collective salvation, that is, salvation from meaninglessness and hopelessness in life of the entire society.

Science and technology in their positivistic tradition of verifiability tend to emphasise the material dimension over and above the spiritual dimension, and so promotes the manipulation of individuals in a technological world which effect has killed more than healed,

the world. Such mechanistic and reductionist scientific thought, though highly progressive and profitable, is narrow by orientation and hence the diseased and unable to realize, from a more empathetic and holistic view. Thus the modern tendency to see and become conscious of only the visible (or over-emphasise the visible over and above the invisible) and to forget the invisible things that are making the visible possible, and which keep the visible going is a service in the promotion of ignorance and skepticism.

The ruling philosophy of development which enjoyed prominence over the years that "what is best for the rich must be best for the poor" is since dated. Material factors, which underlie this philosophy of development promotes and protects mass poverty, misery and degrades and stultifies the human person. As rightly observed by Schumacher,

...The material factors are entirely secondary – such things as lack of natural wealth, or a lack of capital, or an insufficiency of infrastructure. The primary causes of extreme poverty are immaterial, they lie in certain deficiencies in education, organization, and discipline. (Schumacher, 1979:164).

Development cannot be understood in a vacuum. Development is human, and so it is for the human person. Protagoras of Abdera is most obviously right when he alludes that "man is the measure of all things". Man, therefore, is at the apex of cosmogenesis. He bears in a translucent manner the principle responsible for the process of being. This is supported by an analysis of the concept of *Mmadu* in igbo thought, and its equivalent *ozovehe* in Ebira cultural philosophy, as well as *Uma* in Tiv philosophy. Various worded as *Mmadu*, or *ozovehe*, or *Uma*, the word means life in its 'totality', 'beauty' and 'essential appreciation'. It means for the African that, "man is the "beauty of life"; the beauty of all is therefore the plenitude of cosmic life. he is its totality. He is the microcosm of the whole of reality, the epitome of cosmic reality. In him is the basic attributes of being externally and realised – *life* (including the spiritual) is the *all*.

Understood as such, development does not start with goods; it starts with the people and their education, organization and discipline, without which all resources remain latent, untapped, potentials. Human development has much to do with the removal of these deficiencies i.e. education, organization and discipline, which three, must evolve step by step to become the property, not merely of a tiny minority but of the whole society. Thus development becomes care for the people – from a practical point of view. This is because people are the primary and ultimate source of any wealth whatsoever. If they are pushed around by self-styled experts and high-handed planners, then nothing can ever yield real fruit.

While not succumbing to the temptation of slipping into the fallacy of mistaking economic growth to human development, it suffices to argue that, global experience calls for a new world order in which humanity must itself not fail to begin to perceive reality from a radically different perspective than that which has become popular especially with the success of western civilization. Though humanity train (of development) has gathered momentum, it is derailing. We are headed for destruction, and with our technological powers, the plants and the animals, the seas and the rivers. But if humanity must survive on the face of the earth, there is need for a radical break with our immediate past in terms of our values and our world-views.

Human development premised on a philosophy is holistic, functional and humane, entails a shift from the materialistic to the humanistic. To this we shall focus our next attention.

6.4.1 Human Development: Between Materialism and Humanism

To a considerable extent, nature as accessible through causal-mechanistic law has enabled humanity to control nature and provide for itself the good life on earth. The same view has also contributed to destruction of the natural environment and alienation of human beings.

Ehusani argues this point further that,

After liberating them from the authority of God, technological science promised them unending joy, peace and immortality; but has failed to deliver any of these goods, leaving them more confused and disoriented. And today, blinded by materialism, enslaved by greed and humiliated by aggressions, human beings appear to have lost their sense of meaning and purpose (Ehusani, 1991:241).

The necessary reaction in respect of this scenario is to seek a balance such that we may maintain a sustainable harmonious relationship between the human species and nature. The main task of the moment is to formulate a new vision of reality, a world-view that is holistic, functional and humane. Such a philosophy of human integration is here referred to as African humanistic value system. This brand of humanism restores meaning and wholeness, not just in human community, but in the entire cosmos. For creation has meaning only in the human person, and when the human person loses his or her sense of meaning and purpose, the rest of creation is subject to futility, and groans in utter travail.

The western metaphysician may perhaps find fault with this thinking to the extent that reality for him is essentially composed of mind on the one hand, and matter on the other i.e. mind-body dualism. In Africa, however, no such abstruse and sterile metaphysical speculations can arise given the African cultural view of the world and mode of knowing.

man is both spiritual and physical, and any attempt to subtract one of the elements from man simply creates self-disorder, the latter of which (self-disorder) has become a metaphysical contagion affecting the whole world (Anyanwu, 1981:87).

Perhaps this very important, and central place of man is always ignored in the mind-set of the technological man. Human development has to do with the provision of both the material (physical and spiritual (non-physical)) opportunities for people, which judicious use of their talents transform their real situation to living a full and happy life, and steadily improving the lot of the mass population. True, western science and technology and has positively

impacted on man and society, providing man the good life on earth, but it has also popularised a dysfunctional world-view and a destructive axiology. As Ehusani has chronicled,

Western technological civilization has traded half-truth and illusions to all the lands of its conquest and these half-truths and illusions have largely been accepted as the reality. For example, in our day, it is taken for granted that there is a first world, a second world, and a third world and that there are developed nation's, developing nations and underdeveloped nations. The criterion for this stratification of the global society is economic and material advancement, and nothing more. When such other criteria as peaceful co-habitation, sociability, hospitality and the absence of crime are used, the whole first world, second world, third world structure crumbles (Ehusani. 1991:242)

The promotion and protection of these false values means only that materialism is the directing index of development, to the neglect of the equally important complimentary index, namely humanism which stresses fellow-feeling, community, wholesomeness and meaningfulness in life. It may be correctly posited that, "the near-absolutization and universalization of an otherwise purely economic category is the triumph of materialistic reductionism, in which the world is judged, humanity stratified, and development measured by how much of the earth's resources a given society consumes".

Such categorization and or definition of development stands rejected as a narrow vision of reality and the human person. This view neglects the development of persons, in the promotion of widespread meaninglessness and hopelessness in life. This as argued elsewhere above, is largely responsible for the global problems of the twentieth century homo technos, which call for solutions.

African humanism, thus, offers an alternative axiology to the men and women who today hunger and taste for meaning, who want progress in all regions of human endeavour. This humanism speaks of human development as the promotion of the good of people, every person and the whole person. Pope John Paul II here speaks the African mind when he sees human dominion as "the priority of ethics over technology, the primacy of persons over things, and the superiority of spirit over matter" (John Paul, 1979:316). A nation is said to be

developed when it has succeeded in making its people live together in harmony and unity, in love and justice, in mutual respect, interdependence and peace – when it treats its people, especially its disadvantaged group, humanely.

In the African cosmology, the human reality stands in a class of its own, far above any other inhabitant of the universe. It goes without saying therefore that the African sees as utterly degrading, the scientific approach to the human person which sees and treats him as an animal a little separable from the anthropoids. Such understanding of man in relation to issues of development amounts to an abuse of humanity. Kwame Gyekye, more aggressively appreciates the human person in his intrinsic value. According to him, “a human being is not just a bag of flesh and bone, that he is a complex being who cannot completely be explained by some laws of physics used to explain inanimate things, and that our world with all its complex and strange phenomena cannot simply be reduced to physics” (Gyekye, 1984:210). Man is more than just an animated lump, mixed with water, he is part of animal, and part of God.

The implication of this understanding is that, the African humanistic value system calls for a redefinition of our present notion of development, and a reprioritising of our developmental efforts. Development has to be integral or holistic.

In addition to material advancement, development has to embrace the soul and the spirit of the human person, of every human person, and the physical environment in which he or she thrives. Development must see the growth and fulfilment of the human person, of every human person, as the goal of progress in science and technology, in economics, in politics, and in religion. Development must be a human fact. It must be more spiritual and cultural than economic and technical. Development must not just mean, “to have more”; rather it must mean “to be more”. It must mean an ongoing commitment to advance from the less human conditions of disease, hatred, crime war, racism, poverty, oppression, injustice, corruption, faithlessness, hopelessness, etc, to the more human conditions of health, of love, peaceful co-existence equity, justice, community fellow-feeling, faith and hope. Development must be understood in its material moral, spiritual, social and environmental dimensions, if it is to be a truly human endeavour (Ehusani, 1991:243).

Clearly, materialism has its positive aspects; but to judge human progress and development via economic and technical indices alone amounts to a breach of the whole notion and to fill it with ambiguity. Development, seen through the prism of African humanism is the dynamic progression in the spiritual, moral and material welfare of the human person and of all people. It is on the one hand the maximal presence of human dignity and integrity, natural love and justice, sociability and discipline, and on the other hand, the minimal presence (or desirable absence) of war, homicide, suicide, drug addiction, mental breakdown, oppression and starvation. Human development is the progressive humanization of society by championing the movement away from the materialistic and mechanistic, and towards the humanistic.

Concerning the shift from the materialistic to the humanistic, it must be noted that, development does not entail a total rejection of the materialistic outlook in favour of the spiritualistic. It simply advocates a balancing of the two in the context of appropriateness of a given technology. The question involves the transfer of technology to those not yet in possession of it; but who need it to promote and protect the human person. Here, questions that agitate our mind are; what type of technology is appropriate for who and what? Who determines which/what technology to be encouraged? and who advances the humanistic value system of the Africans? Such questions and many other ancillary ones shall be answered in our next section.

6.5 Human Development: Technology Transfer or Appropriate Technology?

Martin Lings once wrote, with direct reference to the condition of the modern world that, if it can be said that man collectively shrinks back more and more from the truth, it can also be said that on all sides, the truth is closing in more and more upon man. It might almost be said that, in order to receive a touch of it, which in the past required a life time of effort, all that is asked of him now is not to shrink back. And yet how difficult that is.

Our previous chapter acknowledges the postulates of this writer as the paradox of humanity. In the excitement over the unfolding of his scientific and technical powers, modern man has built a system of production that ravishes nature and a type of society that mutilates man. Such is the philosophy of exaggerated materialism, which we here challenge as inadequate for the purpose of human development. This philosophy promotes a narrow vision of reality, and emphasises the accumulation of goods and the manipulation of techniques, to the neglect of the development of persons.

Against this misthink, the sages and teachers have challenged and pleaded for a new world order thus "seek ye first the kingdom of God, and these things (the material things which you also need) shall be added unto you". They shall be added, we are told, here on earth where we need them, not simply in an after-life beyond our imagination. More than ever before in human history, terrorism, genocide, breakdown, pollution, exhaustion, and chemical warfare, has not only promised, but threatened that even if you seek first the kingdom, these other things, which you also need, will cease to be available to you.

It is to be noted at this point that the destructive forces of the modern world cannot be brought under control simply by mobilizing more resources of wealth, education, and research – to fight pollution and chemical hazards, preserve wild life, to discover new sources of energy, and to arrive at more effective agreements on peaceful co-existence. Though these are important, there is more to as opined by Schumacher:

Wealth, education, research, and many other things are needed for any civilization, but what is most needed today is a revision of the ends which these means are meant to serve. And this implies, above all else, the development of a life-style, which accords to material things their proper, legitimate place, which is secondary and not primary (Schumacher, 1979:290).

This is the point on which our discussion in this section hinges, that is, the logic of production: which way – through the creative application of knowledge of other cultures which is technology transfer, or through the design and application of technical knowledge for

the benefit of the immediate community, which is appropriate technology. As Schumacher himself acknowledged:

The destructive forces unleashed by it (the logic of production – exaggerated materialism) cannot be brought under control, unless the 'logic of production' itself is brought under control – so that destructive forces cease to be unleashed. It is of little use trying to suppress terrorism if the production of deadly devices continues to be deemed a legitimate employment of man's creative powers. Nor can the fight against pollution be successful if the patterns of production and consumption continue to be of a scale, a complexity, and a degree of violence which, as is becoming more and more apparent, do not fit into the laws of the universe, to which man is just as much subject as the rest of creation. Equally, the chance of mitigating the rate of resource depletion or of bringing harmony into the relationships between those in possession of wealth and power and those without is non-existent as long as there is no idea anywhere of enough being good and more-than-enough being evil (p. 291).

It means, here that, pollution must be brought under control and population of mankind and his consumption of resources must be steered towards a permanent and sustainable equilibrium – this can be made possible through a conscious effort of intersecting the material and immaterial, the visible and invisible. Thus the tendency of the modern man to see and become conscious of only the visible and to forget the invisible things that are making the visible possible and keeping them going does not, and cannot amount to development. The philosophy of exaggerated materialism promoted and protected by scientific technology produces a "process of mutual poisoning" whereby successful industrial development in the cities destroys the economic structure of the hinterland, and the hinterland takes its revenge by mass migration into the cities, poisoning them and making them utterly unmanageable. As already stated above, our crudely materialistic philosophy that makes us liable to see only the material opportunities and to overlook the immaterial factors is a misguided effort in human development.

Human development is not primarily a problem for economists, least of all for economists whose expertise is founded on a crudely materialist philosophy. Human

development requires a new philosophy which takes cognisance of the yearnings and aspirations of the entire human population; it must be humanistic, which takes poverty and other inhuman conditions as diseases which must be permanently exterminated from the human system. From a severely practical point of view, this new thinking no longer support the saying that "what is good for the rich must be good for the poor", but support a development policy that "care for all people" because they are the primary and ultimate source of wealth.

The conclusion here is that, man's current pursuit of profit and progress, which promotes giant organizations and increased specialization is not and cannot be called development (at least in human terms). In fact, it has rather resulted in gross economic inefficiency, environmental pollution and inhuman working conditions. Thus, man is pulling the earth and himself out of equilibrium by applying only one test to everything he does: money, profits and therefore giant operations. We have got to ask instead, "what about the cost in human terms, in happiness, health, beauty and conservation of the planet?" which indices are architectonics of human development.

It is argued on this score that all success which end promote the essential needs of man are likely to be illusory unless there is also a healthy growth or at least a healthy condition of stability – among the very great number of people today whose life is characterised not only by dire poverty but also by hopelessness. Such healthy growth or condition of stability it is said, could come about through technology transfer, while others say it could be made possible through appropriate technology.

6.5.1 Technology Transfer

In her conclusion in the article, "the Africanness of a philosophy, Professor S. B. Oluwole (1992:122) says, "may be the invaluable lesson to be learned from the great debate on the existence of African philosophy is that different human cultures can contribute to

progress and human civilization.” The underlying mentality of this thinking is that borrowing from other cultures is an essential component of progress and development; technical, material or human. It thus means that the less developed (underdeveloped) and or developing nations are more likely to borrow wisely the creative knowledge of other cultures in the service of their essential desires. The Asian Tigers (Japan, China, Korea, Indonesia etc) have proudly demonstrated how to borrow wisely from other cultures (i.e. Europe and America). The Japanese, for instance, do not only encourage foreign teachers from Europe and America, they also have exposure to other cultures, as an essential element of their educational policies.

In Africa, the Egyptian contribution to the march of civilization is another of such examples of cultural symbiosis that has engendered progress and human development. One historian once wrote on this score that:

Long before her decline set in, Egypt had laid the foundation of a culture on which that of the western world was afterward built. References have already been made to her skill in Agriculture, architecture, writing, and painting. She had developed the use of metals, and had devised a method of practical mensuration. Spinning and weaving, and other industries had been introduced. By means of her sea-going ships she had established commerce with the outer world. And as early as 2500 BC, she had devised a Calendar, which, with the changes afterwards made in it by the Romans, is practically the same as that now in use (Ifechukwu 1991:33-34).

Europe itself obtained its arithmetic symbols from the Arabic figures 1, 2, 3... as opposed to Roman figures i, ii, iii. Even European languages borrowed from one another. Hence we often find in the English language, words with either French, Latin or German origin. Even in music, one can find traces of African music in European and American music.

In all of these, the instrument in use is what we call creative imitation, which principle, in respect of technology argues that we do not need to re-invent the wheel – that instead of trying to start from the scratch the development of new technology, we can adapt the already developed technologies from other cultures to our own environment. The advantage of this

strategy is that, it could save us a lot of funds which could be devoted to research and development. It is argued here that such an attitude in scientific technology is what comes to us a technology transfer, which adaption not only help in making the wheel suitable for our environment but also to use the technology of making the wheel to make other things we need.

Thus argued, technology transfer is not a mere import of another culture entirely, but a capture of the applicable and the spirit of technological progress already caught by other cultures. In this attempt, we look at how other peoples have applied techniques to the situation similar to ours and attempt such application. We are thus challenged to avoid the mistakes, the wastes, and the destructions that accompanied their own (i.e. the technologies of those from whom we seek to adopt or transfer).

The argued thesis, here, is that global problems today call for solutions that draw on the resources of different cultures. This then makes the imitation of other cultures imperative. As one writer puts it "if we want progress in all regions of human endeavour, we must learn that civilization consists in terms of native contributions and outside borrowings." It remains to be seen, however, how such outside borrowings has or can contribute to human development.

Put into proper perspective, technology transfer is examined by the conventional school in terms of the product cycle theory of international trade in which technology – owing enterprises in the advanced countries exploit their monopoly advantages in the third world market. The informing philosophy here is that, it is cheaper for the recipient countries to import technology than produce it locally. Attempting a further critique, the critical school examines technology transfer in terms of an unequal relationship between the developing and developed capitalist economies. It regards the situation as the inevitable outcome of capitalized development, and locates dependency within the centre-periphery concept which opines that part of the third world is part of the centre and, therefore, the actions of the former are taken in the light of the centre. Thus the dependent relationship determines both what

happens and what is possible between two sets of unequal countries. By prognosis, this implies, in practical term that technology transfer is a problematic issue in the developing economies like that of Nigeria.

Such, perhaps, is the thinking which informs the conclusion of Uduigwomen (1996:161) in his description of technology transfer as "the buying or importation of foreign technology by a particular country or state without due regard to the question of whether or not it suits the environment of the buying country or state." This, in itself, creates problems to the recipient country, for it means the introduction of a foreign culture into the recipient culture hence the two are bound to react negatively which, in our view dehumanises and depersonalises the individual and his society. Perhaps, the elucidating words of Professor Kwame Gyekye says it all that, the alien cultural product is not simply "transferred" to the recipients. Rather the significance of the product, they would seek it, acquire it, and appropriate it – that is, make it their own. This means that they would participate actively and purposefully in the acquisition of the product. But, as he argued further:

To the extent (1) that what is called technology transfer is, in its essentials, an aspect of the phenomenon of cultural borrowing, and (2) that the people to whom some technology is transferred are, thus expected to understand and take possession of it through active and purposeful participation in its acquisition, "transfer of technology" is, in my view, a misnomer. For what is transferred may not be acquired, appropriated or assimilated (Gyekye, 1997:40).

It is to be noted, therefore, that technology transfer cannot engender human development; indeed it does not have the intrinsic quality to trigger any meaningful form of development due to the absence of any necessary and sufficient conditions of assimilating, digesting and translating the techniques of foreign origin by the recipients countries. Thus technology is not transferred. What is transferred, on the contrary, is the colossal economic resources of the developing countries to the already developed ones. It must, thus, be noted that any form of technology that does not originate from within the socio-cultural environment

of a people can hardly be useful in dealing with their peculiar problems. This conclusion may perhaps be an exaggeration, but the fact is that, a technology, borrowed or originated from within a cultural environment must be made to interact in a meaningful sense with the local environment. It must serve the immediate needs of the local population, it must be appropriate in the sense of being amenable to management by their users, and in harmony with the environment, and which are conserving of natural resources.

To the extent that technological transfer does not satisfy these essential criteria, it is an unwanted foreign tissue in the human body system. Ali Mazrui's biological metaphor of technological transplant does not qualify for our acceptance either. In his words, "there has been a considerable amount of technology transfer to the third world in the last thirty years – but very little technology transplant. Especially in Africa, very little of what has been transferred has in fact been successfully transplanted" (1985:281-282) we may add here that, if by "successfully transplanted" the revered Professor of African studies mean to say that Africa has appropriated and acquired or can appropriate and acquire western technology and thus improve her lot, we roundly reject the assertion. Rather, western scientific technology with its static metaphysics has helped in the destruction of the entire African continent – socially, economically etc, and to that extent, destroyed the human person. Perhaps, the revealing reply of Kwame Gyekye helps to collapse Mazrui's poor analogy. Says he:

To the extent (1) that this biological or medical metaphor clearly involves passivity on the part of the recipient (i.e. the patient), who, thus has no choice in actively deciding on the 'quality' of the foreign body tissue to be sewn unto his body, and (2) that there is no knowing whether the physical constitution of the recipient will accept or reject the new body tissue, the biological perception of acquiring the technological products of other cultures is very misleading... besides the body on which the foreign body tissue is to be transplanted is in a diseased condition which make it impossible for it to react in a wholly positive manner to its new "addition" and to take advantage of it (p. 40).

We may add here that, even if we assume, analogically, that the society that is badly in need of the technological products of other cultures is technologically or epistemically

'diseased', the fact would still remain that, in the case of the human society, the members of the society would, guided by their needs, be in a position not only to decide on which technological products of foreign origin they would want to acquire, but also to participate actively and positively in the appropriation of those products.

Clearly, neither "technology transfer" nor Mazrui's "technological transplant" is a fruitful way of perceiving, and pursuing the acquisition of technology from other cultures for the purpose of human development. Indeed such forms of cultural borrowings destroy, dehumanise and under-develop cultures. What we do need in our chart to human development is scientific consciousness and not scientific knowledge. Scientific consciousness entails knowledge about science while scientific knowledge denotes knowledge of science. Andrew Efemini explains further:

Anyone with scientific consciousness understands the place of science in man's struggle to improve his living condition on earth. He does not see science as something that should be pursued for its own sake but as something that should be pursued for man's benefit... Once our educational system is able to produce people who have scientific and technological consciousness, it would have produced those who would be committed to the pursuit of scientific and technological development because they would be fully aware of the consequences of their refusal to do so (Efemini, 1982:18).

It must be said without fear of contradiction that, technology transfer is synonymous with cultural importation, which problems are myriad. Science and technology must better be acquired than bought. Acquisition, understood here, is also called copy engineering or creative imitation in which the recipient culture acquires the technology from other cultures by either copying or "stealing" it from industrialized countries and then adapting or modifying it to suit our (the recipient) environment or by developing one's own technology in response to the needs identified in the environment. China and Japan are classical examples in this regard.

Undoubtedly, technology can transform human society in numerous ways. For this reason, the post-colonial, developing countries will have to consider technology as an

instrument in the realization of basic human needs than as an end – as merely a way of demonstrating human power or ingenuity. As already acknowledged in our previous chapters, technology has meaning because of man; because of the service it renders to man. It thus becomes a fundamental mistake to conceive its meaning independent of man and his life. Thus, technology must be concerned fundamentally, and essentially with such human needs as food, shelter, water, health, clothing etc. The pursuit and satisfaction of these basic needs should guide the choice and appropriation of technology.

This brings us to the issue of the type of technology that is appropriate for human development. Perhaps, such zeal may have informed a one-time minister of science and technology to declare powerfully that, “we must reach out to the world’s wealth of knowledge and practice. We must pursue the solution of our problems of industrial manufacture and economic progress with dedication, conviction and patriotism” (Newswatch, February 12, 1990:14).

6.5.2 Technology with a Human Face

...what ought to be chosen is the technology that will be applied to industry, food and agriculture, water, health, housing, road and transportation and other relevant activities that make ordinary life bearable... military and space exploration technologies for instance, may not be needed by the postcolonial state – certainly not in the early decades of its postcolonial existence (Gyekye p. 41).

The appropriation and development of technology must necessarily take into account the local circumstances and objectives before the adaptability of any technological product. This is because technology has the capacity to transform human society, either positively or negatively, involving changes not only in our ways and patterns of living, but also in our values. It means then that, human beings will have to decide whether the (new) values spewed out by technology are the kinds of values we need and would want to cherish. Rightly argued, Gyekye asserts that:

Technology emerges in, and is fashioned by, a culture; thus right from the outset, technology is driven or directed by human purposes, values, and goals (Ibid).

This historical relation between technology and values thus maintained, means that, what will be produced for us by technology will (have to) be consonant with those purposes, values and goals. Thus, an argument in the promotion and protection of human development is necessarily an argument in support of the development of a brand of technology that is humanistic in form and outlook; a technology with a human face – appropriate technology.

Various referred as “alternative technology”, “intermediate technology” or “small-scale technology”, appropriate technology is defined by a committee of the United States House of Representatives as “those technologies which are decentralized, which require low capital investment, which are amenable to management by their users, which are in harmony with the environment and which are conserving of natural resources” (Topic; Issue 131:50).

The inherent understanding here is that, technology is made by humanity for humanity, and not humanity for technology. This means that, human beings and their welfare should be the centre of the focus of the technological enterprise. It thus means also that, technology must be driven to satisfy such needs that are appropriate to a given culture, that is, a given industrial activity should be appropriate to the conditions of a given people, (developing district), which itself dictates a technology to be employed.

The appropriate technology is founded on a dynamic metaphysic. This metaphysic is progressive as much as humanistic, and so draws its strength from the convergence of several trends herein considered:

- (i) The discovery that resources are not unlimited and or unrenovable, i.e. oil and gas and solid minerals.
- (ii) That the development of cost-effective high technology often put people out of work.
- (iii) That the exportation of up-to-the-minute technology to developing nations by the

developed nations creates more problems than the solutions it seeks to bring, for the indigenous cultures (i.e. recipient) could not absorb it effectively.

- (iv) That the side effects of technological innovations has heightened, as health hazards developed as by-products of such seemingly beneficial innovations as pesticides and oral contraceptives.
- (v) That scientific advances were eroding the ecology.
- (vi) That scientific and technical knowledge created new and dangerous cultures as humanity converted the instruments of scientific technology to more dangerous uses, which were never ever part of the scientist innovation.

This thinking is informed by a humanistic philosophy, which according to Schumacher, "makes the kind of common sense that could help the survival of life on earth become at least a decent possibility". Thus, appropriate technology is the appropriate means of re-directing the destructive ugliness, gigantism, normlessness, infantilization, standardisation, conformity and non-identity which modern scientific technology produces. It is the appropriate means of re-humanizing the factory workers (for instance), who have been robbed of their creativity, affectivity, spontaneity and responsibility, and made to be mere Robopaths.

Appropriate technology thus argues that, technology, and humanism are two interactive factors, which are not, and should not be arithmetical concepts, but should rather co-operate and co-exist with the concern for the interest and welfare of the people in the technological society to produce a total quality individual (TQI).

Schumacher had similarly expressed his scepticism of the positive impact of scientific technology. Says he:

If we ask where the tempestuous developments of world industry during the last quarter of a century have taken us, the answer is somewhat discouraging. Everywhere the problems seem to be growing faster than the solutions. This seems to apply to the rich countries just as much as to the poor. There is nothing in the experience of the last 25 (now 33) years to suggest that modern technology, as we know it, can really help us to alleviate world poverty, not to mention the problem of unemployment, which already reaches levels like 30 per cent in many so called developing countries... the apparent yet illusory success of the last 25(now 33) years cannot be repeated... so we had better face the question of technology – what does it do and what should it do? Can we develop a technology, which really helps us to solve our problems – a technology with a human face? (Schumacher, 1979:144).

For the African, the question of what western technology does is straight forwardly answered that (1) western technology destroys, dehumanises and kills, while the question of what it should do attracts the response (2) technology (of any form) should not lose the humanist essence of African culture. The reason is that, for the African, the value of concern for human well-being is a fundamental, intrinsic and self justifying value which should be cordoned off against any technological subversion of it. Kenneth Kaunda very forcefully expresses his concern in this connection thus:

I am deeply concerned that this high valuation of man and respect for human dignity which is a legacy of our (African) tradition should not be lost in the new Africa. However "modern" and "advanced" in a western sense the new nations of Africa may become, we are fiercely determined that this humanism will not be obscured. African society has always been man-centred. We intend that it will remain so. (Kaunda, 1966:28)

This prophetic desire can only come true if, and only if, the adapted technology is humanistically driven. A humanistically driven technology is that brand of technology which directing compass is informed by the humanist essence of a given culture. It acknowledges the prime place of man which understanding informs the choice of a technology that suits the said human environment. Unemployment and its resultant poor quality of life demands an appropriate technology that offers mass employment and re-assures food on every body's table. The charismatic visionary E. F. Schumacher is most obviously a genius in advancing a

philosophy, which serves this need. In his *Small is Beautiful: Economics as if People Mattered*, (1979) Schumacher dramatised what he calls "Buddhist economics", as a classical example of humanizing humanity through an appropriate means. He explains better

The very start of Buddhist economic planning would be a planning for full employment, and the primary purpose of this would in fact be employment for everyone who needs an "outside" job: it would not be the maximization of employment nor the maximization of production (Schumacher, 1979:54-55).

We may refer to this humble attempt as "technological-reclamation" of the messy activities of scientific technology, which has left modern man too busy doing nothing and or working tirelessly to destroy himself and the entire ecosystem. Appropriate technology here, focuses on the identification of human needs, and proceeds in a small but beautiful way to attack the problem, "life and direct", and solves the problem without any damage to the human person or the environment – it emphasises the philosophy that technology is appropriate to the environment, it conserves energy and, or resources.

Very well aware of the convergence of the trends earlier stated above, humanity is reminded that a price has to be paid for anything worthwhile; to redirect technology so that it serves man instead of destroying him. Then, humanity is said to be on its way to full and meaningful development. Schumacher argues the same point positively as, a possibility to give a new direction to technological development, which according to him is

a direction that shall lead it back to the real needs of man, and that also means: to the actual size of man. Man is small, and therefore, small is beautiful. To go for giantism is to go for self-destruction (Ibid. p.155)

Perhaps, the example described to us by Robert Cahn of a community of Zen Buddhists could very well serve as an ideal form of appropriate technology, which promotes and protects human development. They grow all their own food according to organic principles. Food and energy production, waste disposal, water usage and construction are being developed consistent with both Zen principles and the notions of appropriate technology. For example,

the community plans to use windmills as an electricity-producing technology. One of the group's leaders once commented,

Although we treasure leaving in the reality, of the present, we are in no hurry. We build in terms not of a generation or two, but 500 years or more... the result is a highly productive, ecologically and environmentally ethical relationship to the land, resources and animal life. (Drew #131:52).

Similarly, a widely cited demonstration project in architectural technology has been conducted at the University of Lagos wherein a one-storey building has been constructed with one hundred percent locally sourced raw materials. Perhaps more astonishing is the fact that the entire building could be dislodged without any form of destruction to the building materials used, and which could be reused elsewhere for another building.

In the field of agriculture, planned research and exploration of the vital relationships between soil, plant, animal, and man, have made it possible for present day farmers in many countries to successfully obtain excellent yields without resort to chemicals and without raising any doubts about long-term soil fertility and health.

In the area of industrial technology, the ever-increasing campaign of appropriate technology is yielding positive dividends. Researches in this area with futuristic philosophy shows that, technology with human face is fast becoming a household activity; that, it is possible, that, it is viable, and that, it reintegrates the human being, with his skilful hands and creative brains, into the productive process. It serves production by, and for the masses instead of mass production.

Our discussion thus far reveals that the third world, but Africa in particular, cannot be salvaged and humanised by western technology. The inventors themselves (Europe and America) have become slaves of their hands and creative brains. Its adaptation by the developing world has brought more poverty, and increased rather than diminished our problems in terms of mass unemployment, mass migration into cities, rural decay, and

intolerable social tensions. The human person has been left dehumanised and thus lives a life of meaninglessness and hopelessness. What we need is rehumanization; reorientation of relationships between man and nature, which itself engender order and harmony. We need technology, but a different kind of technology, a technology with a human face, which instead of making human hands and brains redundant, (*as has been the case with western technology*), helps them to become far more productive than they have ever been before. As Gandhi once said, the poor cannot be helped by mass production, only production by the masses (ibid p. 149). Perhaps a clear distinction of the two expressions could enlighten us and bring meaning to bear on our position.

- (i) The system of *mass production*, based on sophisticated, highly capital-intensive, high-energy-input dependent and human labour-saving technology presupposes that you are already rich, for a great deal of capital investment is needed to establish one single workplace.
- (ii) The system of *production by the masses* mobilizes the priceless resources which are possessed by all human beings, their clever brains and skilful hands *and support them with first class tools*.

Comparing and contrasting the two Schumacher validly writes:

The technology of mass production is inherently violent, ecologically damaging, self-defeating in terms of non-renewable resources and stultifying for the human person. The technology of production by the masses, making use of the best of modern knowledge and experience, is conducive to decentralization, compatible with the laws of ecology, gentle in its use of scarce resources, and designed to serve the human person instead of making him the servant of machines (Schumacher, 1979:149).

To the extent that the technology of production by the masses is synonymous with appropriate technology, we acknowledge that the human person's interest is best served here. Appropriate technology is vastly superior to the primitive technology of the past, sophisticated, capital intensive, high-energy-input, dependent and human-labour saving

technology. Appropriate technology promotes best the humanist essence of African culture, hence the full development of the human person. Unlike the modern technology which has deprived man of the kind of work that he enjoys most; creative, useful work with hands and brains, but which keeps him exceedingly busy working on things that are not necessary, appropriate technology is underpinned and guided by some basic moral values, and directed at the fulfilment of the material welfare balanced with the spiritual welfare of human beings. Quoting Karl Marx, Schumacher argues this distinction between modern technology and appropriate technology as a case in favour of appropriate technology. He writes:

They want production to be limited to useful things, but they forget that the production of too many useful things result in too many useless people (Schumacher p. 147).

Especially when the processes of production are joyless and boring, which confirms our suspicion that modern technology, as it has developed, is developing, and promises further to develop, is showing an increasingly inhuman face, and that we might do well to take stock and reconsider our goals.

Going by the spirit of African humanistic heritage, technology makes more meaning and gives hope to life if and only if it expresses its instrumental and intrinsic value. As an instrument in the quest for human fulfilment; its use ought to be guided by other, perhaps intrinsic and ultimate human values, in order to realise its maximum relevance to humanity. Kwame Gyekye strongly supports this position as he writes:

In considering technology's aim of fulfilling the material needs of humans, the pursuit of the humanist and social ethic of the traditional African society can be of considerable relevance because of the impact of this ethic can have on the distributive patterns in respect of the economic goods that will result from the application of technology. In this way, extensive and genuine social, and in the sequel, political transformation of postcolonial African society can be ensured, and the maximum impact of technology on society achieved (p. 43).

6.6 Conclusion

The acknowledged task of technology, it is said, is to lighten the burden of work man has to carry in order to stay alive and develop his potential. On the face value, it is difficult to fault this assertion. It is easy enough to see that technology fulfils this purpose when we watch any piece of machinery at work; a computer for instance, can do in seconds what it would take clerks or even mathematicians a very long time, if they can do it at all. This is aside from the fact that one single crane can carry the weight which a battalion of soldiers cannot. Obviously, work is reduced, and man finds more time to rest, but it increases other kinds of work. Most astonishingly, technology has "thrown the child with the bath-water"; modern technology is most successful in reducing or even eliminating skilful, creative and productive work of human hands and brains, in touch with real materials of one kind or another.

Such glorification of the works of science and technology, we have argued, has distressed, and destroyed man and society, and ravished the entire ecosystem. Virtually all real production (resulting from technical activity) has been turned into an inhuman chore which does not enrich a man but empties him. "From the factory", says Schumacher, "dead matter goes out improved, whereas men there are corrupted and degraded" (p. 146). Agreed, man cannot live without science and technology any more than he can live against nature. What needs the most intelligent and careful consideration is understanding the essence of technology (in its forced revealing) and the legitimate role of human life in such revealing, and discovering the essence of ourselves on earth and within our environment in the world. The ingenious endeavours of man's brain and hands should (must) be directed towards non-violence, harmonious co-operation with nature, and towards the noiseless energy, elegant, and economic solutions normally applied in nature, in promoting and protecting a sustainable ecosystem.

Giantism, the characteristic description of modern technologists complexities and excesses, in which accumulated toxic substances, and or wastes, may have no chance of possible positive disposal at any date in human existence, thus committing future generations to tackle a problem (if they can at all), which they do not know how to handle. Humanity, but Africa in particular may be on the path of authentic human existence if it adopts the position of a report on the control of pollution published by Her Majesty's Stationary office, entitled *Pollution: Nuisance or Nemesis*. It says in part,

"it would be only prudent to slow down the nuclear power programme until we have solved the waste disposal problem...that no more nuclear reactors should be built until we know how to control their wastes (quoted from Schumacher p. 40)

The obvious conclusion is that, modern technology, which is founded on western static metaphysic, promotes and protects violence, destruction, inhumanity, exaggerated materialism, and so is one dimensional in outlook. Such metaphysical outlook has not, and cannot engender progress and human development.

Our argued conclusion is that, African humanistic heritage, which ingredients and concern for human behaviour and existence, is an important "better half" of what makes human existence meaningful. It is thus at this point that we have advanced a philosophy of appropriate technology as an alternative to modern (western) technology. Western (modern) technology is not culture neutral, and so, even its transfer cannot serve the intrinsic needs of Africans for want of cultural sameness, and it is bound to deliver him in the worst possible way. Technology in its essence is far from neutral or merely an instrument of human control; it is an autonomous organizing activity *within which humans themselves are organized*, and not a means to an end. Understanding technology as a means to an end entails not only decisively redirecting nature, but of consciously and actually setting-upon nature, which in itself conveys an atmosphere of violence and exploitation, degradation and dehumanisation.

Such attitude to nature which find expression in modern technology as a "challenging-

forth" has thus instigated the withdrawal of the human agency from technology and in its stead acquired an attitude of violence as the causal factors interplay. To that extent, science and technology creates and sustain dangers and problems to the whole of creation for historical or even geological ages. This is a transgression against the biosphere. It is here argued that no degree of prosperity could justify such a transgression against life itself, which according to Schumacher (p. 141) is more serious than any crime ever perpetrated by man. The idea that a civilization could sustain itself on the basis of such transgression is an ethical, spiritual and metaphysical monstrosity. It means conducting the (economic) affairs of man as if people really did not matter at all, with emphasis on money, profits, and therefore giant operations.

Heidegger named this context 'enframing' (Ge-stell). But, "where enframing reigns", he argues forcefully, "there is danger in the highest sense" (Heidegger, 1979:28). This is because, the entire nature; human, technology, in their essences are challenged-forth for revelation. The true essence of nature is in its revealing, its bringing-forth i.e. of causation as Plato expressed it in *The symposium* that *Every occasion for whatever passes over and goes forward into presencing from that which is not presencing is poiesis, is bring-forth* (p. 10), where revealing and unconcealment take place, where *ale theia*, truth happens (Heidegger, 1979:13).

While not rejecting wholesale modern technology, we argue that the philosophy of creative imitation is the best option. This is an argument to the effect that different human cultures can contribute to progress and human civilization. Hence our association with Professor Sophie Oluwole's conclusion that, "global problems today call for solutions that draw on the resources of different brands of thought" (Oluwole, 1992:122), which may perhaps contrast with Holderlin's elegy "homecoming" i.e. return to our truly human nature.

Thus asserted, human development is, a "totality" of the human person; the dynamic progression or upward movement in the spiritual, moral and material welfare of the human

person and of all the people. It is the maximal presence of the desirables on the one hand, and maximal absence of the undesirables on the other; it is the progressive humanization of society, and harmonious relationships between humans and nature. "Man (humans) understood in this relationships", is *he* who *he is*, heir and learner of all things", and in the thought of Holderlin, "a conversation" whose future lies in the discovery of his essence on earth and within his environment in the world. (Heidegger, 1979:277) This, in itself, calls humanity to a homecoming, i.e. bringing humanity back into its essence. As Heidegger queries, "might there not perhaps be a more primally granted revealing that could bring the saving power into its first shining forth in the midst of the danger, a revealing that in the technological age rather conceals than shows itself?" (Heidegger, 1977:34). Our next chapter answers this question in the affirmative, that the saving power does exist to bring humans back from the danger of modern technology, into their essence, a homecoming, a return into the proximity of the source, the essence of being human that toward which humanity should work for its good and being.

CHAPTER SEVEN

7.0 SCIENTIFIC TECHNOLOGY AND THE HUMAN ENVIRONMENT: AN ETHICAL PARADIGM FOR SUSTAINABLE DEVELOPMENT

7.1 Introduction

Technology like any rational work of man has as its effect the achievement of the destiny of man, a destiny includes the good and happiness of man. So, it is the fruit of both the spiritual and material life of man. Our analysis thus far, reveals the interplay of science and technology in complex ways; that this interplay stands in great confusion which itself is part of the dangers of our time. Rightly put, a civilization that develops only its material side and not in corresponding measure in the sphere of the spirit is like a ship with defective steering gear which gets out of control on a constantly accelerating pace and thereby heads for a catastrophe.

This chapter argues that scientific technology (i.e. human creativity), interacting with nature (i.e. natural environment) is not and should not be "a journey outward away from home but a homecoming"; a discovery of the essence of ourselves on earth, and within our environment in the world. Such an endeavour is uniquely the function of man whose active life involves a rational principle; an activity of the soul. Samuel Enoch Stumpf recasts Aristotle's hypothetical syllogism to justify this claim. That man's end involves "an active life of the element that has a rational principle. In his words,

...if the function of man is an activity of soul which follows or implies a rational principle... then the human good turns out to be activity of soul in accordance with virtue (Stumpf, 1993:31).

Put in perspective, the proper functioning of man's soul is essentially man's function as man, which nature of man's soul is the provision of the body with its unique life and operation which in turn makes it the kind of body which is human. It means for us then that, the soul makes the total person, in whom consist the irrational and the rational parts that conflict

between our desires or appetitive and reason respectively. This inter-subjective actively raises the problems and subject matter of morality. As rightly observed by Mclean,

Technology and its instruments are appreciated not as extensions of man's physical faculties but as participating in his intellectual insight with its spiritual values (Mclean, 1984:11).

Understandably, man's moral action, which here entails the conscious, rational control and guidance of the irrational part of the soul, in its conception of ideas, and or active creation and use of technique, is architectonic to sustainable human development. As we proceed, we shall advance the morality of human integration here called African humanism as an ethical approach for sustainable human development. Western civilization has advanced the general human good though, it is a disaster because it is far developed materially than spiritually. Founded on the principle that nothing is good in itself, and that all that is relative, western scientific technology has failed to acknowledge the philosophy behind sustainable human development, namely, the good of the body and the good of the soul. Here argued, African humanism is advanced as a science of human conduct that transcends the limited analysis of the different strands of ethnical theories of subjectivism, objectivism, Hedonism, etc. discussed above.

7.2 The Ethical Paradigm

Leopold Sedar Senghor, the poet laureate wrote that, "Negro-African Society puts stress on the group than on the individuals, more on solidarity than on the activity and needs of the individual, more on the communion of persons than on their autonomy" (Senghor, 1964:93-94). A close study of African societies reveals that the above statement expresses no touch of exaggeration. It rather expresses the core of African ontology. It enunciates the concept of communitarianism which sees the human person in African societies as an inherently communal being embedded in a context of social relationships and interdependence and never as an isolated, atomic individual. Such is the communal ethics of the African

peoples which is here referred to as African humanism or African communalism. This is an African philosophy of life which characterise man as the microcosm of the whole of reality and life itself as the *all* that there is. Here understood, African humanism encapsulates the African metaphysical concept of *being as force*, that is, every living thing, and all objects are endowed with force. That, reality is an inseparable mixture of “mind” and “matter”, and that, all forces are in constant interaction, and that there is a hierarchy of forces concatenated in an all pervading universe.

Among the Igbo, Man’s insufficiency and powerlessness act as a Catalyst for human behaviour. Rational human norms in Igbo society are a product of communal justice in terms of what Ekei says, “moral obligations, moral oughts, mutual help and cooperations” (Ekei, 2001:77). What is central in this ethical orientation is that, Man is a being that intra-act and interact within the human sphere and with other beings respectively.

The Igbo capture this central ethical orientation thus, “ordinary animals scratch their backs at trees, when their backs irritate them, men turn their backs to their fellow one” for assistance (Ibid). Similar expressions of interdependence, co-existence, care and concern are found in Tiv social, economic and metaphysical affairs. Life for the Tiv, is not just living in the community but participating actively in its life and activities. Such is when the Tiv say *Uma ka orjime*, that is, life is neighbourliness or fellow feeling and that life is greater than riches (*tuma hembra inyalegh*), it is greater in value (*Uma hembra Zanaliala*). It goes without saying that, for the African, life and consciousness is directed towards belonging to an organic whole. Thus, the African society develops a sense of duty and obligation to live and work for the whole, to promote and protect the general good of humanity and its environment. This explains the significance of the Igbo proverb, *ofu mkpulu aka luta mmanu ozue ora nile onu* (if one finger is soaked with palm oil, it spreads to other fingers). This is an expression of the idea of collective responsibility or corporate dimension of justice or injustice. It is wake-up call for

corporate morality rooted in a series of blood relationships requiring the interconnected parts to so act for the greater good and harmonious co-existence of all.

A point must be made though, that, man, at the individual level is life, his or her being is found in community. His self-knowledge is important though, it makes meaning only to the extent that it is directed at a wise and gentle use of the earth's creation. This is what defines the African as a moral being who controls and directs his desires for the achievement of the common good in a communal society. This is an ethical philosophy whose principle is "I am because we are and since we are, therefore, I-am". This ethical paradigm combines knowledge and wisdom to limit the adventures of scientific technology and place it in accord with human essence to engender biospheric harmony.

Fundamentally, such moral basis and content as promoted and propagated in African humanism is definitive of the human environment which essential features of civilization combine material achievement with moral and spiritual development of the individual i.e. the good of the soul as well as the good of the body. Placid Tempels (1959:172) also echoes similarly that "material possessions; housing, increase in professional skills are no doubt useful and even necessary values. But do they constitute civilization? Is not civilization above all else progress in human personality?" It is understood here that 'progress in human personality' entails a liberated individual with a creative approach to the human environment, who is constantly guided by the good, and able to consistently live up to its demands.

Argued as such, African humanism is the greatest science (knowledge), and it identifies virtue with knowledge (science) which true science is architectonic to the essence of man; "to become a good man." In what seems to be a global challenge, Socrates queries in a manner that is typical of African spirit.

What is it good for to know all the rest, if you do not know the only thing which is essential? What use will you make of a science if you do not know how to use it for the good? It will be in your possession like a tool in the hands of a man without experience he manipulates it a random and injures himself more than he makes progress at work (Diogenes, 1925:179).

By interpretative analysis, African communal ethics (humanism) enunciates a true science, that is, the domain of ethics, the science of excellence, which knowledge can promote human interaction; within human beings on the one hand, and between human beings and other beings in the biosphere. That humanity has the capacity to do everything and to be everything. Most rightly enthused, it is in the human self that the science of good and evil is found. It is through the examination of the inner state of man that we learn and we must seek for whatever we must avoid. The inner reflection provides us all the solutions sought.

Truly, science and technology have powerfully helped man to free himself from the immediate material constraints imposed by the search for security though, they have similarly caused new evils like degradation of the environment, effects on man's health, the dehumanising, robotizing of society and the deepening of social inequalities among others. Prevalence of such noticeable evils of science is a product of ignorance, hence humanity must seek within its being to know and advance what convenes it.

What then counts as an ethical approach for sustainable human development is founded on the African assumption that all men have the same nature and whatever is good for one is also good for the other. The Tallansi of Ghana define this approach more properly thus, "the rights and duties of individuals appear as elements of corporate rights and duties, and the solidarity of the units is stressed at the expense of the individual's private interests or loyalties" (Basu, 1969:71). In this communal philosophy, humanity engages in self-search to unravel objective values that engenders sustainable living. Its aim is to make man discover in himself, his destination, his end, the ultimate end of the world, the truth, that is what is, in itself for itself, he must attain by himself the truth.

Self-knowledge which here means a rigorously rational introspection obviously avoids contradictions but promotes harmony between convictions and actions. Such condition is what life is said to be a moral one. Thus, as a basis for human activity in a biosphere, African communalistic ethics acts as a guide in the promotion of a true moral life. Human endeavours, which result from self-consciousness, does not (and cannot) disrupt the link between conviction (belief) and action.

In truth, such ethical approach more properly defines authentic human beings and hence sustainable human development. Understandably, ethical knowledge (self knowledge) amounts to good ethical conduct which knowledge unites conviction with will, thought with action, under the guidance of an inner lucidity, of reason, or of reflective wisdom. This knowledge guides (or should guide) the products of our brains and the works of our hands to avoid contradictions, and so to be in tune with human existence. But human existence, it must be unequivocally stated, demands meaning in the universe. The meaningfulness or meaninglessness of the universe itself starts from the meaningfulness or meaninglessness of human existence. Every human endeavour, using this ethical approach as a guide must be subordinated to the human person. It is here argued that, absolute devaluation of the human person as is common in today's *techno-polis* is most unethical. Sustainable human development process with its purview is an invitation to the understanding of the nature and value of the human person to which Professor J. I. Omoregbe readily provides; that,

man is the key to the understanding of the whole reality. The human person transcends the infra-human world. The human person possesses an inviolable dignity, an inalienable liberty and an inseparable moral responsibility. (Omoregbe, 1990:196)

This high premium on the centrality of the human person as the absolute value and the Supreme Being in the universe isolates him out never to be used simply as a means to an end. This approach argues further that, virtue, which quality is self-knowledge can set humanity

free from the illusion of reliance on individual ability, and so liberate the human person from the servitude of the selfishness, calculation and anti-social ego to fit into the universality of moral laws where in contradictions are non-existent, with man always thinking and acting rightly in the promotion of the common good. Arguably, such a civilization is holistic, which human (sustainable) development, individuals are able to express their inner talents fully in the creation of a happy and peaceful community, just as they bring about an ecologically prosperous natural environment, which nurtures them. Such is what is argued as an 'ethical approach' towards the evolution of a sustainable human development, wherein, the interests of the individual and society and humans and nature become congruent. The question is, how does this communalistic philosophy regulate the modern sciences (and technologies) in the achievement of this noble goal of sustainable human development?

The good is not just the material, physical or transient things, but what is really useful to man; his sovereign good which is his last end. Under this ethical approach, humanity is saved from the catastrophe which trails the trend of development of human knowledge (science) and skills (technology) that are constantly in the direction of seeking more comforts, conveniences and control of the natural environment.

More than ever, humanity is today confronted with a new reality, the increasing knowledge of nature and the ready capability to manipulate it to destroy the delicate network which he, is involved for better or worse. To this effect, man has stored in his armouries forces of nature which, if they escape his control, could annihilate the whole mankind. When and where this happens, humanity is said to be acting in the fashion of cancer cells, which when they run amok and burst out of the prostrate and take over the liver and lymph glands, it kills everything in the body including the cancer cells themselves.

Obviously, modern science and technology has given today's humanity more than he bargained for; serious and burning problems ranging from ecology, exhaustion of the natural,

non-renewable raw materials and the problems of scarcity, starvation and misery of the great majority of people in the third-world. But as it is said, "where the danger is, grows also the saving power", which saving power is entailed in African communal ethics. This approach emphasises inwardness, subjectivity and self-knowledge from which overflows other considerations i.e. social and metaphysical concerns. It is perhaps the absence of this self-knowledge, this self-consciousness that blinds our knowledge of human essence as graphically presented by Eric Fromm:

He (man) works and strives, but has an obscure consciousness of the usefulness of his action. Whereas his power on the matter increases, he witnesses his powerlessness on the twofold level of personal and social life.... Becoming master of the nature, he has become slave of the machine he has made with his hands. His knowledge about matter is great, but his knowledge about himself is nil (Fromm, 1968:138).

This endeavour wherein human knowledge remains *undirected* towards the inward dimensions of man offers the gateway to the true essence of man on the true human condition. Working within the framework of this ethical approach, human aspirations are made to rule self-interests and short-range perspective, and profitability subordinates sustainability. For nature has to be considered as the whole, of which human beings form one component. As a very important component, they are meant to serve the common good of humanity rather than make it subservient to individual needs and wants, for each generation must pass on what it has received in good order to the next generation.

Thus argued, science is truly useful to human kind if and only if it is ethically sensitive. Correctly rephrased, science without conscience is but ruin in the soul. This subordination of science to the human spirit is lucidly interpreted to signify the kingship and dominion of man over the visible world, which task consists in "the priority of ethics over technology, in the primacy of the person over things, and the superiority of spirit over matter" (The Common Good, 1997:31). Humanity totals, and society tumbles in the event that there is the growing priority of technology over ethics, in the growing primacy of things over persons and in the

growing superiority of matter over spirit. This is a contradiction of the human will resulting from absence of self-knowledge. In order to act well, which thought links with action, the stake is, to acquire the science of the good, and virtue is that science. This is the good of the whole man, in his body and soul.

As the sciences are ever developing and progressing, and responding to the diverse needs and expectations of *Homo technos*, ethics (philosophy), the supreme science must ever trail them, judging and governing them to accord with the pursuit of the common good, even against strong economic forces that would deny it so as to avoid the feared evil of turning science into an endeavour that devotes itself to organised murder and mass dehumanisation. The perfect thought of St. Thomas Aquinas may here suffice, that, "any culture or society or age that does not submit the sciences to the critical leadership of philosophy (ethics) heads to confusion and low rationality" (Aquinas, 1981:12). Meaning then that, public life needs rescuing from utilitarian expediency and the pursuit of self-interest. The Igbo of Nigeria capture this idea beautifully, "if a person buries himself, (alone) one of his hand will be out" (sic.) (Ekei, 2001:136). In human affairs, the twin principles of solidarity and subsidiary need to be applied systematically to the reform of the institutions of public life.

In names, proverbs, songs and images, the human person is life and central to what counts as development. This philosophy holds that, that which is good is that which is subsumed in the concept of the human person who is the centre of complementation and communion of all created worldly values; the natural, social, the universal values, all values: material and spiritual have their ultimate meaning only in reference to the person. Sustainable development only is to the extent that it makes the whole of man; his material and spiritual values, a focal point. This much, is what Tiv communal ethics encapsulates that, the human person signifies what is most perfect in all nature and that, human beings are at the centre of

concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

It is thus not far fetched to conclude that modern technology destroys and dehumanizes. Indeed, humanity journeys and involves with nature to the point of intrusion upon it. Thus, instead of diverting the natural course co-operatively (wherein lies the essence of technology) modern technology emphrases and achieves the unnatural by force. Not only is it achieved by force but it is achieved by placing nature in our subjective context, setting aside natural processes entirely, and conceiving of all revealing as being relevant only in human subjective needs.

The essence of technology originally was a revealing of life and nature in which human intervention deflected the natural course while still regarding nature as the teacher and, for that matter, the keeper of life and nature. The essence of *modern* technology is a revealing of phenomena, often far removed from anything that resembles 'life and nature' in which human intrusion not only diverts nature but fundamentally changes it. As a mode of revealing, technology today is challenging – forth of nature so that the technologically altered nature of things is always a situation in which nature and objects wait, standing in reserve for our use. We pump crude oil from the ground and we ship it to refineries where it is fractionally distilled into volatile substance and we ship these to gas stations around the world where they reside in huge underground tanks, standing ready to power our automobiles or airplanes. Technology has intruded upon nature in a far more active mode that represents a consistent direction of domination. Everything is viewed as "standing-reserve" and, in that, loses its natural objective identity. The river for instance, is not seen as a river, it is seen as a source of hydro-electric power, as a water supply, or as an avenue of navigation through which to contact inland markets. In the era of *techne* humans were relationally involved with other objects in coming to presence; in the era of modern technology, humans challenge forth the

subjectively valued elements of the universe so that, within this new form of revealing, objects lose their significance to anything but their subjective status of standing-ready for human design. Thus everything in the universe, including humans, have been transformed in significance leading to a loss of humanity. It may be said to that extent that, humanity has been conducted out of its own essence.

Obviously, our attempt at converting science and technology as tools of human development has effected the greatest threat to humanity by carrying humanity away from its essential nature. On the one hand we consider ourselves, rightfully, the most advanced humans that have peopled the earth but, on the other hand, we can see, when we care to that our way of life has also become the most profound threat to life that the earth has yet witnessed. Today, technological medicine, has even begun to suggest that we may learn enough about disease and processes of ageing in the human body, and that we might extend individual human lives indefinitely. In this respect we have not only usurped the god's rights of creation and destruction of species, but we may even usurp the most sacred and terrifying of the god's rights, the determination of mortality or immortality. Thus materially and spiritually, human life and its environment have been profoundly transformed, and humanity no longer has a correct relationship with the environment.

The suggestion here is that, the way out of the demeaning effect of science and technology grows within African humanism; an ethical perspective grounded in African knowledge systems. It is communalistic and homocentric in its essential details. Such temperament is called the "serenity of the soul" which condition entails a communion between the body and the mind. This is an African moral philosophy that argues deductively that, since a human person is possessed of both mind and body requiring both spiritual and material fulfilment, and that, pursuit of wealth and the satisfaction of the physical needs of man must be tempered by the cultivation of the mind. Outer satisfactions of a material kind should be

enhanced by the inner satisfaction of the mind and spirit. This is the goal of holistic human development which the physical needs of man are achieved through science and technology (from nature) though, they are not used in a manner that they will dominate us and finally empty our being. They are used in a way that we are at peace and a piece of nature. This ethical paradigm advances a philosophy of inclusivism in which one is, because others are, and so, things and talents (science and technology) are used to heal humanity and the environment, and liberate man from the negative hold of scientific technology.

Expressed in songs, art, proverbs and names, this ethical paradigm touches on all conditions of African life, namely wealth and poverty, health and sickness, joy and sorrow. They also contain observations and good counsel against undesirable vices like anger, haste, greed, ingratitude, lying, pride, selfishness and stealing among others that scuttle human progress and well-being. A Ugandan proverb, "Anger killed a mother cow" and the South African proverb "Horns which are put on do not stick properly", are crowning examples. They both condemn hypocrisy and arrogance while encouraging human integration and the cultivation of virtues in the hope of achieving progress and human well-being. Again the Tiv drive home a captivating moral lesson when they say, *ortato orun hamma kwagh u ashe a nenge tugh ga* (The hunter does not disclose everything he sees in the night while hunting) and, *Aluer zwa kaa er I tondu tyough yo u kpaa u a yem tyough-tingir* (if the mouth says the head should be beheaded, when it is beheaded, the mouth will follow it). This communal morality expresses the African conviction that knowledge should be combined with wisdom in the course of human inter-subjectivity. That, cooperation, prudence and self-knowledge combine to advance human quality.

True, science and technology have made tremendous progress and growth, we have mastered gravity and space, we have driven back the limits of life or death, we can now choose the sex of our children and may tomorrow reproduce our own kind asexually and treat

any type of complicated disease, thanks to the breakthrough in the study of genes. But herein, that power, lies all our problems. It is thus no longer what could I know, which is the question of science, but what should I know and do which is the question of sense (ethics). What is being argued for is a responsible human environment in which humanity is called upon to integrate in its present actions the care to preserve the life of its descendants, nay its environment. This ethical paradigm enjoins humanity to act in such a way that the effect of its action be compatible with the permanence of an authentically human life on earth.

This is a call for a meaningful relationship of openness and dialogue within the human being on the one hand and, with nature; the environment on the other. In its essential details, African humanism suggests a metaphysical tradition in which the physical and spiritual forces are fused together in the immediate affirmation of existence and equi-primordially linked up with everything else. Argued here, the human person is neither a thing nor an object to be used, but primarily a responsible subject, endowed in truth and oriented towards values. Hence;

- (i) Humanity must seek a balance such that we may maintain a sustainable harmonious relationship between the human species and nature.
- (ii) We must learn to manage the economy to sustain the complexity and stability of nature while at the same time to manage nature so as to sustain our economy. As our desires are insatiable, we must learn to accommodate our desires to the limits nature sets, not to push the limits of nature beyond its capacity for generation.
- (iii) While humanity needs to develop economically and technologically in order to deal with the problem of poverty in which a great majority of human beings still live. Continuation of economic development at the present rate endangers the rights of the future generations to life and a healthy environment. Humanity must therefore, learn

to balance short-term thinking and immediate gratification with long term thinking for future generations by shifting the balance towards quality rather than quantity.

- (iv) Consumption contributes to human well-being when it enlarges the capabilities and enriches the lives of the people. Consumption, when excessive, undermines the resource base and exacerbates inequalities. Consumption therefore must be such as to ensure basic needs for all, without compromising the well-being of others and without mortgaging the choices of future generations.

This is the agenda for sustainable development which corpus entails that nature has to be considered as the whole, of which human beings form one component, which important component, they are meant to serve nature rather make it subservient to their own needs and wants. The human species, with all its attributes of intelligence, inventiveness and capacity of intervention is called upon to use these qualities in a positive manner to serve the whole of which they are a part. Instead of exploiting nature in a manner of forcing things to appear which man does not need, instead of dominating nature which action backfires and ends up thoroughly debasing the earth with man inclusive, humanity should act as sentinels of nature and help maintain the multifarious delicate webs of the eco-systems that make it function in a sustainable manner. "We could learn from the bees" recommends Dr Devendra Kumar, "the manner to serve nature and get its sustenance simultaneously. The more the honey it collects from the flowers, the more it serves, in the propagation of the plants by helping in their fertilization. We could emulate the bees by fulfilling our needs through a similar symbiotic relationship with nature." (Kumar 2001:2).

Thus, cooperation, acceptance, care and concern are expressions of African communalism which have combined to reinvent a new world order for sustainable human development. Argued here as African communal ethics; Igbo, Yoruba, Tiv etc., it entails the cross-cultural core values of love, truthfulness, fairness, freedom, unity, tolerance,

responsibility and respect for life which act as architectonics of sustainable human development; a holistic development that combines the physical, emotional, intellectual and spiritual dimensions.

This is a call for the regulation of human activity which activity proceeds from man, and is also ordered to him. The development of his life through his mind and his works should not only transform matter and society, but it should also fulfil his spiritual realm, for it is what a person *is* rather than what he *has* that counts. Thus, technical progress is an important compliment of human development though, it is of less value than advances towards greater justice, wider brotherhood and a more humane social environment. It is here argued that, *the norm for human activity* is to harmonise with the authentic interest of the human race, in accordance with God's will and design, and to enable men as individuals and members of society to pursue and fulfil their total vocation – the better ordering of human society.

Such is what we have advanced as an ethical paradigm for human sustainable development. This communal philosophy of life assures justice for humanity. It is anchored on the African inter-related channels of co-existence, acceptance, care and concern for one's neighbours. In itself, this communal philosophy of life is informed by the indigenous knowledge systems of the African peoples which itself is determined by the full, integral development of the human being as a human being. It is a holistic Philosophy of life, of nature which rest upon a single premise that, the individual is a member of a community of interdependent part. This quality of African communalism finds concrete expression in the extended family system and is characterised by mutual help and interdependence. In the very words of Omoregbe:

the traditional African makes no sharp distinction between a "brother", "half-brother", "half-sister", "first-cousin", second cousin", etc and they have no such things in their languages. The traditional African both calls and treats any relation as a brother or a sister. Any member of the extended family who has the fortune of being even a little better economically than the others comes to their aid. (Omoregbe, 2005:41)

While fragments of this communal behaviour find expression among the Indians and Australian Trobrianders, and some western cultures, Africa remains the grand home of this homocentric philosophy. This communal philosophy is deeply rooted in the African psychic and social organization that the powerful wave of slavery, western expansionism through colonialism and Christian evangelism and Arabico-islamic pillaging of Africa could not uproot. Today in African economic life for example, the individualistic capitalist attitude of *everyone for himself and God for us all* is totally unheard-of. They shared common land, roads, markets, shrines, ponds, and community halls were built with community efforts. It was an economic system which guaranteed the survival, not of the fittest as such, but of the fit and weak alike. Possession of personal wealth was never for the purpose of dominating any of his fellows, and so endanger the group's *life force*, but to positively affect the community or group. This communal spirit is captured in concrete terms by Walter Rodney thus:

The crops produced on land that was family property and through family labour... were distributed on the basis of kinship ties. If a man's crops were destroyed by sudden calamity, relations in his own village helped him (to reintegrate). (Rodney, 1972:44)

Thus mutual aid is viewed in Africa as a moral obligation. A Tiv proverb argued this point better; *nyange angbian utaan-kar-uniin, pue una bunde u* (if you do not make it possible for your neighbor to have nine, you will not have ten). The African dictum here is, *seek the good of the community, and you seek your own good. Seek your own good and you seek your own destruction.*

Argued as such, this brand of philosophy of life offers protection and aids the promotion of communal interest. It is grounded in the belief that a life shared is a life well lived hence many Africans, living the true spirit of this communal philosophy, help in training children of relations and also share their fortunes with members of their extended family. It emphasises the role of human involvement towards the amelioration of human predicament. It tries to highlight the indispensability of being-with, in trying to countervail the forces of human

limitations, human scarcity, powerlessness and ambivalence. It is a unique African philosophy of life; the traditional brotherhood or familyhood offered as an African contribution to re-humanizing the progressively dehumanised technological world. It is indeed possible through this holistic approach to heal Africa and fulfil Kwame Nkrumah's prophetic charge that; in the last century, the Europeans discovered Africa. In the next century, Africans will rediscover Africa. It is an ethical approach in which there is a tempering of material acquisition with the cultivation of the mind. This is more so because people who deploy all their resources into providing food for the body only, shall leave nothing but a legacy of skeletons and excrement to their offspring.

7.3 Summary

Science and the techniques to which it has given rise have changed human life since its great advances in the 17th century. The advances being wrought by scientific technology continue at an increasing speed that it seems comfortable to venture a conclusion that there is no sign of any new stability to be attained on some scientific plateau. Also, the evolutionary possibilities of science extend immeasurably beyond what has so far been realised. The questions posed and reasonably answered in our preceding analysis have been; can the human race adjust itself quickly enough to these vertiginous transformations, or will it, as innumerable former species (like the dinosaurs; then the lord of creation) perish from lack of adaptability and or poor relationship with nature and the environment? What manner of change(s) off/in the environment through man's scientific skills constitutes his sustainable development? etc.

Our response to these and many other questions is informed by the idea that, *not only will men of science have to grapple with the sciences that deal with man, but they will have to persuade the world to deal reasonably with what they have discovered.* This, we have argued

is a task that humanity must not abdicate otherwise, man will destroy himself and the entire biosphere by his halfway cleverness which he misinterpret or misrepresent as development.

In more specific terms, our work has shown that advances in scientific technology have unarguably improved the lot of humanity in virtually all areas of human endeavour. So ubiquitously shown, stupendous advances in the areas of technological medicine, food and agriculture, communication and information technology, and warfare among others have been made. We argued in particular that through the phenomena of globalization, scientific technology has enriched the world culturally and benefited many people economically as well. It has enabled humans to tap the enormous resources of the world to eradicate poverty in the 21st century. Technology, we have argued, has revolutionized communication during the past decade; access to information, practically everywhere in the world, has become quicker, cheaper and easier via the use of television, internet, telephone and microchip thus making every other person in the world next to each other. But to argue that such significant achievements grants a *not guilty* verdict in favour of unrestrained application of technology is to ignore the obvious problems raised by scientific technique. The problems of exhaustion of the soul and raw materials, contamination and pollution of the atmosphere and the capacity for accidental chemical and toxic detonations suffice as examples. Indeed Bertrand Russell argued in this direction when he says:

It may be that by the time the world's supply of oil is exhausted, atomic power will have taken its place. But to this sort of process there is a limit, though not an easily assignable one. At the present there is a race for uranium, and it would seem likely that before, very long there will be no accessible source of uranium. If, when that happens, the world has come to depend upon nuclear energy as its main power, the result may be devastating.' (Russell, 1962:717)

Positivism, which fundamentally promotes the spirit of scientific technology, brings about progress in human society, without its equivalent in human growth. We thus argued that such character of modern man in the modern techno-polis substitutes man for the machine, and

that this manner of life can hardly be stable, but must sooner or later bring the penalty that lies in wait for those who live on progress in matter instead of growth in spirit and matter combined.

Our conclusion then, is that the organic nature of the human society compels humanity to live in a harmonious, interactive relationship with nature, and the environment for its sustainability in an adventurous manner. We may say, in the voice of the encyclopaedic Russell that it is a good thing that people should be adventurous and that there should be scope for individual enterprise, but it must not be such that will bring total disaster. In an unusually commanding tone, Russell states that:

You may still, without harm to your fellow men, wish to be the first man to reach the moon. You may wish to be great poet or a great composer or a man who advances the boundaries of scientific knowledge. Such adventures injure no one. But if Napoleon is your ideal, you must be restrained. Certain kinds of anarchic self-assertion, which are splendid in the literature of tragedy, have come to involve too much risk. A motorist alone on an empty road may drive as he pleases, but in a crowded traffic, he must obey the rules. More and more the lives of individuals come to resemble the motorist in traffic rather than the lonely driver in an empty desert (Russell 1959:720).

Russell's position is informed by the reasoning that while the pure man of science is/may be concerned with the advancement of knowledge, and which in his professional moment takes it for granted that the advancement of knowledge is desirable, commonsensical men who do not understand his scientific work can utilize the knowledge that he provides in ways other than what is intended. This is apart from the fact that the new techniques to which science gives rise often have totally unexpected effects. Russell lucidly acknowledges this fact that,

The man who decides what use shall be made of new techniques are not necessarily possessed of any exceptional degree of wisdom.... And so the scientist finds that he has unintentionally placed new powers in the hands of reckless men.... He knows that science gives power and that the power it gives could be used to increase human welfare; but he knows also that very often it is used, not so, but in the very opposite direction. (Ibid, 720-721)

It is a truism that scientific knowledge is one of the glories of man which is often more useful than harmful, and that the fear of knowledge is very much often harmful than useful. But as the man of science makes progress in scientific knowledge, and recreates the world, the question of importance remains their social duties towards this new world that they have been creating? What are the collective duties of humanity?, makes more meaning than ever for today's humanity. In attempting to answer these questions, our work has argued for *correlative changes in our beliefs and habits*. Without these changes we cannot bring about human well-being; sustainable human development, and that if these changes in our physical environment are not in place, humanity shall suffer the fate of the dinosaurs. Hence, our collective responsibility entails recourse to the truly human essence which we can adopt ourselves in a new world that need tentativeness, as opposed to dogmatism in our beliefs; an expectation of co-operation, rather than competition, in social relations; a lessening of envy and collective hatred. It is to these that we must look to undo the evils which have resulted from a knowledge of the physical world hastily and superficially acquired by humans unconscious of the changes in themselves that the new knowledge has made imperative.

This position argues a conclusion which summarises our entire thesis. In the words of Russell,

The road to a happier world than any known in the past lies open before us if atavistic destructive passions can be kept in leash while the necessary adaptations are made. Fears are inevitable in our time, but hopes are equally rational and far more likely to bear good fruit. We must learn to think rather less of the dangers to be avoided than the good that will lie within our grasp if we can believe in it and let it dominate our thoughts. Science, whatever unpleasant consequences it may have by the way, is in its very nature a liberator, a liberator of bondage to physical nature and, in time to come, a liberator from the weight of destructive passions. We are on the threshold of utter disaster or unprecedentedly glorious achievements. No previous age has been fraught with problems so momentous; and it is to science that we must look for a happy issue. (Russell, 1959:724-725).

Russell point of view is illustrated in an African (Tiv) wisdom orature thus: *ka mato u aza-a-ku la shi una hide amin ye* [it is the ambulance which conveys the corpse that will return

with it]. The implication here is that the crisis of modern science and technology which has in turn resulted in global problems of different kinds can be handled by understanding the essential nature of science, and technology on one hand, and that of human beings, on the other. Thus understood, reason plays a dominant role in human activity. The application of reason to reality is the judgment of the meaning of that reality with respect to the destiny and good of man i.e. it involves the determination of the reason for its being. Now, the rationality of a thing depends on:

- (i) the active rational mind which gives meaning to it
- (ii) the ontic rationality which the thing carries of the mind
- (iii) the ontological reason which is the meaning coming from the things as illuminated by the perceiving spirit and becoming one with it.

As a being who possesses both the ontic and ontological reason, man judges the rationality of a given reality in terms of his own meaning, being and destiny. The crisis of modern science and technology is no doubt a misjudgement in man's rationality which must be re-conducted to judge the meaning of science and technology with respect to the good and destiny of man. Science and technology, like any rational work of man must aim at the achievement of the destiny of man; to be man and to be fully man in both his physical and spiritual values. For in truth, "technology and its instruments are appreciated not only as extensions of man's physical faculties but as participating in his intellectual insight with its spiritual values" (Mclean 1964:11). This is an argument in the direction of the rationality and morality of science/scientists on the one hand and of technology and technologists on the other. The material goods that are employed at the service of man must not only involve the determination of the reason for their being, but also the extent of the moral responsibility of the scientist and technologist with regard to what they project to the society in scientifico-techno-production. The necessity of this position stems from the existing harm caused, and

the impending dangers and risks posed by technology and technological production in the *techno-polis*.

This is with reference to the natural challenge of man himself to be man and to be fully man; the realization of his rationality, his meaning and good. As argued in chapter four, *techne* as the *recta ratio factibilium* (the right reason of making) has reason and meaning because of the rationality of man. Thus argued, every material value must be judged in reference to the good of man – the total man – the human person. We then advance a conclusion in alliance with Leo Ward who, in his article “Values and Contemporary Technological Culture” holds that the central assignment of man is that of becoming man. In his very words, “man is oriented and pre-oriented to be man and more and more to be man... man must be and must fully be. The end of man himself is his being what he is supposed to be: to be and to be fully man” (McLean, 1964:165).

They must serve a more superior value which is deeper, more radical, than technological goods. That is why it is the vocation of man to wisely employ science and technology to advance humanity's good. For, “a value-rich humanity presupposes a value-wise humanity. The value of technology is, thus, in the wisdom of man to employ it to advance his good. This is the rationality of man, whose vocation is to see that the instrumental values which technological goods are, do not override man, who is the prime value. What the world (but Africa in particular) need in this age of complexity, perplexity, war of man against man, greed, intolerance, and technological dehumanisation are morality, humanness and human cohesiveness and mutual support for the meeting of, and conquering this oddities. The invitation to rediscover Africa and place her on the path of sustainable development is not by raising her to the level of the west. It is not by endowing her with every material good. It is not by integrating her into the world of commerce. Rather, it is by commitment to personhood and to all that it stands for – the integral well being of making the human person truly human.

The 1993 declaration of the Parliament of the World's Religions in Chicago most obviously fulfils this "fundamental demand" and "ethical tradition" namely that, "every human being must be treated humanely, and what you do not wish done to yourself, do not do to others." (Yersu Kim 1999:13). These principles give rise to broad moral guidelines which regulate humanity and links it to nature and the environment for sustainable development, which entails,

- (1) a commitment to a culture of non-violence and respect for life;
- (2) a commitment to a culture of solidarity and just economic order;
- (3) a commitment to a culture of tolerance and a life of truthfulness; and finally,
- (4) a commitment to a culture of equal rights and partnership between men and women.

If, and when these guiding principles are given a pride of place, to regulate the biosphere, then, humanity is on its sure way to achieve *autarkeia*, (the good of life) which is used by Aristotle to designate three key aspect of human life

- (i) political good
- (ii) economic independence
- (iii) virtuous life.

This, to us, is the highest good, which, through the exercise of man's rationality, the good of the whole person – in both his material and spiritual life is achieved. This holistic approach to science and technology suggests less problems in the direction of unemployment, economic security, the problem of personality in which the full identity of the worker is hidden in the industrial structure, and most importantly personality fragmentation i.e. dissociation of ones intelligence and action. It is important to adopt the suggestions of Nwoko as solutions in this regard

- (1) applying the positive principles of modern ergonomics i.e. an act of balancing the relationships between man and machine in industrial production so as to reduce the negative effects of machine on man, by tempering the strain and discomfort involved in the use of machine, by applying and improving control systems.
- (2) stepping up the right metaphysical doctrine of work that favours the spiritual aspects of man.

These are the governing terms of African knowledge system, a humanistic value system which views development as a human fact, that is, the growth and fulfilment of the human person, of every person as the goal of progress in science and technology, in economics, politics and religion. In so doing the truncated and depersonalised homo-technos is conducted back into his essential humanness to be and to be fully man. Such is what counts as sustainable human development; the essential design of science and technology.

7.4 Modest Proposals

It is a truism that man cannot live without science and technology anymore than he can live against nature. What needs the most careful consideration, however, is the direction of scientific research, which should not be left to the scientists alone. As Einstein himself said, "almost all scientists are economically completely dependent" and "the number of scientist who possess a sense of social responsibility is so small" that they cannot determine the direction of research. He posited, "the direction of research should be towards non-violence rather than violence; towards an harmonious co-operation with nature rather than a warfare against nature; toward the noiseless, low energy, elegant, and economical solutions normally applied in nature rather than the noisy high-energy, brutal, wasteful and clumsy solutions of our present-day sciences" (Einstein, 1960:108).

Thus, the separation of pure science from its applications is no longer feasible in the context of moral valuation. As correctly asserted by Max Black (1979:50) the purest, the most

recondite discoveries of disinterested scientists can now, in a relatively short time, be harnessed to the production of new materials, new contrivances, new ways of transforming individual lives and the very shape and structure of society *in ways that are least contemplated by the scientist*. It is thus suggested that the classical claim for the autonomy of pure sciences be jettisoned in the light of the unforeseen consequences of science and technology. Indeed, a plea of scientific neutrality can only be properly characterised as an expression of deliberate myopia or, to put it bluntly, moral irresponsibility. Science, though a move towards the unknown guided by the known, it is neither goalless pursuit, nor a blind move. Any scientific endeavour worthy of its name must be a planned venture, it must carry with it an ultimate intention of discovery for the good of man and society. This is the position canvassed by M. I. Nwoko when he says "the scientist is not to be a mere "robot" of researches and experiments irresistibly tearing nature open out of curiosity without a plan of employing it for the good of man... He must of necessity before and after, challenge his research and experiments to an imperative of universal rationality and morality" (Nwoko, 1992:144).

Perhaps humanity would not have needed the Hiroshima and Nagasaki experiences, the Chernobyl nuclear accident, the Lagos high-calibre explosions at Ikeja or even the wanton use of explosives and weapons by the Nigerian army to kill and destroy villages in Benue state etc., to learn of the destructive effects of nuclear products and or weapons of mass destruction, if humans had paid attention to the imperative of the rationality and morality of scientific technology. Agreed, scientists (and to some extent technologists) have the least knowledge of the consequences of their researches, experiments and products, though, they must all the same be inflamed more by the application of their findings in the promotion of the common good, and not just a blind move towards the unknown. Here lies the philosophic challenge; to seek and answer fundamental question in relation to scientific endeavours, viz; what is the rationality of scientific technology with reference to the good of man? Is it part of the destiny

of man and the finality of scientific technology that man turns out to be the slave or victim of the product of his own ingenuity?

Closely following the above suggestion is the principle of "guilty until proven innocent". The history of science shows that science is an occupation in which many experiments fail. Even when they succeed, they are most likely to be either overthrown or, better still, remain part of the problem or increase problems. In treating the ills of society for instance, scientists and technologists are far too materialistic to the neglect of the spiritual. Analogously stated by Garret Hardin (1979:54), the measures used in treating the ills of the society are all too often more a form of sympathetic magic; removing blood to cure high blood pressure, or applying money to cure poverty! This method of solving problems is too simplistic to say the least; the problems are merely prolonged, indeed their remedies are soon to become part of the problems. It is thus argued that our thoughts should be hinged on the overwhelming probability that any newly proposed remedy based on the old approach may not work. This is perhaps the most intelligent way of dealing with the unknown; the assumption that each new remedy proposed will do positive harm, until the most exhaustive tests and carefully examined logic indicate otherwise.

It is thus, suggested here that, humanity should seek to put the burden of proof on the proposer of a new piece of scientific technology or ideas or remedy to human problems, that his product is effective and harmless (or, more exactly; does more good than harm) before it could be licensed for public use. As has been argued above, the value of technology is not in neutrality but in the wisdom of man to employ it to advance the human good. So, as the prime value, the instrumental values which technological good are, must not be seen to override man.

In the event that the scientist or technologist has to act (or choose) between two evils, he must choose the lesser evil. In this case, he does not will the unintended but foreseen consequences either as an end or means but sees that he cannot get something else without

getting the consequences. He rather wills the cause of which consequences are necessary effects; i.e. the principle of double effect. It is permissible to perform an act that has an evil effect though, the following basic conditions must be met:

- (i) That the act must be good in itself.
- (ii) The intended good must not be obtained by means of evil effect.
- (iii) That the necessary evil effect must not be intended for itself but only permitted.
- (iv) That the reason for permitting the evil effect must be proportionately grave.

Furthermore, government should play more proactive roles in the implementation of major environmental policies aimed at promoting a healthier living within both our planet earth, and the global commons. The European Union alone has adopted more than 300 items of environmental legislation (Nigel Haugh, 1990). This is aside from the many other dozen environmental policies or control legislations adopted by both western and African countries (Oyeshola 1998:77-92). Governments and organizations should move away from paying mere lip service, towards actual implementation of control measures and agreements.

In the words of Oyeshola,

...we have entered a new era of development: Post Cold War, Post North-South, Post Structural Adjustment. The challenge for development co-operation is two-fold: not to wait with development until it is safe; not to wait with co-operation until you have found a stable partner. Be prepared to integrate development with politics. Do not wait for peace. Politicians and mediators are accustomed to thinking in terms of power. They should take the potential of grass root development seriously as an essential building block for peace (Oyeshola, 1996:8).

The suggestion here is that the starting point in a search for solutions to the man-created problems such as environmental degradation, dehumanisation and the general pollution of the environment by the very acts of the man of science itself is man himself, who is the apex of cosmogenesis. It suggests a proactive belief in the intrinsic value of human dignity and justice in human interaction so as to bring about a credible and just world order

free of the dehumanising and polluting effects of scientific technology, and which promotes stability and security. This is suggested as a cost effective measure, to safeguard human and material resources from the crisis of science and technology. The human and material resources will/should be cheaper and better channelled, to serve humanity, to promote the intrinsic value of human dignity and justice in order to prevent conflict and promote structural stability and environmental justice.

We suggest that Non-governmental Organizations (NGOs) including religious organizations should act as the gadfly of the National Governments and the United Nation (UN) and institute a regime of social justice, create and sustain a humane and human friendly environment. This is a call for reform, and a recognition of the transnational character of the current crises without which the problems of global poverty and environmental degradation will get much worse, and will increasingly threaten international security.

Rather than orchestrate organised dehumanisation and degradation through scientific technology with its exaggerated materialism, humanity should adopt the way of co-operation among its membership on the one hand, and within and among nation states on the other, in seeking the good of the human person and improving the quality of life on earth.

Eric Hobsbawm (1996:6) in his reflection on the global crisis in science and technology said, "the last part of the century (20th c) is an era of decomposition, uncertainty and crisis." Truly, there is every sign of uncertainty and crisis when we grant the increasing growth in world population, industrialization, pollution, food production and continued resource depletion among others. These problems are universal or global in nature as they affect practically all parts of the world and would sooner or latter affect everybody in the world due to the increasingly integrated and global character of the world economy in which every other thing (people goods and ideas) is next to each other and move world-wide.

To avoid what D. H. Meadows (1972) calls “the limits of growth” on this planet in the near future, humanity has every reason to identify such global problems facing the entire biosphere that upsets tranquillity, and proceed to regulate same, to protect, and promote planetary harmony. This is a call for a framework for universal or global ethics which, making use of the transcendental reflective approach, articulates what values and principles may be mobilized in order to steer the forces of technological and economic change for the purposes of human survival and development. The *Encyclopaedia of World Problems and Human Potential*, Vol. 1, claims to have identified some 12,203 of such world problems (1994:60), which may form the basis of our proposed global ethics project.

Our understanding in this suggestion is that, while the universal humanity has the capacity forge an ethical statement that will be acceptable to all societies and cultures, it should results from what Yersu Kim (1999:38) describes as “ethical dialogue”; an open-ended, evolutionary process and mutual learning, an arduous process of intercultural debate and consensus-building revolving around the basic issues of relationship with nature, human fulfilment, respect for the cultural rights of the individual and community, and justice for all.

Globalisation of values and principles are more likely to bring about world peace, ecological justice and sustainable human development. These cannot be achieved through the powers of coercion exercised by the international creditors and multilateral financial institutions but rather through the self-propelling power or rationality of the market. The formal tends to produce gains for the few and marginalization of the many while the latter benefit all actors relatively equally and creates in its stead an effective national government. Thus argued an effective state is vital for the provision of goods and services – and rules and institutions that allow markets to flourish and people to live healthier and happier lives. Without it, sustainable development both, economic and social, is impossible.

It is further suggested that a philosophy of science and technology education should be developed and planted in the African fertile ground of *Afro-humanism*; the basis of which is the communion-man, in order to educe from the roots of the people's life suitable sensibilities that will in turn generate quality skilled labour and institute an ethical code governing relationships in human societies founded on traditional African values and based predominantly on service to humanity rather than profit for the professionals.

The suggestion here is the institution of ethics in the curricula of all the three tiers of our education; primary, secondary and tertiary levels. As an endeavour that seeks to establish or determine a standard for distinguishing between good and bad conduct or assessing the moral worth of our actions, dispositions, ends, objects or states of affairs, ethics or moral philosophy is most desirable as a tool in the hands of both the professional scientists and technologists as well as the policy makers and the end users of instruments of science and technology. Here understood, knowledge of the science of human conduct (ethics) will act as a code of principles or a set of rules that will regulate and guide the conduct of professionals and end users of scientific ideas and technology.

It is suggested in particular that, African indigenous knowledge system within which is found the value system of the African, should be given a pride of place in the curriculum of science education with particular emphasis on professional and environmental ethics. This will not only engender the standards of professional competence and integrity, but also instantiate accepted professional procedures and enwisdomise the professional to work with theoretical knowledge within a practical situation. The informing justification here is that, science and technology are rational human actions only to the extent that, its ultimate finality coincides with that of the destiny of man and the good life for man. Only through a reasoned reflection, open to the fundamental question of existence and free from reductive presuppositions, can

society discover sure points of reference on which to build a secure foundation for the lives of individuals and communities.

7.5 General Conclusion

Our discussion thus far leaves no one in doubt that the impact of western civilization is a bundle of paradoxes and disillusionment. On the one hand, human ingenuity has been put to the optimum in the areas of medicine, transport and communication and information systems among others, with every advantage in favour of the human race and the natural environment in both quantity and the quality of life. However when we contrast this “best of times” with the present unfulfilled desires of man; food, shelter and clothing, and the rate of deterioration of our biosphere, the ever looming threat of nuclear war, alienation and dehumanisation which are the direct result of human creativity, our generation could, today, be described as “the worst of times”.

Arguably, our present world has seen the emergence of the *machine* and the disappearance of the *person*. That science and technology have conferred on man the power to destroy himself and his environment, and that science and technology triumph today though, their value and *raison d'être* as an index of human (sustainable) development is questionable. Rather than heal humanity and conduct it back into its own essence, humanity is delivered over to science in the worst possible way; as an instrument of human control which singular act humanity itself is carried away from its essential nature. Modern (western) science and technology has effected the greatest threat to humanity by carrying it away from its essential nature. Hence, science and technology in themselves are mere stages in the process meant to lead us to achieve human (sustainable) development.

Sustainable human development in the context of this research means a rehumanization of humanity, improving the quality of human life on earth resulting from technology, which

new epoch humanity is healed by coming back into its own essence. It is the liberation of man from the negative hold of technology.

This is a call for a responsible human environment in which humanity integrates into its present actions the responsibility of future generations and the environment. Instead of acting in the tradition of modern science and technology, of exploiting nature in its manner of forcing things to appear which he (man) does not need, instead of dominating nature and debasing the entire biosphere, humanity could act in the tradition of sustainable development; as sentinels of nature, and help maintain the multifarious delicate webs of the ecosystem that make it function well in a sustainable manner. Thus:

We could learn from the bees the manner we serve nature and get its sustenance simultaneously. The more it collects honey from flowers, the more it serves in the propagation of the plants by helping in their fertilization. We could emulate the bees by fulfilling our needs through a similar symbiotic relationship with nature (Kumar, 2000:2).

But the world (especially the West) has lost much of this humanistic tradition, of symbiotic relationship with nature. It is thus our reasoned conclusion that the world (especially Europe and America), has a lot to learn from the African humanistic heritage, which philosophy of human integration puts man at the apex of cosmogenesis. The person, in African culture, is the measure of all things, the totality which the self achieves in the individual entity, in the unity of his spiritual and physical aspects, the basis of our practical judgement of the good.

The culture of science, and technology which finds expression in domination, control, manipulation and the exploitation of everything (including man) and turning same into standing reserves, is to say the least, dehumanising and robbotizing and does not count as human development. Essentially understood, science and technology are autonomous organizing activities within which humanity itself is organized. Development is not and cannot be a product of exaggerated materialism and consumerism. It is not having more but

being more, the truly essential nature of being human. The true essence of technology, in its perilous ways calls humanity to a homecoming. It brings humanity back into its essence, the truly human nature in which development fulfils human needs from nature through the combination of the physical, emotional, intellectual and spiritual dimensions. In this way, humanity is at peace with nature, and at peace with its emotional needs while maintaining peace between the individual and society.

The western concept of development traded through western civilization is but in the promotion of a one sided humanity. Although these half truths have been accepted as truths, (reality), they must be jettisoned in place of a global conception of development as the growth and fulfilment of the human person, of every human person as the goal of progress in science and technology, in economies, in politics and religion. Development must mean an on going commitment to advance from the less human conditions of disease, hatred, crime, war, racism, poverty, oppression, injustice, corruption, faithlessness etc to the more human conditions of health, love, peaceful co-existence, equality, justice, community-fellow-feeling, faith and hope. Development is a truly human endeavour which results from a conscious agent in the whole process of truth happening. Thus said, human (sustainable) development is a product of a technology which diverts the natural course co-operatively instead of achieving the unnatural by force which process backfires and boomerangs on man who himself becomes a victim of his product.

Given the above, we argue that the burden of techno-scientific civilization, which has in many ways imperilled humanity and the environment, has threatened to conduct humanity outward away from its essential human life on earth. Sustainable human development, it is here argued, is a cultural synthesis of ideas and values; a morality of human integration, a morality of the full development of the human person in his material and spiritual spheres. It is here referred to as African humanism i.e. philosophy of human development which promotes

the good of people, every person and the whole person. It restores meaning and wholeness not just in human community, but in the biotic community. Thus, a scientific civilization qualifies as development when it promotes progress in human personality. Science enabled humanity to control nature and provide for itself the good life on earth though, it has also contributed to the destruction of the natural environment and alienation of human beings. Humanity must seek a balance such that human beings can maintain a sustainable harmonious relationship between the human species and nature. Essentially, the "conqueror" role of *Homo Sapiens* that allows humankind the capability to destroy the earth calls for a change to plain member and citizen who has respect for his fellow-members and also respect for the world community as such.

It is concluded that,

- humanity must therefore learn to organize techno-scientific forces to sustain the complexity and stability of nature while at the same time manage nature for sustainable development.
- human desires are insatiable though, humanity must be rationally guided to accommodate its desires to the limits nature sets, not to push the limits of nature beyond its capacity for future generation.
- although humanity needs to develop economically and technologically in order to deal with the problem of poverty in which a great majority of human beings still live, humanity, in so doing, must learn to balance short term thinking and immediate gratification with long term thinking for future generations by shifting the balance towards quality rather than quantity.

The premises above are anchored on the ethic of sustainable development as expressed through African communal ethics. This ethical approach presents itself as an alternative axiology to the men and women who today hunger and thirst for meaning in life. The argued conclusion is that, African humanism or African communal ethics is the regulator of scientific

technology. The informed position here is that the works of a person's hands should not dominate him or her. As the EBIRA proverb states, *Epe o ma godo huna oza ene chire* (the okra shrub does not grow taller than the person who planted it). The point of this wisdom literature is that, the human persons are worth infinitely more, and enjoy an overwhelming superiority over that which they produce or nurture, hence the TIV saying, *ka we a tav a kuma zorun atuu ov ga u gber a* (if you cannot harvest the okra fruit from the shrub, then you cut it down).

This ethical approach is determined by the full, integral development of the human being as a human being. It is a holistic philosophy of life, of nature which rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in the community whereas his ethics prompts him also to care for, and cooperate with other members of the biotic community perhaps in order that there may be a place to compete for. For the African, scientific technology is an activity, and as an activity known in Africa (Tiv) as *mfe*, it is not an uncontrollable natural phenomenon like the earth's rotation. It is a system of activities which is amenable to internal or external control but only under the leadership of African human knowledge system, norms and values that are characterised by humanness, personalism, hospitality, wholesome personal relations and the overwhelming sense of the sacred. In a universe from which God has been expelled, any reason to respect man is forfeited. Man becomes simply an object, similar to other natural objects on which other men exercise their will to power.

The urgent need in today's progressively dehumanised techno-polis is a living place in which unity of knowledge can be built with the discovery of meaning in life. Subjectivity of the person and an essential orientation towards communion with God and with another human person, must be the foundation of all approaches including the scientific, if humanity is to reveal and advance the truth about the human person and the communion of persons.

This is the point at which the thrust of our work lies. It is our fundamental contribution to the conscious attempt at reclaiming the human person, to rapidly shift from a thing-oriented person to a person-oriented society. Here argued, African humanistic heritage has something to offer the world of today. Plagued as it is by materialism, greed and aggression, and groping hopelessly for peace, togetherness and meaning, dehumanised progressively by the technocratic society, and sometimes pitifully as in the spirit of a victim of the fallacious prestige of technical civilization, African Communalism (as is particularly expressed in the extended family system) presents itself as an alternative axiology for sustainable human development.

Although the west has excelled in scientific achievement, it has lagged behind the African culture in probing the possibilities of the human spirit. While humanity has known all about the origin of the solar system or electron microscopy of dead animal tissues, little is known about man himself. The argued conclusion therefore is to supplement the knowledge of things and of the body machine with the science of human life as represented in African humanistic heritage which values must not be indiscriminately appropriated by western technological civilization that lacks order in its soul.

In African knowledge system, the human person is life, and any life at all is of greater value than material comfort. We need to sustain the capacity of our human minds to attain the essential truth necessary for reaching our goal of fulfilled, meaningful lives. We need commitment and service to human longing for an ever fuller knowledge of truth beyond the current of stark nihilism in philosophy, which rejects the meaningfulness of being and real purpose. Indeed, the biotic community must not be allowed to disappear like the dinosaur or descend into the junk heap of destruction due to the misapplication of human knowledge and for lack of wisdom and internal decay in the manner of the twenty-six (26) civilizations that had risen upon the face of the earth in the last centuries.

The humanism advanced here is that in which the perspectives of science and faith or communal values are no longer in conflict. It advocates a vision of society centred on the human person and his inalienable rights, on the values of justice and peace, on a correct relationship between individuals and the community, on the logic of solidarity and subsidiarity in the biotic community. It is a humanism capable of giving a soul to economic progress itself, so that it may be directed to the promotion of each individual and of the whole person. It is communalistic.

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