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HUMANISING THE SCIENCES THROUGH THE SOCRATIC METHOD

M.S.C. Okolo
Communication and General Studies Department,
The Federal University of Agriculture,
Abeokuta, Ogun State, Nigeria
mscokolo@hotmail.com

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Abstract

There is a growing attitude that science alone is what humans need to preserve –nurture, progress, succeed, and sustain – their existence. This brand of thinking is expressed in two major ways. First, it sees science as all-important, supreme and self-sustaining. That is, science is all that everything else needs and all that science needs. Second, it views all knowledge from the humanities as quasi-knowledge, suspect, incapable of advancing humans' practical and material concerns and, consequently, of limited or no real relevance. The purpose of this study is to examine this attitude. To do this, the study employs an analytical, comparative and interdisciplinary approach. Philosophical analysis is employed to interrogate the methods through which science derives its knowledge to ascertain if the claim that something is scientifically proven is based on a universal certification. Its' comparative stance involves comparing the sciences and the humanities to find out if they differ so radically from each other. The interdisciplinary texture of the work derives from its ability to cut across the sciences and the humanities. The study finds that there is a need to protect ideas and disciplines which help to guarantee a balanced understanding of our world. This is where Socrates comes in as an embodiment of the two. The study concludes that Socrates' position reveals that there is a deep affinity between the sciences and the humanities. There is something more fundamental than material things which science deals with and it is this deeper structure that provides the anchor for science.

Keywords: Humanities, Science, Socrates, Socratic Method, Scientific Method

Setting the Context

Increasingly, there has been a shift towards the scientification of our world to the point that human progress is equated with scientific (and technological) progress as if they are synonymous with each other. The situation is such that every aspect of human life is conditioned, shaped, processed, packaged, delivered, commoditised, evaluated and endorsed by the dictates of science. This implies a systematic compressing of knowledge to align with the scientific directive, monitoring, sanction and wisdom. Bohme (2012:73) sums this up well: 'we…live in a *knowledge society*, which is more precise terms means that technoscientific knowledge has come to subordinate or suppress all other forms of knowledge and has consigned education in other forms of knowledge to a marginal existence.'

Here some major concerns arise: Is science truly equipped to establish all matters of fact and to solve problems of all kinds? For instance, are the equations of the humanities ideas unconfirmed evidence on the one hand, and the sciences hypothesis experiment confirmed evidence on the other hand, valid? Is confirmed evidence in science strictly speaking based on deductive rigour? Is it to say that something is scientifically proven based on a universal certification? Is there a condition under which the scientific method and that of humanity can become fused, or, at least, mutually beneficial? In short, does the scientific method differ so radically from that of the humanities or is the disagreement hinged on the formation of the two concepts in different logical contexts?

Lowenthal (1961) provides a useful guide. He explained that if 'we limit ourselves to observable facts…, there is no way to determine what is important and what is unimportant, what essential and what unessential' (p. xiii). He further posited that science suffers from the same lack of certainty as non-experimental sciences given that part of its subject matter is the living, full human being, with all of his feelings and attitudes of which there can be no guarantees of certainty. The best that can be hoped for is that 'by a certain finesse and an eye for probabilities, we can sift out the valid and important from the misleading and trivial in much of our data' (p. xiv).

Socrates is, perhaps, the first man in recorded history to demonstrate that ideas and how they are acquired matter. His major concern was to ensure that the ideas that are conceived in the mind are as clear as they should be so that they can guide humans properly in achieving whatever set goals they are after. He devoted his life to philosophical enquiry to the point of dying for it, thus becoming the symbol of the philosopher, the index for measuring philosophy and the true mark for evaluating what philosophy and the philosopher can achieve. His life's work then was to show how facts relate to each other by questioning their basis to expose the truth they contain. This unity has a basis in historical reality: for there is, indeed, a unity between scientific and Socratic Methods that follows from the fact that they have a common source in the Socratic truth-

seeking model. The project of humanising the sciences through the Socratic Method, then, is simply an attempt to reconnect science to its foetal origins. This will ensure that science keeps receiving healthy nourishment.

The Socratic Method will play a dual role here: first, it will be used to demonstrate that Socrates' philosophy can be built into a method. Second, it will be used to show how that method can be used to represent the impact of humanities on science. In other words, the Socratic Method and the humanities will be used interchangeably in this study.

Socrates: A Brief

History teaches that great thoughts endure and that individuals who are interred in the memory forever are those who bequeathed to the world profound thoughts. So it is with Socrates, a Greek philosopher, born in Athens around 469 B.C., the son of a stonemason and a midwife. In contrast with other great Greek philosophers such as Plato and Aristotle, he wrote nothing. Knowledge of his life and thoughts came mostly from the writings of two of his pupils: Plato and Xenophon. For instance, in Plato's *Theaetetus*, Socrates sees himself as a midwife who delivers ideas from people and then tests them to see whether they withstand rational examination. The first and most important task for philosophy, for him, is to understand the things we take for granted – what constitutes a good life, justice, courage, other virtues and, especially, our knowledge claims. He 'identified the philosophical life as one of continuing enquiry and investigation, into others' beliefs and one's own' (Annas, 2003: 19-20). For Socrates, then, the essence of philosophy is to conduct a continuous examination of knowledge claims held by others and one's own.

Socrates' philosophy, which has outlasted two millenniums, is primarily devoted to the search for truth. His profound conviction which dominated his entire life and which he sought to communicate was that the search for truth was the highest ideal for humanity. The core mandates of his interior life were to search for truth, secure freedom for the individual and, above all, help men to see the need for an enquiry. His concern is not that others should accept his position but that people should cultivate an inquisitive mind towards issues and that nothing should be accepted as knowledge until it has been thoroughly investigated. He believed that philosophers should be willing to put their interests last for the sake of the truth. His willingness to drink the hemlock instead of saving his life, thinking of his commitment to his family and escaping from the prison as his friends suggested was a result of his unwavering conviction to the sanctity of his philosophical life. By subsuming everything into philosophical concern, Socrates lifted

the ideals of philosophy to a sacred height. His life is proof that philosophers, as members of society, are the public representation of that society. A philosopher should always be aware of the fact that his words and action can have a serious effect on society. He was an embodiment of what is contained in the word truth, its reality, its necessity, its centrality in human affairs, and its potency.

In 399 B.C., Socrates was found guilty of vague charges of impiety (introducing new gods) and corrupting the youths. His punishment: death by drinking poison – the hemlock. So at the age of seventy, surrounded by his disciples, the controversial figure, the dissident, the eccentric, the defender of freedom of conscience and freedom of speech, the self-acclaim gadfly, the embodiment of individual conscience and intellectual integrity, the philosopher now the prisoner drank the hemlock. So ended the life of the man whom Plato (2003) eulogised as the wisest and justest and best.

Difficult as it may be to draw a defining line between what Socrates indeed said and what his chroniclers wanted him to say, there is little doubt that he promoted the habit of persistent questioning, testing knowledge claims to see whether they hold up to reasoned investigation, promoting enquiry before doctrine, seeking the truth through enquiry and the need to think philosophically. It is these that the study is interested in and will refer to as the Socratic Method.

Socratic Method

To be sure, Socrates did not leave any defined method. At this point, it is pertinent to take care of a possible objection. All that is credited to Socrates is from a secondary source so to speak since he left nothing in writing. The confidence in constructing Socratic Method, however, comes from, at least, three main considerations. One, there are countless documented accounts concerning Socrates' life, his activities and, especially, his unwavering devotion to the quest for truth. For this study, the accounts of two authorities who happened to be in a position to give first-hand information on him are considered. The first is the immortal author of the *Republic*, Plato, who was his pupil. Most of Plato's writings were devoted to Socrates. Among them are *Euthyphro*, *Apology*, *Crito*, *Phaedo*, *Gorgias*, *Protagoras and Meno*, *Symposium*, *and The Last Days of Socrates*. The second is Xenophon who received his education in Athens during the time of Socrates and also wrote extensively on Socrates. His books on Socrates include *Memorabilia*, *Apologia*, and *Conversations of Socrates*. Two, their accounts regarding Socrates and his activities, particularly, his total commitment to the search for truth by examining every item of knowledge for its logical and rational thoroughness have not been disputed, not even by the critical Aristotle. Instead, Robinson (1989:299) informs that Aristotle ascribed two things to Socrates: inductive arguments and universal

definition, both of which are concerned with the starting point of science, even though Socrates did not make the universal or the definitions exist apart.

Three, life is about construction. So long as the required materials are in place, construction can go on. In this case, there is enough evidence of how Socrates conducted his affairs to enable the construction of his method.

To begin with, he did not force his truth on others; his goal is for them to freely discover it. He shunned dogma. He prodded, he questioned, he suggested but never stated. He did not compel his audience to accept his position; indeed he expects them to argue, except that the arguments have to be in genuine pursuit of truth. His talks with people according to Hamilton (1973:227) usually end with: 'This may be true, but is also quite likely to be untrue, and therefore I would not have you too easily persuaded. Reflect well – and when you have found the truth, come and tell me.' He was convinced that everything worthwhile can only be more important than any well-defined theory whatsoever. In many ways, he is a precursor to a series of great heroes who defended the freedom of human spirit, thought, speech, and action, and stood against institutionalised oppression, restriction and, especially, any dogma inhibiting scientific advancement. For him, the search for truth is free and continuous and not something that can be imprisoned in a definition and/or reduced to a formula.

All these can be compressed into a clear goal and a well-honed method: the unexamined life, Socrates insists, is not worth living. Each person is invited to self-examination, a critical reflection in the quest for truth, a questioning and testing [of] one's most fundamental beliefs' (Wilson, 2007:36). His unshakeable conviction lies in the belief that truth is the fundamental reality and that every person possesses the capacity to attain it and can achieve it if one genuinely seeks it.

The concern of this study, then, is in his idea that knowledge has to be tested and subjected to reasoned investigation. In building up a Socratic method for this study what is important is not what Socrates left undone (even though that has philosophical merit) but the clear-cut and uncompromising legacy he left behind. He instituted a tradition of questioning, of testing, of critically examining every item of knowledge to ascertain its logical adequacy and rational consistency all of which are very essential in any field of knowledge and, especially, the sciences. Indeed, the habit of questioning, testing and insisting that only the truth has merit is the tripod holding the foundation of science.

The Scientific Method

The scientific enterprise is typically associated with systematised knowledge obtained through observation, hypothesis, experiment and reasoning. An analysis of, at least, two of these will be used to show the extent scientific knowledge is as self-sufficient and reliable as the scientific enterprise is claimed to be. First, let's begin with observation. The observation here refers to the conscious, systematic study of nature. The underlying emphasis is on empirical entities that can be apprehended. Yet, science, often, claims observation of what cannot be seen. Horsthemke (2017) points to two such claims. First, is the claim 'to know things that we might not be able to observe' (p.594). Examples represent the claim to know what is going on inside a molecule which cannot be seen with the naked eye. Also, they claim to have 'seen' places like the bottom of the ocean, deep toward the centre of the earth, or deep space which we cannot observe directly except with the aid of instruments like microscopes, telescopes, and cameras. Second, 'much of what we observe occurs against the backdrop of some or other theory we have about what it is we are looking at' (p.594). A good example is a geologist's ability to examine a vein of gold. This ability is made possible by his prior training, and his learned theory which enables him to 'see much better' than if he had no theory at all.

In his book, *Impossibility: The limits of Science and the Science of Limits*, Barrow (1999) cautions that science cannot always live up to its proclamations. For him 'limits to what is impossible may turn out to define the universe more powerfully than the list of possibilities' (p. 249). Sim (2002:164) provides the following sketch of Barrow's account: Barrow gives several examples of the unknowable. For instance, we can never know the universe as a whole since some areas are simply too far away from our planet ever to manage to transmit light to us. There are also limits on what can be measured at the sub-atomic level, and without measurement in science there is no knowledge. Then, too, the future states of non-linear dynamic systems in which chaos and complexity apply cannot be predicted because of their acute sensitivity to even very small alterations in their initial conditions.

Second, the hypothesis is another core method of science. The hypothesis here refers to an idea, a projection about how a scientific experiment will turn out. There is no set procedure, structured method or clear-cut formula for forming a hypothesis. Bradford (2017) calls it 'the initial building block in scientific method… a suggested solution for an unexplained occurrence that does not fit into current accepted scientific theory.' The main point is that hypothesis 'is a *creative* side of the scientific enterprise. The ability to create is a function of imagination and talent and cannot be reduced to a mechanical process (Copi, 1978:467). It entails speculation, opinion, and tentative statements and why they are possible and plausible. For this reason, a hypothesis is typically written in the form of

an if/then statement. For example, if COVID-19 spreads via respiratory droplets, then people who do not wear face masks are more likely to contract the disease. Even though this statement can be tested as hypotheses are meant to be, it is, however, impossible to prove its correctness by 100 per cent. Even with all the awareness about the coronavirus, there may be people in the world today who do not know anything about it. Here we have a cardinal method of science which cannot guarantee 100 per cent accuracy but more importantly, depends on ideas, guesses and imagination to validate its relevance. To form a hypothesis, then, one has to conceive it in the mind first.

At this point this deduction can be made: access to scientific knowledge is gained chiefly through two broad ways – empiricism and rationalism. Empiricism stresses experience and the facts that come from observation and experimentation. Rationalism emphasises reason and the theories that come from logical inference. While the empiricist gathers facts; the rationalist organises, packages and *animates* them. Kant points to this difference and their necessary fusion when he declared that 'theories without facts are empty and facts without theories are blind.' A well-rounded and -ordered knowledge needs a blend of both facts and theories. The teaching of facts that science glories in cannot be done without a critical and comprehensive examination of the nature of the fact. Facts without logic – how the facts relate to each other and for what purpose – will be meaningless. Indeed, science looks to inductive logic to affirm its truths and record its progress.

Discussion of Method: Science and Socratic

Certain criteria help to distinguish science from every other intellectual activity. These are found in the way, and method, in which science is conducted. These are a reference to laws or regularities, data gathering through observation and measurement, formulating and testing of hypothesis, experiment and explanation. It should be noted that this method may not follow a strict order. What is important is that they help humanity to solve problems by organising human experience with nature into meaningful and understandable systems of explanations. Ogunniyi (1986) describes the experience as (a) the discovery of regularities and discrepancies and their effect on nature; (b) knowledge of human actions on things, events or situations, and the consequences of such actions and (c) understanding derived from the control of diverse phenomena in nature and so on. Understanding for Umoren (1996:11) 'helps the scientist to probe further into the nature of things and events and to control and harness such things and events for the benefit of mankind.' This implies that science has to look to reason, and critical enquiry to do justice to its calling. It is, perhaps, for this reason, that Weaver (1969) reminds us that even though science is a way of solving problems, it cannot solve all problems. He insists that

science is not an arrogant dictation in the whole area of life but rather a democratic companion of physiology, art, religion and other valid alternative approaches to reality. National Science Teachers Association (1964) equally is of the view that a scientifically literate person understands the interrelationship of science and society, ethics which controls a scientist, the nature of science which includes basic concepts and the interrelationships of science and humanities.

Socrates is, perhaps, the first known figure in recorded history to nudge humans to reconsider the meaning of the word knowledge. A key task of Socratic enquiry is to find effective ways of enabling people to see things clearly in life. He sees philosophy as the love of the truth which human beings can discover if they genuinely seek it for in that lies the highest destiny of man: his ability to know the truth. That is, Socrates made critical enquiry a cardinal focus in knowledge acquisition. For him, there is a need to objectively interrogate all our knowledge claims, test them for possible bias and subject them to consistency evaluation to ascertain the extent of their fidelity. The implication is that there is no room for accepting any claim at face value. All our observations must pass through rigorous examination, and constant and consistent review before they should be accepted as the truth. There must be a mental distance in investigating issues. As such authentic knowledge can only be built through a painstaking review that transcends the idea-originator to other people who have the requisite skills to examine it. Socrates was fond of testing his ideas through dialogue with others and also subjecting other peoples' views to the same treatment. In Plato's *Theaetetus* Socrates sees himself as a midwife who delivers ideas from people, and then tests them to see whether they withstand rational examination. He insists that wisdom begins when a man finds out that he does not know what he thinks he knows. True knowledge can only be achieved through the practice of persistent questioning and criticising the answers. For Socrates then the first step in knowledge acquisition is to ask questions, probe into the nature of assumptions, to interrogate new and old beliefs to the point that any reasonable person can identify with them. His method is to find out what has already been accepted about the subject with which he is concerned and whether the basis for acceptance is based on objective truth finding. For him, to be worthwhile, our belief must conform and pass the test of critical analysis. He insists that true knowledge can only come through repeated interrogation, criticism and evaluation. Philosophy, in this wise, must be seen as a social activity capable of accepting different worldviews, dissecting them and positioning the best for the welfare of humanity. In sum, Socrates tries to ensure that the ideas that are conceived in the mind are as clear as they should be so that they can guide humans properly in achieving whatever set goals they are after.

Equally, for scientific knowledge to be accepted it must go through repeated tests by the originator before being passed on for further verification and authentication by other scientists. For this reason, science is seen as objective, not depending on the bias, prejudices and idiosyncrasies of a particular scientist but rather on authentic evidence backed by verifiable facts. To establish authentic evidence, however, recourse must first be made to ideas filtered by the mind. Indeed, a hypothesis which is considered 'the initial building block in the scientific method' (Bradford, 2020) has to be first conceived in the mind. It is this supposition formulated based on the reasoning that the scientist works with in setting up an experiment which can be proved scientifically if the hypothesis is true. That is, the first step in the scientific method is to ask questions. It is these questions that guide the scientist in setting up an appropriate experiment. Through the repeated test, to ensure accuracy, he concludes that he passes on to other scientists for verification. This way the scientific method helps in the establishment of truth. Indeed, Cohen and Nagel (1992:496) note that the 'scientific method is the only effective way of strengthening the love of truth. It develops the intellectual courage to face difficulties and to overcome illusions that are pleasant temporarily but destructive ultimately.' Here scientific method and Socratic Method meet. Horstheme (2017:591) reminds us that the traditional understanding of scientific propositional knowledge which deals with a commitment to truth and scientific evidence can be traced back to Socrates and Plato, whose dialogues *Meno* and *Theaetetus* contain the essence of this definition. The fact that the scientific method appears in the same context as a Socratic mode of enquiry is both a good indication of its historical derivation and a pointer to how it should be interpreted. Bohme (2012:44) in fact, informs that scientific knowledge has its historical derivation in philosophical *truth-seeking.* To talk about philosophical truth-seeking is invariably to recourse to its quintessential representative, Socrates.

In addition, the two main routes of acquiring scientific knowledge: empiricism and rationalism have their basis in philosophy. Empiricism is that theory of knowledge which reduces all ideas to sense evidence, what can be directly observed. To assign the status of reality to a thing is to say that that thing (at least in principle) can be experienced. This is the point of the scientific method. The goal of science is to advance human knowledge through verifiable experience that will make it possible to anticipate the future. The scientific method, then, 'is the only way to increase the general body of tested and verified truth and to eliminate arbitrary opinion' (Cohen and Nagel, 1992:494). Rationalism, on the other hand, extends knowledge beyond experience. That is, it is possible to know something that is outside direct observation, something for which no concrete evidence can be provided. Copi (1978:463) insists that none of the important

scientific propositions is directly verifiable. For instance, Newton's law is not directly verifiable because there 'is simply no way in which we can inspect *all* particles of matter in the universe and observe that they do attract each other in precisely the way that Newton's law asserts' (p. 462). This further proves that the teaching of facts in which science glories cannot be done without a critical and comprehensive examination of the nature of the fact. That is, it is impossible to acquire facts without an underlying theory, nor can there be a meaningful theory without a concrete manifestation. For Socrates, human beings are entitled to freedom of thought to pursue the unfettered intellectual enquiry. It is only through such means that truth can be discovered. What science tries to achieve is to discover a concrete (material) truth that will provide human beings with a good life. Socrates' life shows that truth and goodness are the fundamental realities which are within the range of possibilities of what human beings can achieve.

Deductions

From the foregoing analysis, at least, five general conclusions seem warranted: First, Socrates' position, that is, his insistence that getting to the truth requires rigorous questioning, and probing, in short, that knowledge must be tested, provides the impetus to challenge entrenched positions, scientific and otherwise. Throughout the history of science, science records progress with new ideas supplanting old ones. Indeed, Kuhn (1970) dismissed the idea of an overall grand scientific narrative holding over time. He notes that to 'be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and never does, explain all the facts with which it can be confronted'(p. 18).

Second, Socrates' position reveals that there is something more fundamental than material things which science deals with and that it is this *deeper structure* that provides the anchor for science. Davies (1995:203) points to this when he asserts that 'science may explain all the processes whereby the universe evolves its destiny, but that still leaves room for there to be a meaning behind existence.' For Sim (2002:161) 'physics is transformed into metaphysics at such points' where we try to understand the meaning behind existence.

Third, it is important to acknowledge that the methods by which the sciences and the humanities examine existence differ markedly from each another. Yet, this difference when properly interrogated ends up strengthening the relationship between science and the humanities in, at least, two significant ways. One, a scientist who rejects a non-experimental thesis as his starting point will find in the course of establishing his laws that the only route for his progress lies in inductive logic which in itself relies on *an a priori*, non-experimental thesis. Two, although a study carried out under the humanities can

neither be identical to a work of science nor an adequate replacement for it, it can provide important directions for scientific research. It can, for instance, raise ethical concerns as well as other issues that may help to forestall calamities that may result from some scientific research.

Fourth, despite the prerogatives claimed by the sciences and the humanities, it is evident that there is probably more agreement between them. When scientists, for example, formulate hypotheses they are usually guided by the same sense of responsibility and concern for issues happening in society, and how best to convey them to humanity. This is the approach of the humanities to the same problems. As such, both groups share a concern with how best man and society should co-exist, both seek to set standards about how society should be ordered and both highlight the need to monitor the progress of values (especially the impact of scientific advancement) across time and space. The confluence of interests suggests a deep affinity between the two fields (sciences and the humanities), waiting for acknowledgement and collaboration from each other. It is important to have statistics; but it is necessary to be guided by ideas, how they are acquired and to what use they are employed. A well-rounded knowledge must embrace the epistemology that speaks of equal relevance to both the humanities and the sciences.

Finally, despite all, the fact remains that the scientist must rely on and science must be judged in terms of scientific methodology. But an evaluation of the scientific method must rest, at some point, on a clear understanding of the perimeters set by the humanities of which Socrates undisputedly was the precursor.

References

Annas, J. (2003). *Plato: A Very Short Introduction*. New York: Oxford University Press.

Bohme, G. (2012). *Invasive Technification: Critical Essays in the Philosophy of Technology*. Shingleton, C. (Trans.). London: Bloomsbury.

Barrow, J. D. (1999). *Impossibility: The Limits of Science and the Science of Limits*. London: Vintage.

Bradford, A. (2017, July 26). What Is a Scientific Hypothesis/ Definition of Hypothesis, www.Livescience.com/2? Accessed September 8, 2021.

Cohen, M. R. & Nagel, E. (1992). The limits and the Value Scientific Method. *Philosophy and Contemporary Issues*, 6th edition, 493-496. New York: Macmillan Publishing Company.

Copi, I. M. (1978). *Introduction to Logic*. New York: Macmillan Publishing Co. Inc.; London: Collier Macmillan Publishers.

Davies, P. (1995). *The Cosmic Blueprint: Order and Complexity at the Edge of Chaos*. Harmondsworth: Penguin.

Hamilton, E. (1973). Witness to the Truth: Socrates. In Carlsen, G.R. & Rico, G.L. (eds.). *Western Literature: Themes and Writers,* 224-230. New York: McGraw-Hill, Inc.

Horsthemke, K. (2017). Indigenous (African) Knowledge Systems, Science, and Technology. In Afolayan, A. & Falola, T. (eds.). *The Palgrave Handbook of African Philosophy*, 585-603. New York: Palgrave Macmillan.

Kuhn, T. (1970). *The Structure of Scientific Revolutions*. Chicago and London: University of Chicago Press.

Lowenthal, L. (1961). *Literature, Popular Culture, and Society*. Englewood Cliffs, N.J.: Prentice-Hall.

National Science Teachers Association. (1964). *Theory into Action*. Washington D.C: NSTA.

Ogunniyi, M.B. (1986). *Teaching Science in Africa*. Ibadan: Salam Media.

Plato. (2003). *The Last Days of Socrates*. Tredennick, H. & Tarrant, H. (Trans. and eds.). London: Penguin Books.

Robinson, R. (1989). Socrates. In Urmson, J.R. & Ree, J. (eds.). *The Concise Encyclopedia of Western Philosophy and Philosophers*, 298-301. London: Unwin Hyman.

Sim, S. (2002). *Irony and Crisis: A Critical History of Postmodern Culture*. Uk: Icon Books; USA: Totem Books.

Umoren, G. (1996). Overview of "Science, Technology, Society" Interactions. In Alozie, P. (ed.). *Technology, Science and Environment: A Current Overview*, 9-25. Aba: Vitalis Books.

Weaver, E.K. (1969). Science Education in Nigeria. *Science Education*, 48(4), 351-361.

Wilson, E. (2007). *The Death of Socrates: Hero, Villain, Chatterbox, Saint*. London: Profile Books.