Kuhnian Model of Scientific Revolutions: Applicability in Critical Social Theory

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Contents

Abstract

The conceptions of paradigms and paradigm shifts are central to Kuhn's thesis in the structure of scientific revolutions. Thomas Kuhn discusses intensively these ideas in his book, *The Structure of Scientific Revolutions.* Putting these ideas as overarching principles, he talks about the situation where the world changes for scientists when paradigms change. Kuhn says at times of revolutions or paradigm changes, scientists see new and different things when looking with familiar instruments in places they have looked before. These brought into social context, a newer form of understanding in critical social theories can be adapted.

Introduction

The overall purpose of this research is twofold. At the most general level, I want to show the basic structure of Thomas Kuhn's model of scientific revolutions. I will discuss the major components of the model. The paper is based on the readings of Kuhn's *The Structure of Scientific Revolutions*, second edition, Chicago: University of Chicago Press. 1970. His further writings and other critiques have also been reviewed. I have omitted most of the reviews because of space and time limitations. Nevertheless, I have selectively incorporated those deemed to be of relatively higher significance in the discussion part.

Thomas Kuhn discusses intensively the ideas of paradigm and paradigm shifts in his book, *The Structure of Scientific Revolutions.* At the heart of the Kuhn's thesis is the concept of paradigms and paradigm shifts. . Putting these ideas as overarching principles, he talks about the conceptions of the situation where the world changes for scientists when paradigms change. Kuhn says at times of revolutions or paradigm changes, scientists see new and different things when looking with familiar instruments in places they have looked before.

Kuhn by invoking the "anomalous card" as an example, he introduces the concept of 'anomaly' and how this leads to crisis. And using this, he shows how science is in continuous revolutions and perpetual change of paradigms. Unlike philosophical formulations, a scientific revolution sways the whole scientific world. Whenever such revolutions occur, as there is no higher authority to refer to, the scientific world can do nothing but accept to adjust itself with the new world.

The first purpose of the research is, therefore, to illustrate Kuhn's model and the scientific revolutions and defend his position. I will defend his position from the critical attacks of

different philosophers like Karl Popper and Paul Feyerabend. Among others especially these two philosophers have severely criticized Kuhn from different angles.

The second and most important concern of the study is to show how Kuhn's model can be relevant in the studies of critical social theory. But before doing that I will briefly discuss those I believe are relatively important theories in critical social theory. After doing that I will show how these thoughts can map in Kuhn's model. I will do that by giving examples and drawing analogies. Foucault and Habermas will be of special concern.

Chapter I

The Model of Scientific Revolutions

An understanding of the way science develops, progresses and functions is one of the controversial issues in the dominion of the philosophy of science. Not only that, the very nature of science is not spared from such debates. Thomas Kuhn, among others, is one who has come up with an extraordinary way of explication the nature and progress of science. He believed that there is a basic problem with the conception of science as being depicted by philosophers of science. Therefore he developed a new and alternative image of science that has effected a break in the tradition of philosophy of science.

> "*In effect, Kuhn mobilizes a new conception of the history of science, in which scientific revolution is fundamental and its nature contradicts the formal rationality, normativity, universality, logicism and progressive cumulativity sought by logical empiricists, and still embraced in new forms by contemporary philosophers*."[1]

Paradigm is one of the defining conceptions of sciences in his thesis. Science for him is that which is anchored in a paradigm. He argues that a science without a paradigm is a pre-scientific or as he calls it just mere data collection. Science is always guided by paradigms; and the progress between paradigms is not linear but revolutionary. A linear progress can only happen within a paradigm or within the normal science in a mopping up activities.

[1] *Encyclopedia of Philosophy*, Second Edition.

His point of departure, being a student of history of science, is the problems he encountered in the history of science itself. The problem he identified is that some historians of science found it difficult to comply with the concept of the cumulative development of science. Kuhn says that there are out-of-date beliefs which once were considered as scientific and which are not in principle unscientific because they are discarded. And the way history of science deals with them is a serious problem for Kuhn. He says:

> *"Rather than seeking the permanent contributions of an older science to our present vantage, they [historians of science] attempt to display the historical integrity of that science in its own time. They ask, for example, not about the relations of Galileo's views to those of modern science, but rather about the relationship between his views and those of his group… "* [2]

From the above quotation, it is clear to understand that his notion of paradigm is rooted in this. If one considers the out-of-date beliefs as scientific, those scientists must have been performing their vocation under different paradigms with the current science. Therefore, he says, "…science must have included bodies of belief quite incompatible with the ones we hold today."[3]

What then is a paradigm for Kuhn? According to Stanford Encyclopedia of Philosophy, Kuhn refers to paradigms as Aristotle's analysis of motion, Ptolemy's computations of plantery positions, Lavoisier's application of the balance, and Maxwell's mathematization of the electromagnetic field. Exemplary instances of science are typically to be found in books and papers, and so Kuhn often also describes great texts as paradigms—Ptolemy's Almagest,

[2] Thomas S. Kuhn , *The Structure of Scientific Revolutions*, (Chicago: University of Chicago Press. 1970) 3
[3] Kuhn 3

Lavoisier's Traité élémentaire de chimie, and Newton's Principia Mathematica and Opticks. Such texts contain not only the key theories and laws, but—and this is what makes them paradigms—the applications of those theories in the solution of important problems, along with the new experimental or mathematical techniques employed in those applications.

We should bear in mind, though, Thomas Kuhn, as we are going to see it later on this paper, uses the term paradigm in different senses and ways**.** Nevertheless, for our purpose, let us take his definition of paradigm as a set of received beliefs; and let us look at how these beliefs or paradigms are created.

For Kuhn, the whole process of the march towards a paradigm starts by the accumulation of data supplied by a current metaphysics, another science or by personal and historical accident; a point where everyone (school) concerned of a given phenomena describes and interprets the same phenomena in his own way. At this stage, where Kuhn calls it a pre-paradigmatic, these various schools compete with each other for acceptance and domination. But their existence is so limited that until one with the better theory than its competitors turns up. This theory would eventually be accepted as a paradigm but is never capable of explaining all the facts within which it functions. And most of the time, tagging of the paradigm, like Darwinian, Franklinian, Newtonian, takes place.[4] The rest of the pre-paradigmatic schools fade away and their members convert to the new paradigm. Those who opt to adhere with their own or other views would be ignored from the profession.

It is at this stage that the mopping up starts. By its very nature, according to Kuhn, the paradigm has two essential features. To be a paradigm, the achievement has to be of an exceptional so that to become a center of attention to all schools in the pre-paradigmatic stage and it should also be an open-ended to leave a room for the new practitioners to

[4] Kuhn 15

practice and work out problems within that same paradigm. This paradigm-based research is, according to Kuhn, "an attempt to force nature into the pre-formed and relatively inflexible box that the paradigm supplies".[5]

As a result, as they are in their early stage, paradigms are limited in scope and in precision. Therefore, they serve as guides to researchers for further researches. In addition, specialized magazines pop up and new equipment come. Kuhn says a reception of a new paradigm is associated with formation of specialized journals, a claim for a special place in curriculum, and foundations of specialists' societies.[6]

A paradigm is created in two ways; in the process by which we have seen above, i.e., from a pre-paradigmatic to the paradigm transformations. And on the other hand, it happens through scientific revolutions. And here we are going to see the phases of scientific revolutions, according to Kuhn, that eventually lead to a paradigmatic shift.

Martin Curd and J. A. Cover, in their book, *Philosophy of Science*, say, "…Scientific revolutions are taken to be those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one."[7] These revolutions are predicated in a normal science. As has been demonstrated above, after a paradigm is created, at its early stage, it is limited in its scope and precision. It is mostly a mopping up activity and hardly aims at producing novelty. This is, according to Kuhn, a puzzle solving activity.

Puzzle solving is an activity to reach into a predetermined solution. That is a research is conducted first by producing a proposal and then by stating in detail what solutions would

[5] Kuhn 15
[6] Kuhn 19
[7] J. A. Cover and Martin Curd, Philosophy of Science: The Central Issues, (New York, W. W. Norton & Company, 1998) 287

come up for a given problems. This problem selection is guided by the paradigm within which it belongs to. We can therefore say that a problem and a solution are within the paradigm. The purpose of doing a research is then to add the scope and precision of the paradigm with which the paradigm can be applied. To put it in his word:

> *"…that one of the things a scientific community acquires with a paradigm is a criterion for choosing problems that, while the paradigm is taken for granted, can be assumed to have solutions. To a great extent these are the only problems that the community will admit as scientific or encourage its members to undertake."*[8]

By its very nature normal science is a cumulative and progressive and is the realization of the paradigmatic promise proposed at the beginning. To this end, it applies and uses new instruments and equipment in its activities. This course is without any intention of coming about with novelty of theories and the success of normal science is judged by this lack of novelty. However, it is less likely that this doesn't happen. Kuhn says, "New and unsuspected phenomena are repeatedly uncovered by scientific research, and radical new theories have again and again been invented by scientists." (Ibid. 52) And this is a prelude to a paradigm shift.

This kind of novelty is the result of discovery and invention. Discovery is novelty of facts; and invention is novelty of theory.

According to Kuhn, therefore:

[8] Kuhn 37

> *"Discovery commences with awareness of anomaly, i.e. with recognition of that nature has somehow violated the paradigm-induced expectations that govern normal science. It then continues with a more or less extended exploration of the area of anomaly. And it closes only when the paradigm theory has been adjusted so that the anomalous has become the expected"* [9]

And obviously invention which is novelty of theory is a subsequent phenomenon to tackle this new fact. This anomaly is not as such a new thing by itself but is taken to be new when perceived against the paradigm. And the new inventions are as one way of defending the paradigm and resisting a shift in paradigm. And this leads to professionalization and making the rules of the paradigm more and more rigid. Rigidity is, therefore, the subsequent effect of resistance against a shift in paradigm.

Anomaly, as we have seen it, is an overture to crisis. The rigid restrictions of a paradigm persist to engage the anomaly in its capacity. But if the problem continues, i.e., if the current paradigm is unable to address it, professional insecurity follows. This is because as Kuhn describes it, "… that insecurity is generated by the persistent failure of the puzzles of normal science to come out as they should."[10] Failure of the technical puzzle solving activity remains to be the core of the crisis. Crises are not only a prelude to a destruction of a paradigm, but give a science a chance to explore deeply into the paradigm. Kuhn says, "The significance of crises is the indication they provide that an occasion for retooling has arrived."[11] Although a crisis is a prelude to a paradigm shift, scientists do not immediately abandon that paradigm which has faced a problem. Rather, Kuhn says, "They will devise numerous articulations and ad hoc modifications of their theory in order to eliminate any

[9] Kuhn 52
[10] Kuhn 68
[11] Kuhn 76

apparent conflict." Nevertheless, "some abandon science because they no more tolerate this crisis."[12]

Kuhn says, "There is no such thing as research without counterinstances."[13] It implies that whenever a crisis happens, confusion occurs in identifying as to which is an anomaly and as to which is a puzzle of normal science. This is because a crisis begins with the vague impression of a paradigm. For this reason, Kuhn says, "All crises close in one of three ways."[14] The first is that normal science handles the crisis and everything comes to normal aback. On the second occasion, the problem is labeled as difficult to be handled using the current tools of the paradigm and is passed over to next generation. Third incidence is, Kuhn says, "a crisis may end up with the emergence of a new candidate for paradigm and with the ensuing battle over its acceptance." [15]

This last occasion which results in a full scale transition to a new paradigm shift is what is called scientific revolution. At this stage, when a paradigm is declared invalid, Kuhn says, "Scientists do not see something as something else; instead they simply see it" and he calls this a change in "visual gestalt".[16]

So far what we have seen is the phases by which a revolution happens; and it would be of help if we further see, briefly, the nature of scientific revolutions.

The major features of scientific revolutions are illustrated by Kuhn as those which are non cumulative developmental episodes in which the older paradigm is replaced by an incompatible and incommensurable new one. Besides, Kuhn, in a metaphorical manner,

[12] Kuhn 78
[13] Kuhn 79
[14] Kuhn 84
[15] Kuhn 85
[16] Kuhn 85

created a parallelism between scientific and political revolutions that the sense of malfunctioning that can lead to crisis is a prerequisite to a revolution. Moreover, a scientific revolution presupposes the rejection or assimilation of the older by the new paradigm.

The first problem one encounters while dealing with a paradigm is the difficulty to understand what exactly a paradigm is. Margaret Masterman, a computer scientist working in computational linguistics, produced a critique of Kuhn's definition of paradigm. While she generally agreed with Kuhn's argument, she claimed that this ambiguity of the concept of a paradigm contributed to misunderstandings on the part of philosophically inclined critics of his book, thereby undermining his argument's effectiveness. She identified no less than twenty-one different senses in the usage of a paradigm. In her analysis, she found it impossible to put a paradigm either as a "base theory" or "general metaphysical viewpoint,"

Nevertheless Margaret attempts to categorize these usages into three major groups, that is, when Kuhn equates, firstly, a paradigm with a set of beliefs[17] or with a successful metaphysical speculation[18] or with a standard, she identifies, such usage of a paradigm as a metaphysical paradigms or metaparadigms.

The second sense of a paradigm, as Margaret takes it, is when Kuhn defines a paradigm as a universally recognized scientific achievement[19] or as a concrete scientific achievement[20], r as something like a set of political institutions.[21] She takes this as a one which is a sociological paradigm.

[17] Kuhn 4
[18] Kuhn 17
[19] Kuhn x
[20] Kuhn 10
[21] Kuhn 19

The third Kuhn's usage of a paradigm, according to Margaret, is as artefact or constructs paradigms. This is true when he uses a paradigm as actual textbook or classic work or as supply tools.[22]

Her conclusion is, therefore, that a paradigm should have the property of concreteness or crudeness; this means, literally, either it is, a model or a picture. And by that Margaret is implying that the paradigm should be a context free.

Kuhn is by no means unaware of this accusation. He acknowledges this by saying, "…the concept of a paradigm will often substitute for a variety of familiar notions…"[23] Margaret's assertion of context-free, in this case, comes in a head-on collision with historico-hermeneutical way of understanding and interpreting philosophical texts. If we try to understand a paradigm hermeneutically, it is obvious that eventually, like Margaret herself attempted to squeeze the twenty-one different senses into three, it is possible; likewise, these three usages can be squeezed into one.

Birger Hjørland says:

> *This principle is also emphasized in, among other epistemologies, hermeneutics and Thomas Kuhn's theory of scientific paradigms. Although objects have objective properties the representations of those properties in languages and concepts are always more or less "subjective" or "biased" by individuals, social groups or by different cultures.*[24]

[22] Kuhn 37
[23] Kuhn 11
[24] Birger Hjørland, *Semantics and Knowledge Organization*, (http://dlist.sir.arizona.edu/2312/01/Semantics_and_KO_K.doc.)

Another criticism directed towards to Kuhn is that he talks about infantile science (pre-scientific) and normal (mature) sciences. Kuhn talks about scientific paradigms and defines a paradigm as a fundamental achievement which includes both a theory and some exemplary application to the results of experiments and observation. It is important to note that although Kuhn clearly differentiates science from non science through paradigms, his differentiation is not through objectivity.

By doing so, some of Kuhn's detractors attack him for introducing an unacceptable relativism on the basis that his theory is too cynical, implying that scientific theories are simply temporarily useful utilities for explaining things. And since, they say, on some level, we are always awaiting the next paradigm shift, this theory undermines confidence in the scientists' work.

For Karl Popper, science is the method of trial and error, of conjectures and refutations. Science cannot be done alone. There has to be a scientific community where scientists are free to check and criticize each other. Rationality is essential to science. Rationality requires scientists to have a critical attitude and openness to criticism. This openness to criticism should be translated into the willingness of scientists to falsify their theories.

The distinguishing factor between science and nonscience is falsifiability. Something is scientific if it is falsifiable. Popper used the Marxist theory of history and Freudian psychology as examples of pseudoscientific theories. They are nonscientific and they pretend to be scientific but they evade falsification and criticism because they contain in themselves unquestionable and all-encompassing truths. For Marx, you are blinded by your class interest; for Freud, you are a product of your unconscious.

Kuhn replied, in his the *Essential Tension*, by saying objectivity or testing can be maintained only within the context of normal sciences. And defended his position by enumerating five characteristics--accuracy, consistency, scope, simplicity, and fruitfulness as all standard criteria for evaluating the adequacy of a theory and explains them as:

> *"First, a theory should be accurate: within its domain, that is, consequences deducible from a theory should be in demonstrated agreement with the results of existing experiments and observations. Second, a theory should be consistent, not only internally or with itself, but also with other currently accepted theories applicable to related aspects of nature. Third, it should have broad scope: in particular, a theory's consequences should extend far beyond the particular observations, laws, or sub theories it was initially designed to explain. Fourth, and closely related, it should be simple, bringing order to phenomena that in its absence would be individually isolated and, as a set, confused. Fifth--a somewhat less standard item, but one of special importance to actual scientific decisions--a theory should be fruitful of new research findings: it should, that is, disclose new phenomena or previously unnoted relationships among those already known"*[25]

Another critic is Paul Feyerabend who rejects Kuhn's model of scientific revolutions. He contends that scientists engaged in puzzle solving could not adhere to the truth. Rather scientists ought to operate in a kind of methodological anarchism, so that they are free to pursue any line of thought they choose. This is anarchism is similar to what Kuhn calls it pre-scientific.

[25] Tomas S. Kuhn, Essential Tension, (A collection of Kuhn's essays in the philosophy and history of science was published in 1977)

Richard J. Bernestein paraphrases Feyerbend's central themes as follows:

> *Name any rule, algorithm, decision procedure, method or value that is supposed to guide scientific inquiry, whether it be accuracy, verification, falsification, or some other standard, and I will show you that it has been violated not only in advancing and discovering new hypotheses and theories but in supporting and justifying them. Name anything that you think is ought to be irrelevant to scientific inquiry, whether it be social context, metaphysical beliefs, or personal idiosyncrasies, and I will show you cases in which it is relevant to a scientist's investigations.*[26]

Feyerabend's opposition is substantially Kuhn's assertions of normal science. He believes that, unlike Kuhn, there is not at all any good reason whatsoever a sufficient condition or rules of rational theory-choice. But Kuhn says, "That is not to say that any scientist behaves rationally at all times, or even that many behave rationally very much of the time. What it does assert is that, if history or any other empirical discipline leads us to believe that the development of science depends essentially on behavior that we have previously thought to be irrational, then we should conclude not that science is irrational but that our notion of rationality needs adjustment"[27]

Moreover, here, a question against Feyerabend is, among other strict philosophical issues, can the nature of science by itself be independent of ethics and politics of science? By professional ethics, The American Association for the Advancement of Science (AAAS) defines it as:

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[26] Richard J. Bernestein, Beyond Objectivism and Relativism: Science, Hermeneutics and Praxis, (Philadelphia, University of Pennsylvania Press, 1983)

[27] Thomas S. Kuhn , *The Structure of Scientific Revolutions*, (Chicago: University of Chicago Press. 1970) 59

"Professional Ethics refers to those principles that are intended to define the rights and responsibilities of scientists in their relationship with each other and with other parties including employers, research subjects, clients, students, etc."[28]

From this we can understand that activities of scientific research can not be anarchic and are guided by some codes of conduct. The current controversy on conducting research on human cloning is one example.

By politics of science, I mean, scientific researches are conducted under the premises of solvability and fundability. A research should be able to solve a given problem within a given reasonable frame of time and amount of money. Therefore funding a research lies under the influence of the interests of the sponsors of the research. The sponsors most of the time are not agenda-free; national, organizational (company) and personal interests dictate these researches. Hence, scientific researches, by their very nature, are compelled to fall under some paradigmatic influence.

Kuhn has been attacked from different angles for being a relativist which he strictly opposes it. This opposition of objectivism and relativism is eminent when we look at, for example, the works and criticisms of Karl Popper. Popper believes that and had been searching for an objective foundation of knowledge. Bernestein attributes this objectivist and relativist opposition to the legacy of Cartesian anxiety and takes us into a different direction which he calls it beyond objectivism and relativism. Being a critic of both Kuhn and his opponents, he attempts to show us how he opposes to both groups.

[28] AAAS is the world's largest general scientific society, with 126,995 individual and institutional members at the end of 2008

Bernestein says the Cartesian anxiety is a conviction or a quest for the search of an Archimedean point upon which we can have a starting ground. It is a search for a foundation upon which we can ground our knowledge. Descartes underscored to discover one thing which is certain and indubitable that we can establish knowledge upon it. Descartes demanded us, therefore, Bernestein says, that we should not rely on unfounded opinions, prejudices, traditions, or external authority but only upon the authority of reason. And this assertion, Bernestein says, leads most of the so called modern philosophical tradition into a grand dichotomy of the Either/Or. That is, "either there is some support for our being, a fixed foundation for our knowledge, or we cannot escape the forces of darkness that envelop us with madness, with intellectual and moral chaos"[29]

Bernestein says, at the heart of the objectivists' vision is the belief that there are or must be some fixed, permanent constraints which we can appeal and which are secure and stable. On the contrary, he says, the relativists believe that there are no such constraints except those that we temporarily invent and accept. He puts it as:

> "*Relativists are suspicious of their opponents because, the relativists claim all species of objectivism almost inevitably turn into vulgar or sophisticated forms of ethnocentrism in which some privileged understanding of rationality is falsely legitimated by claiming for an unwarranted universality*"[30]

Bernestein ascribes, for this deep rooted opposition, to be the growing apprehension that there is no nothing, be it, philosophy, God, science, reason etc that answers for our quest to the indubitable and secure foundation. Therefore, he argues that, the source of all these

[29] Bernestein 25
[30] Bernestein 34

controversies is the legacy of Cartesianism. Hence, he says, if we question and get rid of this Cartesian anxiety, the opposition of objectivism loses its plausibility.

Starting from this point, Bernetein attempts to show us how Kuhn is not a relativist and of course how his critics as well are almost on the same common ground with him. He believes that Kuhn and Feyerabend are saying that the search for necessary and sufficient conditions or rules of theory-choice is a project predestined to failure. Moreover, Bernestein says, "Both assert that any statement of rules, procedures, and methods fails to capture the wit, imagination, and judgment required for the invention, testing and evaluation or justification of scientific hypotheses and theories."[31]

As regards to Popper, Bernestein points out that Popper's target of attack is what Kuhn calls the normal science. He says, Popper notes that the line between normal science and revolutionary sciences is not as sharp as Kuhn suggests to be. Normal science is more like revolutionary and science, and revolutionary science is more like normal science. Nevertheless, Bernestein stresses on their common ground by saying:

> *But despite these skirmishes about normal science, Popper's primary purpose is to defend the idea of a rational growth of knowledge. He constantly stresses that all scientific hypotheses and theories are open to and invite sharp criticism. Kuhn does not really dispute these claims. The more interesting issues that divide them concern how we are properly to understand scientific progress and the growth of knowledge and how we are to understand the role that criticism plays in scientific inquiry.*[32]

[31] Bernestein 37
[32] Bernestein 46

Nevertheless, if we see it from a different angle, although Kuhn has shed a light in our understanding of the nature of science, there is a problem to be encountered while one is looking for revolutions in the areas of computer technology, i.e., the issue of whether advances in this field are scientific revolutions or if they are, as Kuhn calls it, achievements within a normal science. If we look at the following example, it is very clear that the demarcation is not indisputable. Moreover, the discipline, computer science, to keep away itself from such hazy demarcation, has developd its own terminology known as Generations. Roderick Hames defines computer generations as:

> *A generation refers to the state of improvement in the development of a product. This term is also used in the different advancements of computer technology. With each new generation, the circuitry has gotten smaller and more advanced than the previous generation before it. As a result of the miniaturization, speed, power, and memory of computers have proportionally increased. New discoveries are constantly being developed that affect the way we live, work and play.*[33]

Moreover he identifies the first generation (1946-1958, The Vacuum Tube Years) as those which were huge in size, slow, expensive, and often undependable. ENIAC was the first electronic computer which used vacuum tubes instead of the mechanical switches. The ENIAC used thousands of vacuum tubes, which took up a lot of space and gave off a great deal of heat just like light bulbs do.

The Second Generation (1959-1964, The Era of the Transistor) had obvious differences between the transistor and the vacuum tube. The transistor was faster, more reliable, smaller,

[33] Roderick Hames, A New Generation of Computers is About to be Announced, (2009) http://www.crews.org/curriculum/ex/compsci/articles/generations.htm

and much cheaper to build than a vacuum tube. They were also much smaller and gave off virtually no heat compared to vacuum tubes.

The Third Generation (1965-1970, Era of Integrated Circuits) or as it is sometimes referred to as semiconductor chip, packs a huge number of transistors onto a single wafer of silicon. These third generation computers could carry out instructions in billionths of a second. The size of these machines dropped to the size of small file cabinets.

The Fourth Generation (1971-Today, The Microprocessor) can be characterized by both the jump to monolithic integrated circuits (millions of transistors put onto one integrated circuit chip) and the invention of the microprocessor (a single chip that could do all the processing of a full-scale computer).

If we look at the major advances in the above example, from first generation to the second is that the increment of memory capacity as regards to the processing speed. From second to third is that there is a complete shift of data processing storage; i.e., the vacuum tube was replaced by integrated circuit, and punch cards by magnetic disks and tapes. And the advance from the third to forth is mainly the introduction of microprocessors known as microchips or silicon chips.

What we observe from this is some scientific disciplines are being trapped between choosing the Kuhn's conception of science and not choosing it. This warrants for more explication and illumination of the conceptions of paradigms. Nevertheless, it is evident that Thomas Kuhn has tremendously impacted our understanding of the nature of science. According to Web of Science®, *The Structure of Scientific Revolutions* has been cited 9,268 times from 1990 to March 5, 2007. His themes of a paradigm are significant and are noticeable. Obviously, a lot more work is expected from philosophers to advance these concepts.

Moreover, I believe that the concept of a paradigm can be applied in other disciplines and fields of studies. He has asserted that a scientific revolution that results in paradigm change is similar to a political revolution. He has put forward that political revolutions begin with a growing sense by members of the community that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created; this can be an analogy of the “anomaly and crisis” of scientific paradigms. The dissatisfaction with existing institutions is generally restricted to a segment of the political community. As being mentioned in chapter nine, Kuhn has widely opened the gate for further researches as to how the conceptions of a paradigm can be applicable in the areas of study.

In the next chapters I am going to show how these conceptions of paradigm, anomaly and incommensurabilty are applicable in critical social theories. I will attempt to show the relevance of Kuhn’s model in social theories. I will do that by making analogies and comparisons of his assertions and other theorists in the field of critical social theories. But first I will go through background information of social theory in the next chapter.

Chapter II

Basics of Critical Social Theory

In this chapter I will show the historical background and some of the key concepts in critical social theories. As the name indicates, critical social theory is a critique of some order in the formation of society. This implies that human actions have led to some social features we are not happy about or we dislike. Critical theory discusses and describes the features of modern society that restrict or constrain individuals from living and thinking in freedom.

Critical theory describes these constraints and offers judgments that are emancipatory of individuals from such constraints. Emancipation is a theoretical framework from the domination of individual human beings by the cultural forms they live in a society. These cultural forms restrict the way human individuals do and the way they think. Cultures control and administer even the way we think. These are regarded as domination because they are not results of natural phenomena but the products of human history or social constructions.

The origins of this restriction could be economic, social or intellectual arrangements. But they are continued in human history that they have become systematically entrenched in a society and are experienced as culture. Tim Dant identifies some of the possible forms of the domination as, "ideas, signs, images, beliefs, knowledge, language, attitudes, protocols, systems, programmes, rules, injunctions, and so on."[34] Critical theory strives to recognize these restrictions and their origins. And this recognition is meant to lead human beings to their rejection and therefore emancipation.

[34] Tim Dant, Critical Social Theory, (London, Sage Publications Ltd, 2004) 3

The phrase critical theory is mostly used loosely. Critical theory was first introduced by Max Horkeimer in his essay "*Traditional and Critical theory*." Renan Rapolo notes that, "Just as the term materialism in the previous phase, the new term was simply a new name introduced by Horkeimer and Marcuse to refer Marx's social theory."[35] But it was also a term that both represented their theoretical orientation and their claim to represent Marx's social theory. Therefore we can refer the origins of the phrase to the critical theories of the Frankfurt School that include Horkeimer, Adorno and Marcuse.

Their object of criticism was the project of Enlightenment. Horkeimer, in an essay entitled "The End of Reason", clearly identifies reason as the highest concept of philosophy but he says, "In following out its own principles, it turns against itself."[36] He continues by saying, "Reason has degenerated because it was the ideological projection of a false universality which now shows the autonomy of the subject to have been an illusion."[37] Nevertheless he doesn't reject reason altogether. He says reason has been reduced to instrumental reason.

Nevertheless all of these originators of the critical social theories refer to Marx. Tim Dant says;

> *"All the authors [Horheimer, Adorno and Marcuse] take Marx's analysis of the mode of production as a starting point that needs to be developed to cope with the changes in capitalism that had become apparent by the middle of the twenties century. What they have in common is an attempt to extend the 'critique of political economy' towards a broader critique of society and culture as a whole. In doing this, all the writers accept the importance of*

[35] Renan R. Castellanos, The Crique of Modernity and the Claims of Critical Theory, (The University of Texas, 1998)
[36] Max Horkeimer, End of Reason, (The essay was first published in *Studies in Philosophy and Social Science*, Vol. IX (1941) but is quoted from online Google Books) 16
[37] Max Horkeimer 16

political economy in shaping the form of late modern societies and in shaping the lives of individuals within those societies" [38]

Karl Marx formulated the concept of alienation that has served as a basis for social critiques. The concept of alienation for Marx is the separation of individual human beings from what gives a human life meaning. For Marx alienation is understood together with labour. But I am not going to discuss the concept of labour as it is not the purpose of the study. But rather to provide brief basic information how Marx came to realize alienation and how that laid a foundation for critical theory. Marx says in the capitalist system labour is reduced to paid work. Workers sell their labour to employers in return for subsistence wage in a mechanical process of production. And this results in different ways of alienations.

Nick Grossley identified four types of alienations that Marx described. She notes Marx saying, "The worker is alienated from the product of their labour." This implies that workers are alienated from what they produce because they do not own what they produce. And secondly, the level of alienation is when the worker is separated from the act of production; that is, workers are forced to produce without their initiative and they don't control the process of production. They are just part of a ring in the chain of production.

In the third level, Marx notes workers alienated from their humanity or being human beings. The alienated workers sell their labour as a commodity and assume the status of commodity and they are reduced to nothing but commodity and their work environment to suggest that they are anything but a commodity. Therefore the worker's potential to elevate one's animal nature is not realized. And finally, human beings are alienated from one another. Marx notes that to live like human beings is to live collectively and recognize one another as human

[38] Dant 4

beings. But if each worker is reduced to a commodity, they recognize each other not as human beings but as commodity.

As we have seen it above Marx's analysis of alienation is mainly a critique of political economy. But it is from this Marxian theory that the theorists known as Frankfurt School developed critical social theory. They pioneered this task of developing critical theory by modifying Marx's critique and adopting it in a critique of culture and society.

Adorno shared Horkeimer's move and joined him in producing a work known as *Dialectic of Enlightenment* which is a critique of instrumental reason. Both believed that because of the Enlightenment project mankind has entered into a new kind of barbarism. They traced the notion of the Enlightenment from Kant's discussion of reason and freedom. Kant puts reason as a defining factor of Enlightenment. He says nothing was required for this enlightenment, however, except freedom; and the freedom in question was the least harmful of all, namely, the freedom to use reason publicly in all matters. And both Adorno and Horkeimer believe that this conception of reason is ambiguous.

Horkeimer says:

> *The transcendental supra individual self, reason comprises the idea of a free, human social life in which men organize themselves as the universal subject and overcome the conflict between pure and empirical reason in conscious solidarity of the whole. This presents the idea of true universality: utopia. At the same time, however, reason, constitutes the court of judgment of calculation, which adjusts the world for the ends of self-preservation and recognizes no function other than the preparation of*

the object from mere sensory material in order to make it the material subjugation [39]

This shows that Horkeimer's realization that there is a problem with reason. Nevertheless he, as I have mentioned it above, never abandoned it altogether because he thought there is also an important aspect of it. Therefore, he tried to distinguish between the subjective (instrumental) and objective (universal) reason. Tim Dant remarks that for Horkeimer subjective reason is, "the form of thought that deals with classification, inference and deduction; it is the type of thinking that is concerned with means and ends"[40] Horkeimer believes that this is the way the modern Western thought has developed. On the other hand, objective (universal) reason is that focuses on concepts that extend beyond the interests of the individual but on the idea of greatest good of humanity. But they say this type of reason has long been abandoned and is hardly possible in the age of modernity.

Both Horkeimer and Adorno attempt to describe these two aspects of reason; the subjective and the objective. They note that the dominance of subjective reason as a way of thought led truth to be demonstrated only by the success of practical action. They continue to say, "When empirical science, potent as a technological force in industrial production, is applied to all forms of intellectual life, reasoned thought ceases to be autonomous and becomes an instrument. Instrumental reason is used as mere tool by man to dominate nature and society that includes human nature"[41]

According to their analysis, therefore, the domination of instrumental reason resulted in loss of meaning and loss of freedom. The Enlightenment project that was meant to liberating human beings turned out to be a force of domination itself. The ideas of Enlightenment

[39] Max Horkeimer and Theodore Adorno, Dialectic of Enlightenment, (Stanford University Press, 2002) 83-4
[40] Max Horkeimer and Theodore Adorno 57
[41] Max Horkeimer and Theodore Adorno 125

manifested in scientific and technological development have led to the domination of nature and society as a whole.

Hence as it has been mentioned above critical social theory partakes in such condition of domination. The phrase is developed in contrast to traditional theory. Traditional theory is based on Descartes' assessment of the relationship between subject and object. Within the Cartesian framework, perception consists, Ruth Groff says, "the passive reception of objectively given facts by a completely separate and purely subjective consciousness."[42] Descartes contrasted this activity with the abstract exercise of reason which held to be the foundation of knowledge. On the other hand, empiricism, she remarks, "empiricism, while it elevates the epistemological status of sensory information to that of providing the basis for scientific truth claims, nevertheless retains the Cartesian view of perception. Thought (subject) is one thing; that which is thought about (object) is another."[43]

On the other hand, as Horkeheimer describes it, critical social theory is radical and emancipatory. It seeks the liberation of human beings from any kind of enslavement. And critique is its central method. But this critique is not just fault finding. Rather, as Adorno calls it, it is setting up a line of opposition, one that deals not just with details but rather with whole system.

Critical theory establishes a perspective and a view of the world about how it is and how it should be. That is, it explains the problems in the social reality. Moreover, it provides how and who should act in order to change the current situation. Critical social theory further offers a clear articulation of justifications for criticism and the way forward. That is why

[42] Ruth Groff, Reason Reconsidered: Political Education, Critical Theory and the Concept of rational Critique, (Toronto, University of Toronto Press, 1994) 24
[43] Groff 38

Horkeimer says a critical theory is adequate if it is explanatory and normative at the same time.

Hence it is within this framework that I attempt to argue that Thomas Kuhn's assumptions in the realm of science are relevant and applicable in the domain of critical social theories. For this reason I believe that it is important to look at two important figures in the area of critical theory; Mitchel Foucault and Jurgen Habermas. These philosophers have influenced critical social theory significantly. I have taken especially the works of these philosophers as important comparators with Thomas Kuhn. Let us first look at some of Foucault's ideas.

Mitchel Foucault is one of the most noted critics of modernity and its enlightenment project. He has written extensively and analyzed the development of Western thought since the Renaissance. His philosophical reflections include analysis on the nature of rationality, truth and power, and on the understanding of what it means to be an individual in modern society.

Foucault's known conception, among other things, is his notion of power and knowledge. He has gone to the extent of declaring that knowledge is inseparably embedded in power relations; that is, the relationship between power and knowledge is indivisible. He has examined how power relations of inequality are created and maintained in a subtle ways and how these are freely adapted by societies. Foucault questions the rationality of post enlightenment society by focusing on the way in which many of the enlightened practices of modernity constrain the freedom of individuals and as a result perpetuate social relation of domination.

For Foucault the relationship between power and knowledge is two dimensional; and he calls it a power knowledge grid. He says, strategies and technologies of power facilitate and generate knowledge. At the same time, knowledge becomes the basis and principle of power; and they create as, Foucault calls it, 'regimes of truth'. These regimes of truth are expressed

as power in some societies bound to religious forms of truth and in modern societies to scientific functions.

Nick Crossley, after identifying Foucault's power-knowledge relations as a key concept in critical social theories, she drugs back the philosophical reflections of Foucault as being rooted in the history and philosophy of science. She states:

> *To grasp the concept of power/knowledge it is essential to begin by recognizing that Foucault's early work was rooted in the tradition of the history and philosophy of science, particularly as shaped by the Work of Gaston Bachelard and George Cangulhem. Like these writers, Foucault was concerned to trace the history, or perhaps pre-history, of scientific discourses, focusing in many cases upon the ruptures or breaks which punctuate the trajectory of these discourses.*[44]

For Foucault, she says, the history of human science is a history of discourse and the underlying 'historical a priori' are that shape the science itself. A priori truths are those whose truth value is believed to be logically or rationally necessary because they deal with what is true by definition and not dependent upon empirical observation or fact. Foucault says this not only by taking the theoretical conception of science, but he indeed studied medicine, psychiatry, sexology and the social sciences.

In his analysis, Foucault states that every mode of thinking involves implicit rules that materially restrict the range of thought. If we try to uncover or as Foucault says, to make archeology of the rules that guide thinking, we will be able to see how an obvious arbitrary constraint makes sense in the framework defined by those rules. Therefore, at this level of

[44] Crossley 23

analysis, what is outside the control of individuals who actually do the thinking in a given period, is the key to understanding the constraints within which people think. The history of ideas, for Foucault, is what is going on in our minds is less important than the underlying structures that form the context of our thinking. That is to say, what is more important is what shaped to happen the thinking (how-to) than what people are thinking.

The other dimension of Foucault's work is his critiques of a 'rational subject' that have governed the Western thought since Enlightenment. Foucault's intention is to break down the domination of reason oriented thinking as being put at the center of thought in order to displace the radically other ways of thinking. In his writings on madness, Foucault attacks the philosophical subject of Enlightenment thought by revealing its implication in certain social practices which since the end of the seventeenth century have led to the marginalization and silencing of mad individuals. Gary Gutting notes that Foucault's archaeology is intended, among other things, to show how apparently impossible modes of thought were quite possible even in not that far past. He says:

> *We believe, for example, that there is no rational alternative to thinking of madness as 'mental illness', but Foucault's archaeology shows that little more than 200 years ago people such as Descartes and Leibniz—the fathers of our modern scientific world—thought of madness in an entirely different way. Such an exhibition has an implicitly destabilizing effect, suggesting that the framework underlying our concepts and beliefs may not have the inevitability we casually assign it.*[45]

This shows that Foucault's challenge to Enlightenment thought is its claim of a universal legitimacy in virtue of its so called accuracy. Foucault attempts to portray that the idea that a

[45] Gary Gutting, Foucault: A Very short Introduction, (Oxford University Press, 2005) 31

reason based thought is the sole origin of meaning and value is wrong and it is just generated by some rules. Therefore, by doing archaeology on this rules that constitute the condition of possibility of thought, Foucault undermines the claims of the sole originator of meaning and normativity. Therefore, not only the development of the Western Enlightenment project cannot be a sole judge and originator of value and meaning but there is a possibility of otherness as well; there are others who can generate meaning.

As we can see it clearly one of Foucault's interests is to look for the conditions of possibility for thought. Gutting describes *The Archaeology of Knowledge* as his method of the study of the history of thought. Foucault is not interested in explaining ideas in terms of eternal social or economic forces, but it is an attempt to give an internal account of human thinking without assuming a privileged status for the conscious content of that thought; that is a thought without a privileged role for the thinker.

On parallel to Foucault, another important philosopher in critical social theory is Jurgen Habermas. Habermas has led a movement in social theory that defends the tradition of Enlightenment and reason. In his major work *The Theory of Communicative Action*, he has outlined various concepts as regards to the critical social theory. He has distinguished the 'system' and 'lifeworld' elements of society. Habermas begins to use this model to critique society as he speaks about the colonization of the life-world by the systems. Moreover, he formulated a theory known as ideal speech situation which is an attempt to make discourse possible.

Lifeworld is the communicative interactions which are coordinated by the mutual understanding achieved between members of society. Lifeworld is put together by the traditions created by communicative interactions. The duties these traditions impose in society also represent the lifeworld. A lifeworld can be seen as the complex universe of

political and social communication that comprises different voices of the members of a society where the members participate in and transmit to others.

Lifeworld is that which is constituted by the shared common understandings, including values that develop through face to face contacts over time in various social groups, from families to communities. The lifeworld carries all sorts of assumptions about who we are as people and what we value about ourselves: what we believe, what shocks and offends us, what we aspire to, what we desire, what we are willing to sacrifice to which ends, and so forth.

Habermas says:

> *…that to make lifeworld assumptions fully reflective—to speak of them explicitly—is already to destroy them. Their power is their "of course" or "taken for granted" quality. Questions about the lifeworld—why do you believe such-and-such? —can only be answered (if at all) by some version of "because that's who I am and who we are"*[46]

On the other hand, the system is constituted by way of impersonal, economic, power and administrative exchanges. System is a result and which develops from lifeworld. A system is expressed in the development of distinctive structures like modern administrative state, education, judiciary, family etc. These structures as they develop, they disentangle themselves from lifeworld. Nick Crossley notes that both the system and lifeworld perform essential functions for society; the lifeworld is a source of legitimate norms and functions to reproduce the cultural patterns upon which society rests, while the state and economy function to produce and distribute basic material goods.

[46] Crossley 38

From this Habermas enters into a key concept known as 'colonization of the lifeworld.' By colonization he refers to the continuous interference of the system into the lifeworld and threatening its existence. This situation is problematic because the system destroys basic aspect of the lifeword which can not be regained. Habermas says indigenous cultures are destroyed and with them go both the narrative structures (meaning) and the normative structures (morality) society live by. And once these are destroyed, they can not be replaced. As a result, he says, there is a normative breakdown (anomie) and at the individual level it causes alienation and psychopathology. The whole idea of this colonization of lifeworld by the system is that it limits or constrains the freedom and abilities of social agents to have free and open discussions. And as we have mentioned it above critical social theory is important when there is a constraint and comes up with an emancipatory theoretical framework.

Hence, Habermas, after analyzing the colonization of the lifeworld by the system, he comes up with an emacipatory proposition known as the *Ideal Speech Situation*. Ideal speech situation is in which citizens are able to raise moral and political concerns and defend them through rationality alone.

Ideal speech situation is an orientation towards an understanding and consensus. And when this is achieved it becomes the knowledge and truth of the situation. Habermas' aim is to create a form of discourse composed of the exchange of reasons guided by the force of the better argument alone. Nick Crossley notes that,

> *What constitutes the best argument, in these cases, will vary according to the balance of cognitive, moral and subjective claims involved: cognitive claims are truth claims about the external world which must be supported by reference to evidence, theory and the logic of inference; moral claims are claims about what is right and require rational justification; and*

subjective claims are claims about truthfulness and sincerity which can be confirmed or disconfirmed in various ways.[47]

Hence, Habermas says no matter differences there might be, participants can take part in a discourse. Nevertheless, in order ideal speech situation to happen he formulated some criteria. Right to speak, mutual understanding, truthfulness and sincerity are very important components of the criteria for Habermas.

One of the criteria for ideal speech situation that Habermas proposes is that equality of rights to participate in discourse. Every participant with the competence to speak and act must have the right to assert, defend or question any factual or normative claim. A desire to reaching a consensus should also be the motive of the discourse.

The second criterion is the equality of participants to make their own interpretations and be open to criticize and be criticized equally. In such a situation Habermas believes that every concern can be brought forward and no unreflected issue will remain.

Third, it is a criterion to be honest. Participants of the speech acts express equally their attitudes and feelings. Here they make their inner intentions transparent to all participants.

The fourth is, Habermas says, for reciprocity of action-anticipation to be realized, there should be equal chances to order and resist orders, to promise and refuse, to be accountable for one's conduct and to demand accountability from others.

From what I have attempted to show, we can say that Habermas' concern, like other critical theorists, is modernity, rationality, autonomy, freedom, and human happiness, and how these

[47] Crossley 141

are connected as societies change. His central concern is emancipation through communicative action. Nevertheless, he is different in a way that he emphasizes on more rationality and reason. He believes more and more of rationality can lead to the redemption of modernity.

Chapter III

Applicability of Kuhn's Model

My concern in this chapter, unlike chapter one, is to show how Kuhn's model of the structure of scientific revolutions parallels major thoughts in critical social theories. To do that I will use analogical methodology that correlate between Kuhn's principles and that of the social theorists. Moreover, I will use examples of major phenomena on our planet that map well in Kuhn's model. As regards to paradigm, let us first see an example that shows two ways of paradigm based thinking.

The concepts, Democracy and Islamic fundamentalism, are two contemporary phenomena that currently depict paradigm based thinking. The values upon which these paradigms function are unique to each another. While Islamic fundamentalism is based on the sacred texts, the values of democracy are rooted on the political thoughts of philosophers; mainly Western philosophers.

Islamic fundamentalism is a movement committed to Islam as a way of life and alternative to the Western secular values. The fundamentalists' goal is Islamization of the total social and political system of their societies, states, and ultimately of the whole Muslim world. Sayyid Qutb[48], defined the goal of fundamentalism as: "The restoration of Islamic life in an Islamic society governed by the Islamic creed and the Islamic conception as well as by the Islamic

[48] The best-known ideologue of the fundamentalist Muslim Brotherhood in Egypt. Author of 24 books, including novels, literary arts' critique, works on education, was executed by hanging on August 29, 1966.

Shari'ah and the Islamic system."[49] And some of the basic values of Islamic fundamentalism are the sovereignty of God and the idea of the state as a tool for implementing the fundamentalist vision.

Fundamentalists give undue emphasis to God as the only ruler and legislator. The task of human beings is to serve God and fulfill the *Sharia* requirements. This emphasis in God implies that no any better political system can be established other than the one based on Sharia. Therefore fundamentalists see the state as the instrument for implementing their vision of Islamic system based on S*haria*.

On the other hand, the values upon which a democratic paradigm is founded is contrary to fundamentalists. My concern here is not to discuss in detail democracy and fundamentalism, rather the aim is to show that the thoughts are always embedded in differing paradigms. Hence, for this purpose, I will briefly outline the commonly accepted principles and values of democracy.

Many agree that the basic value of democracy is rule of law. The rule of law implies that nobody and no authority is higher than the law. Votes of citizens give the government an authorization to implement laws on their behalf. Laws are thereby formulated by the government. The most general explanation of democracy is ruling by the people. Citizens are the sole generators of governmental authority. Therefore, the government is only accountable to its citizens not to God.

Democracy is a system of government in which leaders are chosen by the people in elections. In a democracy, people have choice between different candidates and parties who want the

[49] Quoted from http://www.angelfire.com/az/rescon/islfnd.html

power to govern. The people are sovereign and the highest authority. Citizens have the right to have their own beliefs, including their religious beliefs, on their own choice.

These two are different thoughts embedded on different paradigms. I will discuss on this more when I deal with the concept of incommensurability. Before doing that let me give another example.

We can also see a paradigm based thinking from another angle. Article 39 in Ethiopian constitution has been one typical example of paradigm based thinking. It is about the *Rights of Nations, Nationalities, and Peoples*. For the last twenty years this has been a center of most of political debates. This article has been dealt with from two different paradigm based thoughts. The debate, in so far as we are aware, has shown no hope of compromise and I believe, will continue to be so in the future. The article states that: "Every Nation, Nationality and People in Ethiopia has an unconditional right to self-determination, including the right to secession."[50]

According to the current ruling party, Ethiopian Peoples Revolutionary Democratic Front (EPRDF), the introduction of this article into the constitution is to maintain the unity of the country. The ruling party, time and time again, argued that the inclusion of the article has given confidence to the Nations, Nationalities, and Peoples to stay together within the union. EPRDF believes denying this right is tantamount to violation of the basic rights and can result in total disintegration of the country. The party takes this article as the sole protector of the Ethiopian unity. Its leaders and supporters claim that the bloody struggle waged against the previous regime was primarily to ensure this right.

[50] Constitution of the Federal Democratic Republic of Ethiopia, Article 39

On the other hand, opponents of this article believe that the inclusion of this article would definitely lead into a total disintegration. Whenever there is a political debate, it is hardly possible not to hear them without condemning the article. They say, by just including the article, it implies that people are pushed or made aware of secession. They say the inclusion facilitates slowly disintegration of the country. They say that they believe in the rights of the Nations, Nationalities, and Peoples but short of the right to secession. They also believe there is no mechanism to handle it once it is out of hand.

Time has shown us that this debate will never come to an end until we see the effects. That is, the debate will continue until it is really tested. As Bernestein said above, taking the fallibilistic nature of human beings, there is no way to know until we see the result. Kuhn strengthens this by saying, till then there is no authority upon which we refer to. This shows that, at times like this, there are two paradigm based thinking. One that is embedded on the paradigm that says letting the doors open maintains the integrity and unity of a country; and the other that says as long as all get their rights and close the door will maintain the unity.

The above examples, debates on article 39 of Ethiopian constitution, and the democracy versus fundamentalism, are just few that can represent paradigm based thinking. I believe that they fit in the assumptions of the notion of a paradigm. As we have seen it above a paradigm is a set of received beliefs that guide the whole activity of thinking. And it is this paradigm that determines the nature of arguments.

From this I would like to proceed to the Kuhnian concept of anomaly. Like I mentioned it earlier on, I will use analogies to show that this model is applicable in major phenomena of the world. My first example is the global financial crisis that happened recently.

The financial system of the Western industrialized world is one component of free market capitalism. Free market capitalism is an economic system founded on some set of received

beliefs. One of the major and guiding beliefs is that the market should be free form government intervention and regulation except to defend property rights. A free market economy is an economy where all markets within it are unregulated by any parties other than those players in the market. As we can clearly see its non interventionism from government is a basic principle.

In 2008, this economic system encountered a major setback known as global financial crisis. It is not my concern here to investigate the causes of the crisis. Nevertheless various people have attributed different opinions to the causes of the crisis. My aim is, however, to show how this fits in to Kuhn's model.

Free market capitalism can be taken as a paradigm because it is founded on some given set of beliefs mentioned above. And the financial crisis can be taken as anomaly in the paradigm. After the world encountered this anomaly, the measures taken are, like Kuhn says, "an attempt to force nature into the pre-formed and relatively inflexible box that the paradigm supplies"[51]. The major step taken is to let governments intervene and bailout the financial institution using tax payer's money. This is completely against the received beliefs of free market capitalism. Nevertheless, people agree that the result is not seen yet and the result can be success or failure. Kuhn says, crisis begins with a vague impression of a paradigm. So, at this stage free market capitalism is not yet in a paradigm shift but faced an impression of a crisis which is the anomaly of financial crisis. And the situation can, eventually, end up in exactly the same way to Kuhn's model.

Kuhn says, when crisis happen, the first possibility is that normal science handles the crisis and everything comes to normal. Second, the problem is labeled as difficult to be handled using the current tools of the paradigm and is passed over to next generation. And the third

[51] Kuhn 15

option is the emergence of a new candidate for paradigm shift and with the ensuing battle over its acceptance. Therefore, we can say that the global financial crisis can be either handled with the current techniques applied to handle it, or it might be left for the coming generation to handle it with better techniques. Otherwise, the whole paradigm of the free market capitalism will collapse and another paradigm based system can turn up.

To further illustrate the concept of anomaly it is possible to give some more examples and analogies. For instance, the era of the enlightenment project is the era of science and technology. As some people call it, modern science is the daughter of the European enlightenment. Since the beginning of the eighteenth century reason replaced divine revelations as a basis of knowledge. Science gained great qualitative change as it relied on reason and establishment of clear relationship between cause and effect. Many agree that modern science is a great intellectual success in humanity. We can also say that the enlightenment project is a march in science and technology using the tool of reason. The idea behind is that enlightenment would ensure the good and progress of humanity.

But the enlightenment project could not see the anomalies it would encounter later on. Currently, humanity is faced with anomalies that came out of science and technology. The looming disaster that happens from climate change and global warming is the result of the advancement in science and technology. Global warming is caused by the continuous increase in the emission of CO2 (carbon dioxide) within the last 30 years. Burning fossil fuels by industries and industrial products has been identified as the major reason for the change of temperature in the atmosphere. The disaster of global warming has threatened the existence of humanity.

Moreover, the enlightenment could not see how science and technology could come up with nuclear weapons that can end the whole human civilization and progress. The answer to the question as to how long would it take before humanity vanishes after the currently state

owned nuclear weapons blast is just instantly. Taking the current capabilities of countries into account, these deadly weapons can end humanity in a short period of time. Like global warming, nuclear weapons, too, threaten the existence of humanity. Contrary to the promises of the enlightenment ideals, our planet, in the twenty first century, lives under the threat of these two which are results of science and technology.

Therefore, if we take the above examples of global warming and nuclear weapons, we take them as anomalies of modernity. And as we have seen it earlier, for Kuhn, anomaly is an overture to a crisis. Kuhn says, the significance of crises is the indication that an occasion for retooling has arrived. I believe that we find ourselves in a time of crisis. Some philosophers, namely, the postmodernists, have declared the destruction of the reason based paradigm and quest for an alternative. But others believe this paradigm can be adjusted by some modification. Habermas believes that the enlightenment is an incomplete project and with more reason it can be redeemed. Kuhn calls this retooling.

Kuhn says crises are not only a prelude to a destruction of a paradigm, but give science a chance to explore deeply into the paradigm. Likewise, some philosophers, like Habermas, believe that the project of enlightenment and modernity can be redeemed. Habermas' task is to strengthen the 'project of modernity' by reconstructing it through his distinctive theory of communication. Habermas believes this process of emancipation can be achieved through more reason.

Kuhn's relevance at this point is, therefore, obvious. At times of crisis, he says, we need retooling of instruments. And if we apply this in a social context, we know that there is a crisis. In the case of financial crisis, Western governments have tried to retool their method against their original equipments. They still are trying hard to retool their methods in order to sustain the free market capitalism. With regard to the enlightenment project, some have gone

up to searching a new instrument other than reason; and others believe that reason only needs some adjustments.

As being mentioned earlier, Thomas Kuhn's ideas of paradigm and anomaly have significance in our understanding of social theories. Kuhn says the instruments scientists use determine what they see and their worldviews likewise. With regard to the Enlightenment, the instrument is reason. Enlightenment is characterized as the age of reason. One of the most important ideas borne out of the Enlightenment was that of social progress. Enlightenment thinkers believed that, if science, through the application of reason, could progress, so could humans.

The problem in the realm of science and technology is, as Thomas Kuhn suggests, the use of scientific instruments. He says, as scientists start to employ new and improved instruments of their own, most of the time, their views change. Likewise, if there is an improved instrument of reason which is different from that of enlightenment's, what would happen to the worldviews of philosophers, specifically to the thinkers of enlightenment? The question is would their worldviews change?

As it is well known, there are philosophers who have questioned reason if it were the ultimate instrument that leads to the good of a society. And there are also who defend reason as a way of ensuring progress of humanity and the entire society. If we look at Michel Foucault, he believes that, even though it is difficult to know whether he has come up with a new instrument, reason is not the only way out. He refutes reason as the only instrument of human progress.

When Foucault says that, I believe he is referring to the concept of a paradigm. For Kuhn scientific community cannot practice its vocation without some set of received beliefs. And these set of beliefs are what constitute the paradigm. Therefore, not only a scientific

community but every thought is founded in a paradigm. I believe that there is no single thought which is not anchored in a paradigm. I will try to substantiate this by giving more examples.

In my opinion, if we take reason as an instrument of social progress, and taking Kuhn's conceptions of paradigms, I believe reason can fail at some point. Reason came at a specific point in time to address the problems of that time. Reason, unquestionably, might have addressed those problems sufficiently. But reason could not be able to foresee where reason itself fails. The Enlightenment project, despite solving the problems of its period (modernity), it was incapable of looking ahead to see the repercussions of reason and modernity.

As I have mentioned it, one of my concerns in this research paper is to show that Kuhn's model of scientific revolutions can serve as a model of understanding other social discourses and phenomena. Kuhn believes that when a scientific revolution happens, it is replaced by another paradigm which is incompatible and incommensurable with the previous one. He states that, the two paradigms are incomparable as they function in different set of beliefs. His purpose behind the idea of incommensurability is that discourse is impossible when paradigms are working upon different sets of paradigms.

Hence, Kuhn's assertion happens to be as a response to Habermas' ideal speech situation. As we have seen it in chapter two, Habermas believes that not only is discourse possible, but also validity claims is possible once the criteria for ideal speech situation are fulfilled. He says people with different capabilities of speech and with their rights, whatever issues they might raise can reach a consensus as long as their motive is reaching consensus. In other words, Habermas is saying that what we have seen earlier, democracy versus fundamentalism, and the debate about article 39, can come together and eventually there would be a better argument who wins the debate.

Taking Kuhn's model of the scientific revolution, Habermas' assertion of ideal speech situation is impossible. I believe that this model can serve as a response to Habermas. The major problem here is, like Karl Popper did, that not to accept Kuhn's concept of normal science. Popper defends science as rational by completely denying the existence of any revolution in science. He takes, what Kuhn calls normal science, as what science is all about. Therefore, he says what scientists do there is rational and the method is falsification.

Likewise, Habermas' assertion, despite setting up the criteria, is similar to falsification. That is to say, interlocutors or participants can present whatever ideas and justifications they believe in and can engage in a dialogue. Reason and rationality are key instruments in the dialogue. Justifications and counter justifications are tantamount to verifications and falsification.

The major problem here is, as Kuhn has replied repeatedly, the omission of the concept of normal science from the equation. Kuhn believes whatever rational it might be called, falsification or verification functions within the realm of normal science. Within the paradigm, Kuhn never denied that there is a rational activity. Hence, this takes us into believing that Habermas' assertion of ideal speech situation can only be applicable in a situation where there is a discourse within a given paradigm. For instance, as Habermas says, the instrument should be reason and rationality. The question to Habermas is, therefore, at a time when reason is not the instrument what happens to the discourse. Or how is it possible that two different ways of thinking, as Kuhn puts it, paradigms, communicate with each other? Let us look this by taking examples.

In the discourse on African philosophy, it is commonly believed that Eurocentric rationality is widely described as logocentric and rational; and the African, on the other hand, is described as emotivist. Between these two philosophies, there are various arguments. The

arguments circle around their methodology and of course their instruments of justification. As Wiredu puts it, "the crucial difference [between traditional African folk philosophy and philosophy proper] is that the Western philosopher tries to argue for his thesis, clarifying his meaning and answering objections, known or anticipated; whereas the transmitter of folk conceptions merely says "This is what our ancestors said.""[52]

Leaving other arguments aside, if we take Wiredu's description, we understand that both function on different paradigms. If we look closely, Habermas' ideal speech situation is applicable within the Western paradigm. The Western philosopher has techniques on how to engage in a discourse. People equipped with such kind of instruments, I believe, having put the criteria in place; it is possible to reach a consensus. On the other hand, the African way of justifications is reference to ancestors. That means, as long as proper reference is made, they wouldn't care much to apply reason to justify or clarify their assertions.

We can take these situations as two different paradigms. They function in epistemologically different paradigms. If we take Kuhn's model to understand them, we find out that, these two paradigms are not only incapable of discourse, but also incommensurable. As it is well known, African philosophy is mainly concerned in response to Western discourse on African philosophy. The Western discourse labels the African as irrational and immature. Hegel is widely known for such descriptions. Hence, applying Kuhn's model in such a situation helps us understand that the problem is not being irrational or immature but both the African and Western are in embedded in different paradigms.

[52] Wiredu on How Not to Compare African Thought with Western Thought: A Commentary (quoted from http://www.westvalley.edu/ph/africa.html)

With the same token as in the example of anomaly, democracy versus fundamentalism, Western media portrays Islamic fundamentalism as a threat to the West. Edward Said notes, "For the general public in America and Europe today, Islam is 'news' of a particularly unpleasant sort. The media, the government, the geopolitical strategists, and - although they are marginal to the culture at large - the academic experts on Islam are all in concert: Islam is a threat to Western civilization."

On the other hand, Islamic fundamentalists say, as Tatang Iskarna notes Yusuf al-Qaradawi, a prominent Islamic writer, saying:

> *"The other urgent need of Islam today, as explained by Yusuf al-Qaradawi, is the overthrow of the existing international order which is based on hulul mustawaradah (imported models). This order should be replaced by hall al-Islami (Islamic solution). This change will banish the concept of popular sovereignty and democracy upon which most modern states today are based. The current international order, which is strongly supported by the al-asr al Ameriki (the American Age) should be replaced by hakimiyyat Allah (the rule of Allah) and nizam Islami (Islamic system of government) based on assumptions of divine order rather than temporal political legitimacy."* [53]

It is clear that, from the above narrations, there is a hate and antagonism towards each other and an obvious intolerance. From the description they give to each other, one is against the other. But Kuhn says that the scientist could not have any recourse above and beyond what

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53 Tatang Iskarna, Tracing the Root of the Clash between Islamic Tradition and Western Values in Hanif Kureshi's "My Son the Fanatic"
(quoted from http://www.usd.ac.id/06/publ_dosen/phenomena/91/tatang.pdf)

he sees with his eyes and instruments. If there were some higher authority by recourse to which his vision might be shown to have shifted, then the authority would itself become the source of his data, and the behavior of his vision would become a source of problems. That is to say, the two are just working under different paradigms and can not see or are not willing to see beyond what their paradigms show them. Therefore, they can not judge each other whatsoever.

Understanding this concept of lack of higher authority in scientific world can be applied in such a situation. It can help bring tolerance by giving the message that they are just different paradigms but good in their own way. When Foucault says reason can no be the only judge normatively, he is saying that the other has also a point to make on its own way. As Kuhn says, there can not also be a higher reference to judge. And because of that none is entitled to judge the other paradigm.

More and more appropriate and applicable examples that are social, political, economic, religious etc can be given that that can directly fit in to one or more concepts of Kuhn's model of the structure of scientific revolutions. But taking in to consideration the scope of the study, the purpose is to bring a few examples that can serve as sample and deal with them. Therefore, I believe more research can be done to in favor or against to enrich our understanding of Kuhn's model and its relevance to critical social theory.

Conclusion

In this thesis, I have tried to show the basic structure of Kuhn's concept of scientific revolutions. Kuhn before further enters into arguments on the nature of science, what he did is to show what really science looks like without any judgment. He calls a spade a spade. As a professor of history, he realized that some historians of science found it difficult to act in accordance with the concept of the cumulative development of science. Kuhn says that there are out-of-date beliefs which once were considered as scientific and which are not in principle unscientific because they are discarded. To illustrate that, he gives Galileo's treatment in the history of science as an example. I have shown that Kuhn's primary account of science is based on an empirical observation. Kuhn's final analysis is that science is not cumulative and linear progressive but revolutionary.

Therefore, in chapter one, I have tried to show an account of the nature of scientific revolutions. For him it all starts with a pre-paradigmatic phase and grows up to a paradigm based normal science. A pre-paradigmatic stage is where various schools and scientists compete with each other for acceptance and domination. But their existence is so limited that until one with the better theory than its competitors turns up. For him, therefore, normal science is all about a better theory, not a totally perfect description of a scientific problem. This unperfected theory, therefore, starts to exact itself which Kuhn calls it puzzle solving activity.

At this point, Kuhn is received by a severe criticism from different philosophers which I have tried to defend him. Karl Popper and Paul Feyerabend criticized Kuhn from different angles.

While Popper completely denies the existence of scientific revolutions, Feyerabend attacked paradigms by just accepting the pre-paradigmatic stage.

Popper accuses Kuhn for introducing relativism and calling science irrational. The idea of revolution is unacceptable to Popper. Rather, he says, science is progressive and its method is falsification. Popper replaces the concept of revolution by falsification. Hence, I attempted to defend Kuhn by going back to his work and Bernstein's defense of Kuhn. Kuhn never denied that but as long as it is within normal science. Likewise, I tried to defend Kuhn from Feyerabend's criticism by showing that science can not be anarchic and agenda free.

In chapter two, I have discussed the historical development and major philosophers and their thoughts in critical social theory. I included that because I believe that, for my readers, to be briefly exposed to the theories, can help understand the analogies I make. Hence, I have included, basic thoughts, starting from Karl Marx and Max Horkeimer upto Foucault and Habermas. I have shown the origins and purposes of critical social theory. I have shown that the purpose of critical social theory is emancipation from the constraints the social formations bring about. I have shown that critical theory discusses and describes the features of modern society that restrict or constrain individuals from living in freedom. The origins of this restriction could be economic, social or intellectual arrangements which continued in human history that they have become systematically entrenched in a society and are experienced as culture.

My purpose in chapter three is to show that Kuhn himself is taken as a critique of positivistic philosophical approach to science. Kuhn has questioned this approach as being a perspective of science which holds that the scientific method is the best approach to uncovering the processes by which both physical and human events occur. By doing so we can take Kuhn as a critique whose aim is emancipation from the widely accepted positivistic ideas of science that constrains our understanding of the nature of science.

In this chapter, which is one of my major aims, I have attempted to show how Kuhn's model is significant in understanding our society. I have used different empirical examples like the financial crisis, current debates on Ethiopian constitutions etc to substantiate my arguments. Moreover, I have shown also the importance of Kuhn's model as a response or a defense to major theorists in critical social theory. Jurgen Haberams and Mitchell Foucault have been taken as good examples in my attempt to make analogies between Kuhn and their thoughts.

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