THE INCOMMENSURABILITY THESIS AND THE MYTH OF OBJECTIVITY OF SCIENTIFIC THEORIES

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Abstract

Science has become a powerful impulse in human society by virtue of its significant contributions in shaping the activities and lives of humans, and this image of science is mainly due to its method which has, no doubt, yielded profitable theories that have achieved appreciable outcomes for the benefit of humans. As a result of these benefits, the image of science is held with high esteem, and science is seen as a colossus of advantaged outcomes for human benefit. This image of science is derived from the potentials attributed to the general corpus of scientific theories. The problem here is that such image of science is a product of the assumption that there is a common measure for all scientific theories since all scientific theories are derived following the same scientific method. This implies the claim that scientists can discuss a range of, if not all, scientific theories using a shared nomenclature that allows direct comparison of theories to determine which theory is more valid or useful. In the sequel, using the analytic method, this paper argues for the counter-claim called incommensurability of scientific theories which has become one of the most controversial theses to emerge in the philosophy of science, leading to the rejection of a fixed scientific method and thus, proposing a post-positivist or historical philosophy of science. Though there are different theses of incommensurability, the paper argues for methodological incommensurability given the absence of common standards of theory appraisal. It further illustrates this point with reference to Kuhn's paradigm shift. It concludes that if truly scientific theories are in large part methodologically incommensurable then the objectivity of scientific theories and science in general is a myth.

Keywords: Science, Scientific Theories, Incommensurability, Scientific Method, Objectivity Myth.

Introduction

Today, science has developed tremendously such that it dominates global intellectual space. It plays a major role in the society, it has brought so much progress to society and it drastically influences virtually all aspects of society. In fact, it is evident that science portends progress and advancement of society. The progress is indicated in the productions being achieved by the consequent development of technology and industry, and the conveniences, comforts and power we have got through scientific knowledge. Apparently, most people think so highly of science because it has much hold on the minds of people in the society given the progress it brings to society. Is progress a justification for the exceptional status of science? Other forms of life, of course, have also produced results and brought progress as well.

The achievements and progress of science are attributed to its method. Feyerabend (1975: 15) asserts that science claims to have "found a method that turns ideologically contaminated ideas into true and useful theories, then it is indeed not mere ideology, it is an objective measure of all ideologies." With the claim of the objectivity of its method, scientists are confident by thinking that at least science is objective. Agazzi (2017: 185-6) lends credence to this attitude when he observes that since scientific propositions are characterised by uncertainty, what becomes the more immediate aim of scientific research is not truth but objectivity. Thus, majority of scientists continue to strive for objectivity. In fact, scientists take science as a public discourse and are cognizant of the "need for mutual information, practice of international cooperation, exchanges between specialists of related fields, usefulness of reciprocally testing experiments and computations and comparing viewpoints" (Agazzi, 2017: 186).

Nevertheless, there is a distinction between objectivity in the strong sense and objectivity in the weak sense depending on whether it refers to the object or to the subject, respectively. Accordingly, objectivity in the strong sense entails a reference to the object – objective, in this sense, means a characteristic, a property, a judgment that concerns 'what is inherent in the object', whereas objectivity in the weak sense fundamentally expresses the idea of an independence with regard to the subject (Agazzi, 1998: 56). However, the strong sense of objectivity has lost attention and was replaced by objectivity in the weak sense. In any case, contemporary science offers objectivity in a weak sense as formulated in philosophy as consisting of three formal aspects namely, independence from subject, universality and necessity that are now translated as intersubjectivity and variance in its current version, especially regarding the sciences.

Inter-subjectivity is the more recognised sense of objectivity among scientists and it suggests that a discourse or an affirmation may be put to test by anyone who has a sufficient training in relation to the affirmation, such that the same affirmation can be tried beyond the particular time and space which determine the existence of its originator. As such, the plurality of specialists involved is not enough to ensure objectivity. Rather for the affirmation to become objective, there must be an agreement made by the specialists based on the result of the independent tests using the same method and experiment. On the other hand, the affirmation becomes invariant when it is proven correct by different specialists in different places and time. Thus, the objective method of science is built on the desire to attain unification in science.

Historical materials reveal that over the ages, scientists, philosophers and historians have sought to explain and or to defend the objective scientific method. For example, in addition to Evandro Agazzi's posits above, Nagel (1986: 26) insists that "the pursuit of an objective understanding of reality is the only way to expand our knowledge of what there is beyond the way it appears to us". On the contrary, some critics from philosophy of science have questioned the possibility of objectivity. There is in fact the argument that objectivity of scientific theories is a myth; this is the core argument of this paper, using methodological incommensurability as a yardstick. In like manner, it has been observed that critics frequently ask whether scientists succeed in attaining objectivity or whether objectivity simply means an ideal and nothing more (Durbin, 1988: 211).

The Image and Impact of Science

Talking about the image of science, what comes to mind is the attitudes of people in the society toward science. In other words, the image of science is what comes to the mind of people about science. The general image of science is represented as a good thing since science is responsible for progress; for preserving more lives and for improving the health and comfort of the population. Indeed, science has made mostly positive impact on society as overwhelming majorities say that science has had a positive effect on society and that science has made life easier for most people.

In the early part of the modern era, science had a glaring and unchallenged image that was totally acceptable to both the scientific community and the general public. This image was that of rationality considered to be the scientific method which generates a 'logic of justification' (Newton-Smith, 1981: 1). The scientific method was affirmed because it often corresponded to the realities of nature, though susceptible to change which can be corrected. At this point, this made science the only human activity in which error prompting change are systematically criticized and corrected in view of progress (Popper, 1970: 56). Thus, it is the scientific method that provides a technique for the objective appraisal of the merits of scientific theories.

With its method, science has developed tremendously and the scientific practice dominates global intellectual space. Thus, modern science plays a major role in society especially because of the so much progress it has brought to society with its auxiliary technology. Indeed, science has had a major impact on society and the impact keeps growing as it drastically causes change in virtually all aspects of society. Evidently, science "has made very rapid progress and completely transformed outwardly, the manner of our living" (Krishna, www.pkrishna.org/Impact_science_society.html) and society as well.

Due to accumulated scientific knowledge, society has been grossly transformed in its various aspects such as our means of communication, the way we work, our clothes, housing, food, our methods of transportation, and even the length and quality of life itself. It has, no doubt, made life easier. These are evidences that science portends progress and advancement of society. The progress is indicated in the productions being achieved by the consequent development of technology and industry, and the conveniences, comforts and power we have gotten through the scientific knowledge.

Apparently, science has much hold on the minds of people in the society, and so, most people think so highly of science. Consequently, with the progress it brings, science has designed a cognitive model for society. The cognitive model is not merely some psychological fantasy but a conceptual framework, a recognition system which determines what reality is or not. Anything that does not get the recognition and approval of this model is rejected as meaningless, or worst, as unreality. Thus, human perception is subject to the direction and control of the cognitive model of science, both at the individual level and at the level of the entire society. The cognitive model of science, then, is what sets the rules, defines the structures, bestows meaning, sets up the ethics, values, beliefs, knowledge and almost everything else in society, simply because science brings progress and development.

Invariably, science tells us what reality is and we have only to take it as 'thus says science', whether it is correct or not. In short, the cognitive model of science is designed to control all decisions and actions in society. Through its cognitive model, as revealed by historical materials, science wields enormous influence and control on society. From the foregoing, one major impact of science on society is that it imbues in us the attitude that we can accomplish anything and everything, especially if we find and apply the right technology. This is a fixation on science and it is borne out of the belief that its investigative methods are applicable or justifiable in all fields of inquiry and all matters in society.

However, there was emergence of some controversies with regard to the relationship between scientific theories. There were objections to the supposed position that theories drawn from rival paradigms were commensurable. These objections, championed by contemporary philosophers of science like Thomas Kuhn and Paul Feyerabend, no doubt, altered the initial image of science which was dismissed as being insufficient to qualify the practice of science. In short, according to Feyerabend, as cited in Newton-Smith (1981: 3), the pretensions of the scientific community that it does approximate to the image represent a distorting ideology which is propounded to serve the interests of the scientific community. In the midst of the controversies, however, the concept of incommensurability was introduced in explaining the nature and relationship between scientific theories.

The Nature of Scientific Theories

Theories are a particular type of abstract entities contained in the empirical sciences. Other aspects of the basic structure of science such as data, shaping principles, methods, instruments, etc. make sense only with respect to particular theories accepted and used by scientists hence the notion of scientific theories is important to understand the nature and processes of science. In the empirical sciences, a theory refers to a conjecture or proposition accepted in view of a given scientific operation. This means a theory is an assumption or system of assumptions, accepted principles and rules of procedure based on limited information or knowledge devised to analyse, predict, or explain the nature of a specified set of phenomena or abstract reasoning. In other words, a theory is a generalisation or a set of generalisations purportedly making reference to unobservable entities, e.g. atoms, genes, etc. (Salmon, 1992: 506).

On the general note, the word "theory" has its etymological foundation in "*theoria*", which literally means "a looking at, viewing or beholding". However, in philosophy, the technical usage of the term theory dates back to the Ancient Greek where it referred to contemplative or speculative understandings of natural things, such as those of natural philosophers, as opposed to more practical ways of knowing things like that of skilled artisans. In this sense, Plato conceives a theory as a statement of how and why particular facts are related whereas Aristotle sees theory in contrast to "practice" which is derived from the Greek word "*praxis*" which means "doing" (Ukavwe, 2013: 28). Nonetheless, in modern science, the term 'theory' refers to:

> a well-confirmed type of explanation of nature, made in a way consistent with scientific method, and fulfilling the criteria required by modern science….Given this reason, there is no gainsaying that scientific theories are the most reliable, rigorous and comprehensive form of scientific knowledge (Ukavwe, 2013: 29).

From the foregoing, a scientific theory, according to Onyibor (2007: 86) is:

> a system of rules, procedure and assumptions used to produce results. It can also be defined as a set of hypotheses related by logical or mathematical arguments to explain and predict a wide variety of connected phenomena in general terms. It is normally an outcome of systematic research or investigation about certain phenomena.

The Assumption of Commensurability of Scientific Theories

Certain theses in the gamut of philosophy of science, stemming from the Popperian critical rationalism, assume a kind of unity in scientific knowledge, which at the same time suggests a semblance of scientific theories. One of such theses is the famous thesis on the accumulation of scientific knowledge which states that the body of scientific knowledge keeps increasing with the passage of time. Another of such theses is that of a neutral language of comparison which can be used to formulate the empirical consequences of two competing theories such that the theory with the greatest explanatory powers is chosen. Such theses further presuppose that theories can be inter-translated and that theories are conceived under the same standards of rationality.

In the sequel, the term commensurability was introduced to mean the assumption of a common unit of measurement in trying to interpret successive theories. The emergence of different theories brought glory to science and was perceived as growth per se by the scientific community. And so, these theories spawned from rival paradigms were comprehended to be commensurable since they were all working towards one good – the progress of science. A clear expression of commensurability is that "The commensurability of two theories can be defined (relative to a given set of questions) as the ratio of the total information of their shared answers to the total information of the answers yielded by the two theories combined" (Hintikka, 1988).

From the foregoing, a general conception of commensurability is that "it is a concept, in the philosophy of science, whereby scientific theories are commensurable if scientists can discuss them using a shared nomenclature that allows direct comparison of theories to determine which theory is more valid or useful" (Commensurability, http//www.wikipedia.com/commensurability/htm). The term was coined as a result of a series of problems encountered by Thomas Kuhn and Paul Feyerabend in trying to interpret successive scientific theories.

Some proponents of commensurability of scientific theories include Karl Popper, Imre Lakatos, and Hilary Putnam. However, the commensurability thesis entails that old and new theories have commonality. It does not negate the fact that there may be disparities between them. But it maintains that old paradigm is not completely shattered, as Kuhn proposed, but forms the presupposition for the new one. Hence, for the proponents, Putnam for example, incommensurability is quite incoherent, since we can translate scientific language of events or theories to present relevance (Feyerabend, 1987: 265).

An Overview of the Incommensurability Thesis

The incommensurability thesis is one of the major and most controversial themes in philosophy of science. To yield a productive discussion of the incommensurability thesis, it is imperative to derive an explicit terminological footing for it. The term ‘incommensurability’ has its origin in Ancient Greek mathematics where it meant ‘no common measure’ between magnitudes. Although the application of the notion of incommensurability to scientific theories can be traced back at least to LeRoy and Ajdukiewicz in Poincaré’s conventionalist tradition (Oberheim, 2005), the more modern application of this mathematical notion specifically to the relation between successive scientific theories became controversial in 1962 after it was popularised by two influential philosophers of science: Thomas Kuhn and Paul Feyerabend. They appeared to be challenging the rationality of natural science and were called “the worst enemies of science” (Theocharis and Psimopoulos, 1987: 596). Since 1962, the incommensurability of scientific theories has been a widely discussed and controversial idea in the philosophy of science.

However, the application of the mathematical concept to the case of alternative scientific theories is an extension of the concept that leaves considerable scope for variant interpretation. This is evident in the explanation that:

> Kuhn and Feyerabend argue that successive or rival scientific theories may be incommensurable due to differences in the concepts and language they employ. The terms employed by such theories are unlike in meaning, and even reference, so they may fail to be translatable from one theory into the other. Owing to such semantical differences, statements from one theory neither agree nor disagree with statements from another theory with which it is incommensurable; so the content of such theories cannot be directly compared (Sankey, 1999).

Obviously, there seem to be a gap between the concept of incommensurability in its strict sense of lack of a common measure and in its application to discussing alternative scientific theories in the incommensurability thesis wherein “The discussion is frequently couched, for example, in terms of such factors as the incomparability of the content of scientific theories, variation in the meaning of scientific terms, translation failure between the vocabulary of theories, or absence of common standards of appraisal” (Sankey, 1989: 2).

It is shown from available literature that there are different accounts of the incommensurability thesis but two dominant versions are often distinguished. The first version is the *semantic incommensurability thesis* which is the thesis that alternative scientific theories may be incommensurable due to semantic variance of the terms employed by theories. The second version is the *methodological incommensurability thesis* which is the thesis that alternative scientific theories may be incommensurable due to absence of common standards of theory appraisal (Sankey, 19898: 4-5). Within the context of this study, which gears towards the assessment of the acclaimed objectivity of scientific theories, methodological incommensurability is adopted as a benchmark for the incommensurability thesis.

The methodological incommensurability thesis holds that there are no shared, objective methodological standards of appraisal of scientific theory. Hence, alternative scientific theories may be incommensurable due to absence of common methodological standards capable of adjudicating the choice between them. The idea that scientific theories may be incommensurable in a methodological sense arises out of rejection of the traditional view that there is a uniform, invariant scientific method, employed throughout science, which is the distinguishing feature of science.

Kuhn and Feyerabend are the major contributors to the methodological incommensurability thesis though Feyerabend also contributed to the sematic incommensurability thesis when he took incommensurability to consist in absence of logical relations due to semantic variance of the terms used by theories, resulting in the inability to directly compare the content of theories (Feyerabend, 1962: 68-94). Kuhn's concept of the incommensurability thesis shall be the yardstick for this study. Kuhn's claim that standards of theory appraisal vary with paradigm constitutes the major argument of methodological incommensurability, as he argued against the traditional view, claiming that standards of theory appraisal depend on and vary with the currently dominant scientific paradigm. "There is," he wrote, "no standard higher than the assent of the relevant community" (Kuhn, 1970: 94). On the other hand, Feyerabend's own critique of a fixed scientific method, which he did not present under the rubric of incommensurability, marks another key reference to methodological incommensurability as he argued that the methods employed in science vary historically, and that all rules of scientific method have been justifiably violated at some stage in the history of science (Sankey, 1989: 9-11).

The Myth of Objectivity of Scientific Theories

There are some episodes in scientific history which demonstrate the very best, that is scepticism, and the very worse, that is self-delusion. Self-delusion has demonstrated the worse aspects of science especially where scientists had to bend for the exclusivity of purpose-built equipment, specialized training or national pride perhaps in the face of massive military and corporate funding and ownership or where a new knowledge is being classified as secret or being patented for profit (McCullie, 2011: 3). Such events are often presented as if they were not real science or not part of a 'sacred' ideal (Grant, 2007: 88-89).

Today, the sciences are held as the epitome of rational knowledge-seeking and this is orchestrated with slogans like '*extra scientiam nulla salus'*, meaning that 'there is no salvation (knowledge) outside of science.' And so, today's public, with little or no knowledge of the workings of science, effectively relies on blind faith in the 'goodness' of scientific progress. However, based on Fuller's (2010:1) suggestion "that our continuing faith in science in the face of its actual history is best understood as the secular residue of a religiously inspired belief in Divine Providence", it is arguable that science, like religion, is a belief system with its major difference from religion being that:

> Instead of invoking gods, scientific authority comes from the claim of objectivity, knowledge generated independently of human bias. So, here is the odd thing. Scientific ideas and 'truths' are not certain, unlike the claims of religions and logic: they are regularly overturned from generation to generation. Yesterday's Earth-centric planetary system has become today's heliocentric one. Yesterday's Newtonian billiard-ball universe has become today's curved space reality. Scientific truths of the past are today's forgotten fictions (McCullie, 2011: 5).

Whereas, the public conception of science is one that sees scientists as seeking and uncovering facts to rationally deduce truths about the world (McCullie, 2011: 5). This breeds the notion of objectivity in science which refers to:

> the idea that the claims, methods and results of science are not, or should not be influenced by particular perspectives, value commitments, community bias or personal interests, to name a few relevant factors. Objectivity is often considered as an ideal for scientific inquiry, as a good reason for valuing scientific knowledge, and as the basis of the authority of science in society (Scientific Objectivity, *Stanford Encyclopedia of Philosophy*).

The big question now is whether scientific objectivity is attainable. There are at least some reasons to believe that either science cannot deliver full objectivity, or that it would not be a good thing to try to do so, or both. Does this mean we should give up the idea of objectivity in science? There is no naysaying that the ideal of objectivity has been criticized repeatedly in philosophy of science, questioning both its value and its attainability. Being that the idea of the epistemic authority of science relies primarily on the objectivity of scientific reasoning, it becomes integral to understand the nature and role of objectivity in science. At least "using the term "objective" to describe something often carries a special rhetorical force with it" (Scientific Objectivity, *Stanford Encyclopedia of Philosophy*). Therefore, the focus here is to argue that the objectivity in science is a myth.

Indeed, the purported objectivity of science is a damaging myth. And the special rhetorical force which comes with the claim of scientific objectivity has in it a tendency of repression to accept anything and everything that has been processed through the so-called scientific method as absolute – as if to say 'thus says science.' Consequently, any attempted criticism of science is often met with 'you are not qualified to criticise', similar in tone to Jack Nicholson's famous 'You can't handle the truth' speech as Colonel Nathan R. Jessep in the 1992 film, *Few Good Men* (quoted in McCullie, 2011: 7).

This is how mythical scientific objectivity is – nothing but make-believe. In the wake of Thomas Kuhn's 'Paradigm Shift', which proves that scientific theories are incommensurable – a thesis that disallows objectivity – the purported objectivity of scientific theories will be unravelled and proven to be but a myth.

Thomas Kuhn's Paradigm Shift and the Myth of Objectivity of Scientific Theories

The Structure of Scientific Revolutions is Kuhn's famous and vital work in philosophy of science wherein he proposed the periods of revolutionary science through his discovery of anomalies leading to new paradigm. By this, Kuhn deviated from normal science – which propagates objectivity – as conceived by the scientific community. Kuhn further adopted his concept of paradigm in explaining his ideas on the nature of science and its theories. In Kuhn's perception, a paradigm is an irrational element that can be replaced by another new one, thereby resulting to a scientific revolution, and scientists work within a conceptual paradigm that strongly influences the way they see data. However, this may be difficult as it requires an individual scientist to break with his or her peers and defend a heterodox paradigm; when a more reliable paradigm is advanced it replaces the former paradigm (Ukavwe, 2013: 125).

Kuhn viewed science from a largely historical perspective instead of trying to present a formal description of science as a process. He concluded that science goes through periods of normality, punctuated by periods of radical revolution, that is, *paradigm shift*. And since methods could change incommensurably between paradigms, such revolutions precluded the possibility of a single scientific method hence he argues for the incommensurability of scientific theories. This is because the process constitutes the replacement of an old paradigm with a new paradigm. Meanwhile, there is still room for the emergence of another new paradigm resulting to another revolution. This affirms that the nature of science is susceptible to change and science is cumulative, that is, it is at the disposal to produce more and more truths about the world (Dohmen, 2003), without yielding to bottleneck objectivity.

Kuhn's claim that the old and new paradigms are incommensurable implies that the new paradigm cannot be proven or disproven by the rules of the old paradigm, and vice versa. Thus, he asserts that the normal scientific tradition that emerges from a scientific revolution is not compatible and often actually incommensurable with that which has gone before (Kuhn, 1970: 103). Kuhn insists that the old and new paradigms are totally different based on the way they are defined, viewed by scientists in that field, etc. He avers that the old and new paradigms (or theories) are rival theories having different theoretical framework. Thus, the new theory is not to be conceived as an extension of the old theory, rather a complete new theory indeed, and so they have no common ground. He stated this clearly thus:

> Since new paradigms are born from old ones, they ordinarily incorporate much of the vocabulary and apparatus, both conceptual and manipulative, that the traditional paradigm had previously employed. But they seldom employ these borrowed elements in quite the traditional way. Within the new paradigm, old terms, concepts, and experiments fall into new relationships one with the other. The inevitable result is what we must call, though the term is not quite right, a misunderstanding between the two competing schools (Kuhn, 1970: 149).

With the aid of conceptualization, Kuhn explains that even if the two rival theories are comparable, they remain incommensurable because new concepts are introduced into explaining the potency of the new theories as different from the old theories. Given the example of the theoretical concept 'mass' by Einstein and Newton, Kuhn explained that the physical referent of this Einstein's concept is identical with that of Newton in name, but they must not be conceived to be the same because Newtonian Mass is conserved and Einsteinian mass is convertible with energy (Kuhn, 1970: 102). Thus, on the basis of conceptual explanation of their meaning, they are compatible but not commensurable. On the other hand, on the basis of manipulation, Kuhn (1970: 143) posits:

> Both Boyle and Lavoisier changed the chemical significance of 'element' in essential ways. But they did not invent the notion or even change the verbal formula that serves as its definition. Nor, as we have seen, did Einstein have to invent or even explicitly redefine 'space' and 'time' in order to give them new meaning within the context of his work.

Evaluation and Implications

No doubt, the question of the objectivity of scientific theories and science in general has resulted to an uprising in the scientific community and allied disciplines. Today, the philosophical aspects of this argument have been elaborated with increasing sophistication and refinement. Of special relevance is the audacity to argue that scientific objectivity is a myth. This is what John Ioannidis, professor of medicine, did when he made observations that belie the claims of scientific objectivity by provocatively titling his piece "An Epidemic of False Claims". In this piece, he identified serious flaws in research practices, which he traces to meeting the public's ever-increasing expectations; fragmentation of exponentially increasing research programs; and researcher conflicts of interest with meeting the demands of lucrative corporate funding and achieving personal successes through highly-visible publishing (Ioannidis, 2011: 8).

Contrary to the objectivist view of science, Ioannidis identifies the following problems: (1) claims based on single studies, with replication being done "sparingly and haphazardly"; (2) withholding research data for competitive financial reasons and so preventing replication studies; (3) selectively reporting research results for maximum impact; and (4) deliberately designing and reporting studies to produce most favourable outcomes for research and, by implication, for the financial backers (McCullie, 2011: 11).

Clamouring for the objectivity of science presents science as a special kind of knowledge practiced by a distinct group of experts, but this portends a major risk which is the possibility of being led astray. This is because the compromise or general agreement of a special group of acclaimed experts may guarantee falsification or objectivity but does not guarantee the truth. Thus, objectivity does not imply the truth because it could be mere compromise. This suspicion is aptly expressed thus:

> Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers in the preceding generation…. As a matter of fact, I can also define science another way: Science is the belief in the ignorance of experts (Feynman, 1999: 462).

More so, critiques have demystified the substantive content of mainstream scientific practice, revealing the ideology of domination concealed behind the façade of objectivity. It has thus, become increasingly apparent that scientific knowledge, far from being objective, reflects and encodes the dominant ideologies and power relations of the culture that produced it. Consequently, it is not the case that science provides absolutes or exactitudes as it claims. Using the Newtonian mechanics as an example, it is indicated that although it describes the motions of the planets with great precision, it is nevertheless wrong. Quantum mechanics and relativity are closer approximations to the truth, which is an objective fact, but these theories will too one day be superseded by theories yet more precise (Sokal, 1998: 213).

Another important dimension of the objectivity of science is the marginalization of indigenous knowledge systems as observation shows that they are constantly systematically discredited while Euro-centric conceptions serve as a basis for dominant discourses. In fact, "indigenous technologies and conceptions of irrigation, metallurgy, textile-making, architecture or logics have been consistently discarded" (Pionetti, (n.d.)). Since the theoretical foundations and conceptual frameworks underlying the indigenous knowledge systems and the western one differ, it is absurd to gauge one in terms of another.

Conclusion

Finally, there is the possibility of science creating a monster, through an objective approach, that will harm people, turn them into miserable, unfriendly, self-righteous mechanisms without enchantment or humour. As such, there is the suspicion that the objective methodology of science will weaken man's strength as a human being. For instance, in education, today, scientific facts are taught at a very early age and it weakens the critical abilities of the pupils, depriving them from seeing things in perspective. With its objectivity, science is perpetually exempted from criticisms. Thus, there is the urgent need of a reform of science to make it more anarchic and more subjective. Feyerabend made this clear that "Science, of course, must be reformed and must be made less authoritarian". To conclude, following Feyerabend, "One of my motives for writing…was to free people from the tyranny of philosophical obfuscators and abstract concepts such as 'truth', 'reality', or 'objectivity', which narrow people's vision and ways of being in the world" (1975: 179-80).

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