

Relevance of Ethics in the Physical Sciences in Contemporary Insecure Society

Terfa Kahaga Anjov, PhD

Abstract

There is no doubt that the world we live in is a world of contraries. To a layperson, both sides are parallel without a meeting point. The critical thinker and philosopher, the opposites are two sides of a coin. Each side is necessary for the coin to have value and to be used as a valuable material. Efforts are made to identify the perennial conflicts of interest in the ethicist and the physical scientist who is in the service of humanity around the world. This article aims at interrogating the interactive effect of ethics on physical scientists as they respond to recent happening in the world of science. It is discovered that the product of the physical scientist are cherished because they are value-based. The facts of the physical scientist are values to the ethicists. This reality is evident in available codes of ethics in different professions. Any attempt to prefer one over and above the other would lead to a state of disequilibrium. The consequences of such preferences are grave as can be seen in the unethical release of the Coronavirus from China. This concludes that ethics is all-encompassing. No progress can be said to be made without passing the result of action through the lenses of ethical evaluation. It is critical to make ethics a formidable guide to the production of outcomes in scientific processes.

Keywords: Ethics, Sciences, Security, Physical Sciences, Scientific Method

Introduction

Charles Dickens's *A Tale of Two Cities*¹ which was published more than 162 years is fresh to anyone who is witnessing the havoc Coronavirus has caused and is causing humanity at a time that we are not just amid improved scientific and technological advancement, but in a world of Internet science. In *A Tale of Two*

¹. See Charles Dickens, *A Tale of Two Cities*. With introduction and notes by Andrew Lang. London: Chapman & Hall, 1859.

Cities, the writer speaks of a life of contraries, “It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the season of despair.” This passage speaks volumes of the philosophical challenges facing human existence.

The development of science and technology is expected to improve the living standard of every human being on the face of the earth. This is very difficult to say as daily experience tells us something to the contrary as we live in a globalized village. Can it be said that in our world, everything about human life is possible? Who would have thought that America can be successfully bombarded on September 11, 2001? Who must have had the privilege of prophesying the outbreak of Coronavirus or COVID-19? These events have not only shown that as long as there is life, everything is possible. It has also challenged the relationship between ethics which deals with right and wrong actions of individuals who have control of technology, and other physical sciences. The complexity of our world is comprised of people who are innocent and dubious people depending at the time the person comes in contact with another. This makes almost everything around the concrete world ambiguous.

The Universality of Ethics

The word ethics is derived from the ancient Greek word *ethikos* which comes from “*ethos*” meaning custom or habit. It was Cicero, the Roman politician and lawyer who originally coined ethics. The untrained philosopher uses ethics interchangeably with morality as if both concepts are one and the same thing. The reason for their interchangeability is not far-fetched. Consider the term morality, it is originated from the Greek word *moralis* with its equivalence to the Latin word *ethikos* which also means custom. Here, *custom* implies a moral value. Technically, ethics and morality are not the same thing and cannot function alike and cannot be applied

interchangeably professionally. When reference is made to ethics in a professional way, it is basically speaking of in the theoretical sense. Emphases are made based on the idea of principles and standards for acting. There is virtually no aspect of human endeavour that escapes ethics. Everywhere one turns to in this world the idea of right and wrong is strongly needed and sensible. They are not concrete activities, but are handy tools or codes used for judging human conducts and acts. Morality is clearly a code that is used for judging human behaviour. The mutuality between ethics (theory) and morality (practice) in an individual is purely integrity.

Physical Science

Let no one be confused with the use of physical sciences. Ordinarily, a discourse concerning individual physical sciences would have been most apt, but since their similarities are overwhelming, they shall be treated as the study of the physical or natural world. The physical sciences are divided into four broad areas namely: astronomy, physics, chemistry, and the earth sciences. The earth sciences are further grouped into either four or five branches; geology, meteorology, oceanography and astronomy or geology, meteorology, climatology, oceanography, and environmental science. With this list, it is not out of place to say that physical sciences deal with inanimate matter. Abstraction is the common thread that runs through all the physical sciences.

Scientific Method

Setting a scientific methodology at this moment is significant to a smooth ride of ethics and the physical sciences. History has shown that there are efforts to separate philosophy especially ethics from science. This challenging but great debate is about whether or not philosophy and any of its branches fits in as a science. The question to ask is what is science? Science is a systematic way of getting to know how things are in the world without being aware of any other thing. However, Ronald Mickens and Charmayne Patterson

define science as “the systematic observation, creation, analysis, and modelling of patterns which exist in the physical universe.”² Science begins with observation, experiment, thinking, and demonstration. Whether the experiment is referred to as a demonstration, it follows a certain pattern that can be repeated again and again to produce the same result. The logicity of collecting determined results through the experiment is known as the scientific method. It is used in testing a hypothesis that is contained in a statement as a means of getting to a scientific theory.

The procedure of assembling the various constituents with integrity showcases the cordiality of ethics with any science at any time and location. Bearing this point in mind, the existing debate as to whether ethics is a science or is not, does not hold in recent times and should not be contemplated to avoid wasting precious time. On this point, Paul Copland wrote that: “Science and ethics must not be separated...The progress of research must be kept free from religious and political intervention”.³ He emphasized that ethics is an integral part of science as it requires the scientist to be consistent and empirically justified in his interpretations of the actions of scientists.

This position is most objective as the products of any scientific finding can be measured and experimented universally. It simply means that the ethical guides are followed during the process of experimentation by any scientist who is interested in verifying the tested hypothesis or in an attempt to confirm a theory. The roadmap to the right and most appropriate theory is through a verifiable scientific method necessary to measure the suitability of the result. Rene Descartes is recognized as the first philosopher to

². Mickens, Ronald and Patterson, Charmayne (2016) "What is Science?," *Georgia Journal of Science*, Vol. 74, No. 2, Article 3. Available at: <http://digitalcommons.gaacademy.org/gjs/vol74/iss2/3>

³. Copland, P. Science and ethics must not be separated. *Nature* **425**, 121 (2003). <https://doi.org/10.1038/425121a>.

initiate the quest for a reliable scientific methodology in his *Discourse on the Method of Rightly Conducting one's Reason and Seeking Truth in the Sciences*. In the work, he was aware of how his senses often made him mistake a tree for a man. The making of mistakes as a human being brings the ethical perspective in ascertaining the accuracy of his observations, predictions, and the analysis of collected data. He took several steps to reduce the error to its barest minimum.

This involved reproducing the experiments to avoid wide discrepancies between observations and the obtained results. The most interesting thing about Descartes is how he came to achieve the simplest truth in the world. The idea of suspending and denial of all the knowledge he had already known before his conversion is a factor of ethics. He referred to the process as the methodic doubt. With the new method, he came to the ultimate truth. He realized that he could not deny the fact that he is a thinking being. This made him conclude that he is a thinking being. I think therefore I exist “*cogito ergo sum*”.⁴ The discovery of an indubitable scientific method as the Methodic Doubt, the ground was set rolling for a universal litmus test for science activities in the world. The absence of this litmus test was disastrous.

Recall that in 1638, an Italian astronomer, physicist, and engineer, Galileo Galilei, came up with a thought experiment aimed at disapproving the existing physical theories. It was a challenging moment for the science of his era in the sense that testability and falsification of hypotheses were not thought of. Research findings were unidirectional as they were based on deductive reasoning. For example, observations were used to give explanations for the observations of the scientist. There was a lack of cross-matching between dependent variables and independent variables. These key items that underpinned the scientific method were missing in

⁴. Rene Descartes, *Discourse on the Method of Rightly Conducting one's Reason and Seeking Truth in the Sciences*. Duke Classics 2012, Pg.22.

the great postulation of Aristotle concerning his law of motion which holds that the laws governing the motion of heavens were different from the laws that governed motion on the earth.

Galileo disagreed with Aristotle. His law of inertia was fully grounded on both deductive and inductive reasoning. It was cross-checked through dependent and independent variables with the aid of an experimental group and a control group. It was after all these procedures were carried out and repeated over and over that he declared that: "An object if once set in motion, moves with uniform velocity if no force acts on it." As long as the object is at rest, it remains at rest and if in motion will continue unless an unbalanced force acts on it. This has become a scientific theory because it has been tested repeatedly and it is referred to as the first law of thermodynamics which describes a phenomenon in these words: Energy can neither be created nor destroyed.

The establishment of an experimental group became necessary in the world of science to consolidate the impact of individuals in the ecology of knowledge. This gave birth to the Royal Society on 28th November 1660. The mandate of the Royal Society was to provide proficiency in the sciences by producing experimental evidence that supports the truth in form of theories and laws gotten through the process of repeatability of research findings. The truth got is conceived as a framework upon which observations and facts can be based and such truth is an objective reality. This is difficult for people who are cognitively trapped in their myopic learning. To such people no explanation is satisfactory.

A twist on the suitability of an undiluted scientific method with universal applicability came in with the emphasis on human nature. Whatever kind of knowledge is acquired depends on the mental worth of the intelligentsia. The 17th Century philosopher and an empiricist, David Hume in his Treatise on Human Nature argued against the existence of innate ideas as emphasized by

Immanuel Kant who refers to innate ideas as knowledge (a priori) which is obtained by analysing concepts independent of experience. For instance, human beings have come to know of God's existence, not through experience. But Hume insists that all human knowledge is gotten from experience. The debate between knowing through experience and thinking has taken an unyielding path of eternity which cannot be resolved in this article.

The interest of this article is to establish the existence of a formidable relationship between ethics and the physical sciences. This relationship can be seen to exist if the question of responsibility is answered in the affirmative. What are the basic principles that guide the scientist at work? Does the scientist take responsibility for the product of the work performed? To what extent do concepts like the integrity of knowledge acquisition, production, storage, management, and sharing of data mean to the scientist? Does the scientist need a written code of ethics to operate? These are clear indications that the physical scientist is called to be scientifically honest, open, and should be prepared to take responsibility for the product of his work. This quest is nothing new to those in the humanities especially those in the area of philosophy. It is important for those in other disciplines can follow this path of honour. When the principles and procedures are followed appropriately and correctly, it is an indication that ethics is at work even if no mention of ethical concepts is made in the work.

Ethics and the Physical Sciences: A Relationship

Now, the relationship is established between ethics and the physical sciences. It is most critical to say that it is erroneous for anyone to separate ethics or morality from the sciences, physical sciences, and the humanities. There has been no era in which ethics has been separated from any way of thinking more than in this century. Today, human activities have made us distinguish between the old world and the new world. The old world had

ethics permeate every facet of human endeavour. Unwritten code of ethics was taught to the younger one through observation which is learning by watching and doing. For example, there was no written moral code for a child to learn how to cultivate, dig heaps, and plant yam seedlings among the Tiv people of Benue State. A child would learn by going to the farm every day with his father. The celebration of the Eucharist by a Catholic priest is learned by the seminarian through watching over some time. This makes the ethical issues involved in these practices be taken for granted by all and sundry.

When the elders begin to talk about those days, they are referring to the degree of respect that was accorded to values like; truth-telling, honesty, integrity, humility, transparency, accountability, sincerity, and faithfulness which are needed to turn things around in our age. In those days, the family name was deified above all other things apart from the name of God. The Tiv of Benue State, North Central of Nigeria were a people who understood the importance of value in the ecology of values in the cultural system. A good family name was recognized, cherished, and respected more than material wealth from an unknown source. Whatsoever an individual did, it was to the honour or disgrace of the family name. everyone was careful not to tarnish the family name. The meaning attached to the family name was taken to wherever the person goes to; in the shrine, marketplace, during communal meetings, in the school, and on the farm. What else would have informed the maxim of “iti i dedoo hembra nyaregh” which means a good name is more worthy than money among the Tiv people if not the priority given to value? The seriousness attached to ethics can be transposed to the field of the physical sciences, sciences and the humanities.

At this juncture, it is clear that ethics and the physical sciences are inseparable. The inseparability best be understood with relevant, discipline-specific examples. In the field of chemistry, Noyori

Ryoji and Joe P. Richmond have declared that “Chemistry is closely involved in society, providing the foundations for areas of applied science such as nutrition, medicine, environment, energy and materials”.⁵ What the Chemist does goes beyond the mixing of chemical reagents. It has a lot to do with the human system. The product can build or destroy the human body depending on the quality of the work done. Chemical products that are harmful to the human body and bad and should be destroyed and the chemist should take responsibility for the action performed and the appropriate sanction must be applied after the proper investigation is carried out. Whenever the chemist does otherwise, it becomes unethical behaviour. This pathetic behaviour of the chemists is reported in the Vanguard newspaper:

There is no data to know the magnitude of treatment failures and you know that there is a high level of kidney failure. Most of these diseases you should see in the elderly people are now in the younger people are caused by drugs. Kidney failure is found in elderly people but nowadays is more with the young because of drugs. The same applies to all other ailments but the common denomination is that people go to the chemist and buy drugs.⁶

There are so many factors responsible for the presence of fake drugs in most markets in the world. Most importantly is the desire to get rich quickly through corrupt practices. The Nigerian dealer goes to countries like China, India and Pakistan to collaborate with the pharmaceutical companies to package drugs for the Nigerian market at a reduced price. These companies would agree to produce such drugs which turn out to be substandard and falsified

⁵. Noyori, Ryoji, and Joe P. Richmond, “Ethical Conduct in Chemical Research and Publishing”, *Advanced Synthesis & Catalysis*, 2013, 355 (1), Pg. 3.

⁶. “Fake Drugs: Inside Nigeria's Market of Death”. *Vanguard*, 11 October, 2019.

drugs. What makes this practice immoral is that the packaging is sophisticated so much that medical experts in the field find it very difficult to differentiate the fake from the original except through laboratory analysis. The faked drugs are found among the fast-selling brands and disgustedly they are sold at the same price as the original drugs.

The whole world is devastated by the Coronavirus which occurred in Wuhan, China in December 2019. In the article "The Origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status" nine authors agreed that it started in Wuhan, China.⁷ The World Health Organization declared Coronavirus a world pandemic because it has become a disease that people are not immune to as it spreads across large regions of the world. The problem with coronavirus is not its origin that is traced to either bats or pangolins, how after several years after the appearance of the virus around the globe, improved science and technology cannot exactly explain how the virus came in contact with human beings. According to Johns Hopkins' report:

The first case of COVID-19 was reported on Dec. 1, 2019, and the cause was a then-new coronavirus later named SARS-CoV-2. SARS-CoV-2 may have originated in an animal and changed (mutated) so it could cause illness in humans. In the past, several infectious disease outbreaks have been traced to viruses originating in birds, pigs, bats and other animals that mutated to become dangerous to humans. Research continues, and more studies

⁷. Yan-Rong Guo et al. devastated by the Coronavirus which occurred in Wuhan, China in December 2019. In an article "The Origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – an update on the status". Military Medical Research. (2020) 7: 11, <https://doi.org/10.1186/s40779-020-00240-0> retrived on 25/02/2022 3.29am

may reveal how and why the coronavirus evolved to cause pandemic disease.⁸

This is one strand of the story of the origin of Coronavirus. There are so many other strands. The lab leak conspiracy has gathered momentum over the world as presented by Timothy H. J. Nerozzi on Fox News Channel. Scientists of repute think the coronavirus is not a product of evolution, but some lab process”.⁹ The science that is interested in finding the truth will not relent until it gets to the truth of the matter. The ethical issues arising from the outbreak of the coronavirus are contained in the universal spread to all regions of the world, the uniform application of the lockdown principle to reduce its spread, the difficulty of different laboratory tests giving different results to patients among others.

The field of physics is not exempted from cases of unethical behaviour among scientists. This strange unbecoming attitude was acknowledged when it became necessary for more emphasis to be placed on carrying out the most appropriate research conscious of attempts to destroy the reputation of scientists. Kate Kirby and Frances A. Houle described two cases of unethical publications that rock the Physics community. According to them: “The fabricated data and resultant false claims appeared in multiple-author papers that had been subjected to peer review and published in respected journals. The discovery of the fabrications prompted considerable soul searching in the physics community and raised concerns that APS should perhaps be doing more to promote ethics in physics”.¹⁰

⁸. The Johns Hopkins University, The Johns Hopkins Hospital, and Johns Hopkins Health System.

⁹. <https://www.foxnews.com/world/uk-government-covid-origins-wuhan-lab>.

¹⁰. Kate Kirby and Frances A. Houle. “Ethics and the Welfare of Physics Profession”. *Physics Today*, November 2004, Pg. 42.

Warning stakeholders in research institutes, it became paramount for scientific and technological research in any part of the world to be done in a manner that does not bring disrepute to the integrity of the participants. Aware of this all-important factor, the American Physical Society (APS) wrote:

The physics community has traditionally enjoyed a well-deserved reputation for maintenance of high ethical standards and integrity in its scientific activities. Indeed, the American Physical Society is one of the few professional societies which have not felt the need for a formal code of ethics.¹¹

This is indeed a statement of integrity in the field of physics. Society was aware that a good reputation is critical to the life of an individual, the group and the nation at large. This requires that workers be unbiased in their search for truth. The physicist should have a clear understanding of the method adopted for the research. The truth of the matter is that if workers are researching for a better knowledge, it is an indication of being loyal to the State. It behooves the government to fund such vital research that is error-free. This will go a long way in giving confidence to the beneficiaries of the products of the research findings. It is on the exhibited sincerity of any organization that the welfare packages depend on in the world.

The medical physician needs the application of ethics more than other disciplines because of their association with human life directly. Anything contrary to maintaining the ethics of their medical profession, the name of the individual is at risk just like the reputation of the organization. No matter the kind of legislation in place, when it comes to issues of life, no legislation is greater than the reason for the protection of life at whatever level it is. Is it safe for a young mother to seek to abort her pregnancy for any reason?

¹¹ W. Broad, N. Wade, *Betrayers of the Truth*, (New York: Simon and Schuster, 1981), Pg. 81.

The pro-abortionist would say yes and the pro-lifers would say no! There are so many reasons for a mother to decide to abort her pregnancy in consultation with a medical doctor. However, when abortion is contemplated, the life of the child which is at the point of contemplation is defenseless but real and valuable. This life should be respected and be given all the rights due to it. It is uncharitable to kill a potential human being in the name of freedom of choice.

Plagiarism: Unethical Conduct on Data Management

The idea of plagiarism is an attempt as sweet-coating evil by not calling it the right word. When data is used in a work without acknowledging its source, it is theft and should be seen as stealing. Yes, the result of the new study is reliable, but it is short of affirming through the process of verification of a previous discovery or finding. Apart from refusal to acknowledge the source of information, it gives way to unguided falsification of data which is not a true representation of the findings of the current study. The reason for falsification of information is evil intended as it is a way of not applying the funds collected from the sponsors to their full usage. This leads to misrepresentation of scientific experiments as well as the products and outcomes. These unethical behaviour are some of the challenges that called for the introduction of professionalism in the conduct of research. All concern expects that for every specific observation and experiment a statement of claim is to be made, the procedure should be open to verification. This does not preclude the possibility of change if the tested hypothesis produces something new and better due to the availability of new data.

The failure to follow such laid down procedure amounts to plagiarism. The evil of plagiarism encourages evaluators in most of our educational systems to touch the surface superficially the articles presented for promotion of candidates in the name of the “Politics of publication” to the detriment of the content of the

article and the depth of its analysis. In most Nigerian Universities what is required for the promotion of academic staff among other criteria is the number of articles one publishes in an “impact factor” journal like the Springer, Elsevier, etc. that followed the rating of Thomson Reuters. These organizations do not understand that articles in the Arts and Humanities are not rated on an equal basis as those in the sciences, applied sciences, and the social sciences. It becomes a serious crime not to promote staff because they are not able to publish in Thomson Reuters that is more of a science-based journal than it is for arts and humanities.

The problem in making decisions of publishing articles in “Impact Factor” Journals is the result of lack of self-confidence by those in the University Administration. Academia must note that it is not everything that glitters that is gold. A book should not be judged by the cover, but the content which is appreciated after rigorous reading of the material. These breaches of ethics regarding academic rating take place in Universities. This is succinctly captured in these words:

The researcher . . . will be judged [by] the number of articles, and the corresponding journal names, appearing on the CV. He or she will not be judged [by] the work spent on each paper, how many backup checks were performed to confirm the results, and so on. The high number of papers, in highly ranked journals, is what builds a career. . . . The recent sad events [show] that it is for many people more important to publish spectacular results than to publish true results.¹²

It is apt to state based on the statement cited above that ethical issues are not tied to the appropriation of chemical or magnetic particles alone. They involve a professional code of conduct which

¹². Ethics and the Welfare of Physics Profession” *Physics Today*. November 2004, 43. <http://www.physicstoday.org>.

is needed for effective transfer of knowledge. It is unethical for professionals not to acknowledge younger scholars when they source materials for their research articles, and presentations at different for a. There is no gainsaying that ethics is significant to human existence. It is critical because ethics readily permeates every aspect of human life. Ethics can be a guide in the field where the physical scientist or technologist is at work.

Fact-Value Distinction

Experimental sciences deal with statements of fact but are merely based on the collection of facts. The scientist abhors what is termed opinion or speculations based on speculations of an individual or group of persons. The facts are gotten through experiments and observations. An empiricist tells you what is and a moralist prefers to discuss what ought to be. The former is understood as a fact, while the latter deals with value. It is not everything that is said that is true can equally be right and vice-versa. I indeed borrowed a gun from Mr. A, it is not right for me to return the gun to Mr. A when I discovered that he is mad. This example presents the source of conflict of interest between science and ethics or facts and values. It is apt this paper to define fact as an objective truth about an event or statement obtain through the scientific process and it can be empirically verifiable through the senses to form knowledge. The definition speaks of objective truth about objective reality. Little wonder that Henri Poincare declared that "Science is built of facts the way a house is built of bricks: but an accumulation of facts is no more science than a pile of bricks is a house".

Value cannot be measured as objective truth because what ought to be can never be objective. I make bold to define value as a subjective approach on issues based on an individual's reasoning concerning personal faith or ethical worldview which cannot be scientifically proven to be either true or false. A practical example of an Aristotelian syllogism is helpful.

- a) A mother cannot survive without a transfusion of her son's rare blood type – what is
- b) It is only right for the son to help his dying mother – what ought to be
- c) Giving blood involves no risk whatsoever – what is
- d) The son ought to donate blood to his mother – what ought to be

There are two statements of fact a & c as well as two statements of value b and d. the statements of fact can both be empirically and logically verifiable. They are objective truths. The statements of value are purely subjective because the son could decide not to help his dying mother and refuse to donate blood to his mother. Whether it is right or wrong, it is not possible to explain the value judgment reach at this point purely from the knowledge one gathers of the material world. A Jehovah's witness who before deciding whether or not to donate blood for transfusion has subjectively switched off on blood transfusion, so the decision not to donate blood to his dying mother was already made before the question was even asked. Such action is comparable to carrying out scientific experiments with controlled experiments.

The import of the above discussion is that a fact is not determined by the belief of the presenter. A fact is always independent. A fact is exclusive of the observer and the observed. In every physical science, everybody with the pre-requisite skills can verify the fact of an issue or statement. It is not out of place to categorically state that a fact simply is. Such facts are universally attainable if and only if the procedure is applied, the same result is gotten. It is right to talk about truth and trust in matters of facts. However, there are facts that at a point may not be known, but this does not preclude that they may not be known at all later. For example, the atom was earlier defined as an indivisible element, but in recent times the atom has been discovered to be divisible.

The crux of the matter with the fact-value statements is that it is difficult to make a value-laden claim like a factual claim. Factual claims can mistakenly create cause and effect in everyday life. While values determine what becomes a culture of a people. This is obtainable in our modern world where one's meat is another's poison or what gives you pleasure gives me pain. This has propelled politicians in most of Africa to defect from one political party to the other without thinking of the consequences of their actions on other followers. For instance, a one-time founding father of the People's Democratic Party (PDP) defects to the All Progressive Congress (APC) without consulting those who followed him/her for personal reasons.

This explains a value judgment in which complete acceptance of all variables is possible. Nevertheless, it is not even possible for anyone to live without thinking of value. There are times each individual believes in subjective value, but there are times there is an agreement among the different persons. This agreement creates the culture of a people. The cultural elements that stand out tall in a community or society may not be resolved, but interested parties who want to live peacefully with one another must learn to tolerate the parties in a dialogue.

Values and Morals

The attempt to examine the relationship between ethics and the physical sciences is to guide the scientists in physical science to make decisions that are conscious of the dignity of the human being. An appreciation of what morals and values are will go a long way in explaining why individuals are different in their beliefs, choices, and attitudes. When an individual makes moral claims they are like facts, but these moral claims are not facts. The reality is that morals are culturally and socially formed and inculcated through societal learning. Morals are conventional and grounds for judging the character of an individual. The presence of morals in a society motivates living a good and happy life. This is

the biggest challenge the ethicist who is involved in value judgment faces in life.

There is no certainty about the truth of a value. There is no experiment one has to perform to investigate values like tolerance, the immorality of suicide, or murder. This brings in the issue of the is-ought barrier. It is a barrier in the sense that one is not able to ascertain with certainty the fact that a thing is this way it ought to be this way at all. Hence, it is much homely to state that all values are better considered as matters of opinion and preference; they are at most relative to the agent and the culture of the judge. This position is unacceptable rationally. For if all value judgments are subjective, then it is possible to justify any action, including the worst one can imagine. Available cases can be cited to support this argument. Some of the most notorious and brutal criminals have attempted to justify their actions, suggesting that they did "the right thing." A good example is that of Al Capone, the famous gangster who is quoted to have said that "I have spent the best years of my life giving people the lighter pleasures, helping them have a good time, and all I get is abuse, the existence of a hunted man".¹³ The second case is that of "Slobodan Milosevic who in February 2002, repeatedly denied all guilt concerning his orchestration of genocide in the Balkans".¹⁴ If values are relative, who's to say they were wrong? This allows any action to be morally justified. Uncomfortable with such moral relativism for this very reason, many ethicists have channeled considerable effort into finding a foundation for morality¹⁵ in the physical sciences.

^{13.} Carnegie, Dale. *How to Win Friends and Influence People*. Pocket Books, 1964.

^{14.} At Tribunal, Milosevic Blames NATO: Yugoslav Ex-Leader Opens Defense, Mostly Ignores Charges. *Washington Post*, February 15, 2002.

^{15.} Schultz, Norman. "Distinguishing Facts from Values." *Beyond Intractability*. Eds. Guy Burgess and Heidi Burgess. Conflict Information Consortium, University of Colorado, Boulder. Posted: June 2003 <<http://www.beyondintractability.org/essay/facts-values>>

Conducting Responsible Research in the Physical Sciences

Ethics makes for responsible actions and ways of thinking. It deals with the right and wrong of thought or action. Can we say that ethics is a science? The feeble-minded person would always say no to the question. The simple response comes as a result of the fact that as a science it cannot act in favour of statement of fact and statement of value. Ethical issues cannot be universally and objectively applied to every situation. It is largely conventional and relativist. David Hume sees this perspective as a “naturalistic fallacy” through which he explains the reality of an eternally parallel line between ought and is. He summarized the argument thus:

In every system of morality, I have always remarked, that the author proceeds for some time in the ordinary way of reasoning...when of a sudden I am surprised to find, that instead of the usual copulation of propositions, is, and is not, I meet with no proposition that is not connected with an ought or an ought not. This change is imperceptible, but it is, however, of the last consequence. For as this ought or ought not, expresses some new relation or affirmation, it must be observed and explained; and at the same time that a reason should be given, for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it¹⁶

The beauty of the argument is in the demonstration of how a philosopher can “observe and explain” the transition from is to ought which distinguishes between the realms of fact about the empirical world and value which deals with moral knowledge. If this is true as Hume presented it, then, it is fair to state that Hume

¹⁶ David Hume. *Treatise Concerning the Human Nature*. Pg, 1739–49.

was not out to deny the reality of a change that is “of the last consequence” (T. 469) which should not be considered too fast. The important thing to do is to “deduce” the ought relation if morality is to be derived from their way of reasoning. Let us consider Hume's example (a) we ought to have no other gods before Jehovah and (b) this is what Jehovah commands “seems altogether inconceivable” (T.469). Statement 'a' and 'b' represent matters of fact and matters of value respectively. It is based on this understanding that Hume concluded that there is no sound inference or reasonable transition from is to ought is possible.

It should be noted that Hume did not claim to demonstrate that it is impossible to make a connection between natural facts and moral imperatives. However, he claims that it is possible to at least transit from is to “should” with careful observation and explanation of natural facts about human agreements or conventions to conclusions about our “natural obligations or moral”. A good number of examples are handy. These include the obligation not to rob, steal, break promises, etc. this is an emotivist approach to ethics as he prefers to see reason as a slave of passions. This kind of skepticism is tied to the possibility of human beings having causal knowledge of the natural world.

This understanding was strongly rejected by Immanuel Kant who was of the view that causal relations are not relations between things as they are noumena “in themselves”, they are rather between things as they are presented to us in the phenomena which are through experience. What does it mean to say that things are “in themselves”? Why is it not possible to know things as they are “in themselves” by human beings? How can human beings only know things as they are given to us in the experience? These were the questions of facts that were bordering Kant. These questions were put to rest when Kant came up with the Critique of Pure Reason in which he declared that our minds are not just passive receptacles for sensory experience.

Our minds can structure sensory inputs in every human being in a certain way. He speaks of categories like time and space which are prior to all experience. How are they before all experience? Kant began by explaining what being “a priori” means in his scheme of work. By “a priori” he concluded that the laws of nature are ultimately grounded in the structures of human perception, rather than like “things in themselves”. Therefore, how things are “in themselves” cannot be known by us. This is because there are limits to human reason.

It was from this conclusion that Kant decided to attack Hume's notion that reason is the slave of the passions. Still, with the aid of the Critique of Practical Reason, Kant demonstrates that our moral duties can be rationally derived. The import of his position is that reason should never be a slave to the passions but should rule the passions. Kant is aware of human nature as an autonomous rational agent and as such, they are ends in themselves. This is the understanding that is deeply lacking in most people in our contemporary society, especially in Africa. Leaders in various positions treat other human beings as means to an end, not as ends in themselves. They treat themselves as ends in themselves but turn to treat others as means to an end. This is often done by allowing their rational wills to serve as an instrument of their sensual desires.

The politician does not see the youth as a free individual to be empowered so that his/her future is bright. They see them as means to their becoming a chairman, assembly member, member of the national assembly, governor, minister, and president of a country. This is what Kant abhors when he cautioned that we should never use others as a means to our ends. This position which is our basic duty of ourselves and that of others is clearly articulated in the different versions of the “categorical imperative” especially in the Groundwork of Morals wherein he declared that “Act only according to that maxim whereby you can, at the same

time, will that it should become a universal law".¹⁷ One thing is very clear with these readings. There exists a tension between Kant's epistemology and ethics.

In his epistemology, Kant upholds that the natural world is governed by causal laws, while in his ethics; human action is governed by moral laws. This parallel tension is not feasible for the harmony of the human being who is principally an embodied being; spirit and body. It is impossible for a composing being to be controlled by two sets of diverse laws. The spirit is free but imprisoned in the body. How can the free spirit act in a world that is causally determined by sensual desires? Kant appeals to the mysterious noumena faculty of "the will" which somehow transcends, but supervenes on nature. This would be explained later in the work.

Influence of Ethics on Scientific Research

The focus of this paper is to examine how values that are embedded in ethics influence scientific research which is directly built on facts. To achieve our goal, it is important to go the way of Elizabeth Anderson who insists that the distinction between fact and value demands that "not only that facts be value-free, but that values be fact-free". What does this mean? It means that a scientific researcher should do everything within its power to avoid value commitment to affect the research process. If this is not watched, the findings of our research would also be affected. The fact of the matter is that commitment to scientific truth as an "ultimate value" is capable of shading or distorting their research findings. Some good examples of values that affect our choice of research problems and the commitment to carry it to fruition are given thus: (a) a feminist might be more likely to study gender than a non-feminist (b) a libertarian might be more interested in studying individual rights than a non-libertarian. This way of thinking has a

¹⁷ Kant, I. *Groundwork for the Metaphysics of Morals* (T.K. Abbott, Trans.), 1883, (Original work published 1785).

tremendous implication on universities globally. The compositions of specialized universities like universities of agriculture, health, and technologies have contributed immensely to the production of facts, than the conventional universities. This will go a long way to making the world a secured place.

Speculation and Verification

There is no need for those who know about the study of knowledge to waste so much of their time debating of a close tight relationship between speculation and verification. This is a cordiality that has existed between philosophy as a particular field of study and science. The comment is necessary for those who may argue that philosophy is not a science. Let us agree that it does not need the rigorous interpretations of its variables, it is relevant to show that there can be no scientific progress without philosophical speculations. Why do I say so? Why is this aspect of knowledge not given fair recognition by scientists and her allied forces? Whoever wants to make progress in life, the person must recognize the role of speculation. It is so critical for successful scientific discovery. The acceptance of speculation is the birth of a healthy society. There is no way sciences can make a better society without hypothesizing and bringing out the diverse functions of that which is to be. The matter for worry is that if those in the humanities who are custodians of critical thinking, especially philosophers fail to promote productive speculation, then we are doomed to be eternally destroyed.

Conclusion

The effectiveness and efficiency of the physical sciences to meet the expectations of those who depend on their functions, it must not just be talked into being ethical. It must be seen to be ethical in all its ways. Ethics is speculative and the physical sciences depend on the principle of verification. As ethics theorizes, the physical sciences attempt to put the solutions in forms that are used by human beings. This task is the irreducible power that is vested in the

humanities in general and philosophy in particular under the guise of ethics. A lot of people “who do not understand the contribution of ethics, have refused to appreciate the justification the scientist gives for any discovery”.¹⁸

The significant thing to take to heart is that the whole field of humanities has become ultimately the power-house of any development in the world. It is high time governments around the globe and in Africa, in particular, bring this understanding to bear on their national policies, especially about the education of the younger generation. Too much emphasis on science, mathematics, and technological education to the detriment of arts and humanities cannot produce the required fruits of an educated society. All hands must be on the desk to nurture the growing relationship between ethics and the physical sciences. A relationship between both concepts must be transmitted to every discipline that touches humanity. Ethics naturally permeates the cultural spheres of science, morality, art, and religion. This reality is cannot be denied. It has to be built on for purposes of integral development of both natural and human resources in our world.

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