Kuhn's Philosophy of Science is basically concerned with the question how the scientific knowledge develops. In order to see the growth of scientific knowledge, one has to consider the actual development of science; accordingly the consideration of history of science becomes the most essential. Kuhn has also recognised the importance of the history of science while accounting for its philosophy. His book, 'Structure of Scientific Revolutions' opens with a remark that history if viewed as a repository for more than anecdote or chronology, could produce a decisive transformation in the image of science by which we are now possessed. 

He further states that if the scientific growth is thus viewed from a historical point of view one can easily see that science develops by a series of normal-revolutionary-normal process, i.e. actual practice of science is a process of a normal scientific activity. However, on some specific occasions this process looses its normalcy and becomes extra-ordinary or revolutionary. In this revolutionary period the dominant theories of
science are rejected and replaced by new theory. After this shift the science functions again in its normal phase, with the domination of the newly established theory.

The governing metaphor of both normal and revolutionary periods of science is the notion of a 'Paradigm'. In scientific activity, it is a 'Paradigm' that makes the normal scientific activity possible and it is the same paradigm that undergoes any change. The term 'paradigm' thus functions as a root metaphor of Kuhn's Philosophy of growth of scientific knowledge. The analysis of the term paradigm, therefore, enables us to see the nature and function of the normal period of science and the revolutionary period of science as well.

A paradigm, Kuhn says, is an achievement. 'An achievement that some particular scientific community acknowledges for a time as supplying the foundation for its further practice.' There are two important characteristics of these achievements; these are as follows:

1) These achievements are sufficiently open-ended to accommodate the solutions of all sorts of unsolved puzzles.
2) They are sufficiently precise to attract the other groups of scientists.

These achievements are called as a 'Paradigm'. The normal scientific activity is firmly based on these achievements. It is directed by a paradigm. A paradigm supplies both solved and unsolved problems, at both theoretical and empirical levels. At the empirical level the normal scientific research is basically concerned with three classes of problems. The determination of significant facts, matching the facts with theory and articulation of theories. Let us see these.

The first one is a class of facts that reveals the nature of things which are determined with precision and with a large variety of situations.

The second one is directed by these facts which can be compared with predictions from the paradigm theory.

The third and more important is a class of facts that articulates the paradigm theory by resolving some of its ambiguities which are remain unsolved.

Similar to these experimental and observational problems of normal science, there are classes of the
theoretical problems as well. A small part of the normal theoretical work uses the existing theory to predict the factual information of intrinsic values. The theoretical problems of articulations of theory are predominant in scientific development, specifically when it is a qualitative one. Both, the empirical and the theoretical problems aim at the reformulation of the paradigm. Such type of reformulation occurs repeatedly in science. But very few of these reformulations produce substantial changes. There are very special occasions brought about by the advance of normal scientific research so as to create substantial change. On the contrary, most of the scientific research activities, even the problems undertaken by the very best scientists fall within one of these three above mentioned categories.

Kuhn describes such activities as puzzle solving activities; and the problems as puzzles. He coins the term 'puzzle' instead of 'problems' for a very specific purpose. These puzzles, he says, are within the domain of a particular paradigm. Like a criss cross puzzle, the instruments, methods and techniques to solve them are present within the respective paradigm. A paradigm is thus, 'a strong
network of commitments - conceptual, theoretical, instrumental and methodological - a principle source of metaphor that relates the normal science to puzzle solving.\textsuperscript{3} These are some commitments of a paradigm by which a normal scientific activity becomes a puzzle solving activity. We can very well classify these commitments into two types - metaphysical commitments and methodological commitments.

By the metaphysical commitments, the scientist is told, 'what sorts of entities the universe does or does not contain.'\textsuperscript{4} e.g., there are only shaped matters in motion. Such metaphysical commitments provide a scientist certain types of beliefs. They also provide him values of any scientific theory or paradigm. These aspired values are useful for a critical examination of rival paradigms. Later, in the course of discussion of paradigm change, we can see how these values are operated.

Secondly, by the methodological commitments, a scientist is told what ultimate laws and fundamental explanations are like. Thus, a paradigm is that from which rules, theories are abstracted. According to Kuhn, this is the reason why rules, laws or theories are not shared by the scientist, rather, what the
scientists share is a common paradigm, i.e., there are shared paradigms rather than shared rules. As such, the normal scientific activity Kuhn describes as a puzzle solving activity, since the solutions of these puzzles are assured by the governing paradigm. The nature of puzzle solving activity is such that by itself it indicates that the puzzles are different in kind from that of the problems. The problems seem to have a different category because they occur only on very special occasions. In the advanced stage of normal scientific research, the unsolved puzzles become anomalous. A problematic situation arises which Kuhn calls as 'Crisis'. Hence, the problems are in a higher category than the puzzles as their's is a larger scope and are more intensive. The solutions of the problems are not present within the paradigm as of the puzzles. Still, it is the normal puzzle solving activity that prepares the grounds for the problem solving activity. Let us consider this process.

A normal scientific activity is a highly determined activity, determined by a governing paradigm. Normal science, as a puzzle solving activity does not aim at any novel facts or theories and even
if such novelties are put forth, they are 'repeatedly uncovered by scientific research'.

But some puzzles fail repeatedly. The answers to these puzzles are not present within the reach of the controlling paradigm. At times, it is quite possible, while solving these puzzles some new discoveries may come up, which the scientists cannot uncover very easily. These new discoveries may assure a solution of the unsolved puzzles and hence, can have some unavoidable influence upon the scientists. The scientists may now look for a new paradigm which gradually weakens the control of the existing paradigm. The unsolved puzzles, now do not function as mere puzzles but become rather problematic. The functions of these puzzles are not now limited by the boundaries of the controlling paradigm. The existing paradigm fails to guarantee the solutions of these puzzles, so these puzzles need some other way to be solved. These unsolved puzzles are called as anomalies. The emergence of such anomalies evokes a critical condition. The scientists are in a need to check their own paradigms as they can no more rely on the governing paradigm. The scientific activity now looses its normalcy and it encounters an extra ordinary research.
The extra ordinary research activity is of a very different kind than the normal one. The distinct character of this extra ordinary scientific activity is that it is more concerned with the concrete problems and not with puzzles. This problem solving activity, Kuhn describes as a revolutionary or extra ordinary scientific activity.

Before the considerations of this activity, an important point needs to be clarified here. According to Kuhn, the growth of scientific knowledge undergoes three stages. These three stages are:

1) Pre-Paradigm stage,
2) Paradigmatic stage,
3) Post-Paradigm stage.

There are many points of similarities between the pre-paradigm stage and the extra-ordinary activity. Yet, there are some subtle differences in the nature of each one of them. There is a pre-paradigm stage before accepting any paradigm as a shared commitment, it is only after the acceptance of a paradigm that a discipline achieves the status of a mature science. This is the second stage of paradigmatic control. The extra ordinary activity is the further achievement of a mature science. It is a consequence of a normal
scientific research. Hence, as seen above, the extra ordinary research activity looks forward in search of a new paradigm. Here it is quite likely that the pre-paradigm stage and extra ordinary activity may be confused together, since there are many similarities between the two. Both are in search of controlling paradigm and both have to select it from the available alternatives. But, the alternatives available to each one of them are far different in kind. The alternatives in the pre-paradigm stage are in a constant struggle to be established as a matured one. Whereas, in the extra ordinary period the alternatives are in a constant competition to refute and replace the existing paradigm. The alternatives in the extra ordinary period, thus, exist in between the paradigmatic and the post-paradigmatic stage. While the alternatives of the pre-paradigm stage are struggling to achieve the paradigmatic stage. Thus, these two kinds of alternatives exist on two different kinds of phases in the growth of scientific knowledge.

This indicates that Kuhn is making a periodization of the growth of scientific knowledge. It develops in these three stages. The pre-paradigm stage is the base which further develops into the paradigmatic stage where the discipline achieves its
maturity; as a result of the matured scientific research, a discipline enters into a post-paradigmatic stage.

Thus, the extraordinary scientific research, has its own peculiarities. The paradigm which is never questioned in the normal scientific research, has to face a number of criticisms in a revolutionary phase. The failure to solve puzzles or the emergence of anomalies itself leads to the criticism of the basic scientific commitments. Both the normal and extraordinary scientific activities are thus, bound in an intrinsic relation. The revolutionary scientific activities directly result from the failure of the governing paradigm. The extraordinary activity thus aims at the refutation and replacement of the existing paradigm. It leads to the criticism of the basic shared commitments until some new paradigm emerges with the power to supersede the previous one with power to solve the previously unsolved puzzles.

This shift from one paradigm to another Kuhn characterises as a scientific revolution. With the emergence of a new paradigm, the normal scientific activity is regenerated. Thus, it seems, that mostly, the scientific research is in its normal phase and as
such, most of the time the scientists are concerned with puzzle-solving. On the contrary, the revolutions which are the immediate consequences of the advance of normal research, occur only on particular occasions and hence, are less temporal than the normal scientific activity. One can, therefore, argue that the normal scientific activity is directly responsible for the growth of scientific knowledge, while the revolutions are indirectly responsible for the growth of scientific knowledge.

But this leads to trivial consequences. The normal science which is directly responsible for the scientific growth is of such a kind that it lacks any critical attitude. The normal scientific activity is paradigm based. There is a commitment to the governing paradigm. Hence, the research work is always within the bounds of the paradigm. If the normal scientific activity is directly responsible for the scientific growth, then the lack of criticism has a central role in the advance of scientific knowledge. On the other side, the revolutions which are mainly criticising and refuting the old paradigm have to play a subordinate role, as they are indirectly responsible for the scientific growth. The criticism has an occasional and a temporal role. In a nut shell, it seems that the
normal scientific research or puzzle solving activity, without any critical attitude, is basic. The critical revolutionary activity, being temporal, seems to be instrumental for the growth of scientific knowledge.

The discussion of the growth of scientific knowledge suggests, that the units responsible for the scientific advance are the scientists working within the domain of a particular paradigm. Kuhn has coined the term, 'scientific community' that plays a vital role in a paradigm based research. He defines it as, 'a scientific community, consists of men who share a paradigm.' Conversely, he defines a paradigm in terms of a scientific community, i.e., 'a paradigm is what the members of the scientific community share'.

There is a circularity in these definitions as Kuhn defines the scientific community in terms of a paradigm and the paradigm in terms of a scientific community. But Kuhn acknowledges this circularity. He admits that it is circular and also further justifies that 'not all the circularities are vicious'. However, Kuhn has not explained how it is not vicious.

The scientific community, as defined by Kuhn seems to be an intuitive notion. One of the characteristics of the scientific community is that it consists of the
practitioners of the scientific specialities. The notion of a scientific community is 'widely spread by scientists, sociologists and a number of historians of science.\(^9\) The other major characteristic of a scientific community is its sharability, that it shares a common paradigm. The characteristic of sharability of a paradigm signifies the structure of a scientific community and at the same time identifies such communities as well. The membership of a paradigm highlights another important aspect of a scientific community, the socialization of an individual scientist within a particular discipline. The members of a particular scientific community not only share a common paradigm but, are trained according to the values and norms as well as the methods and techniques given by that paradigm. A scientist is trained according to the methodological and metaphysical commitments of the given paradigm. Such a training is useful for the professional initiation. In the process of education the young generation absorbs similar techniques, methods and similar literature as well. This is possible, not only within a normal paradigm based research but also in a preparadigm stage where many alternative paradigms are competing with each other. Kuhn explains that one of these
alternatives succeeds as a paradigm and then gradually the other alternatives also join the same group of practitioners. He says, 'as a result, the members of a scientific community see themselves and are seen by others as the men uniquely responsible for the pursuit of a set of shared goals, including the training of their successor.'

The members of such communities are in full communication with each other, at the same time, they attract the attention of the members of the other communities as well. The professional communication between two communities may be misleading or may sometimes result in some misunderstanding, though they share some common elements, or agree on some basic issues. Each scientific community has something common to share and along with their own, they also respond to the other communities. Hence, the notion of a scientific community should not be confined to the controlling paradigm alone; at the same time it should be defined in terms of a discipline or sub-disciplines. In this sense, we can locate the scientific communities at different levels. 'The most global is the community of all natural scientists' and among them are the communities of physicists,
chemists, Zoologists and the like. Even within these communities there are further subdivisions, e.g., Organic Chemists or Protein Chemists among them. Thus, there are two main types of communities. They are, the macro communities and the micro communities. Kuhn further states that it is only at the level of the micro-communities, the empirical and the theoretical problems arise. These micro-communities have, therefore, the potentiality to develop further. A focus on the function of these micro-communities can help us to see how science advances from one micro community to still further community. These micro communities are paradigm bound or paradigmatic as well. The research activity within these micro communities is governed by the respective paradigms. Hence, the advanced scientific research within such communities necessarily leads normal-revolutionary-normal process.

The notion of scientific community, existing at different levels, significantly shows that science develops as a non-cumulative process. The break of an existing micro-community and emergence of a new micro-community is the necessity of the advance of scientific research. It thus, seems that Kuhn is correctly giving the account of scientific community in terms of the macro and micro communities.
Kuhn has, therefore, introduced the term, 'disciplinary matrix' instead of a 'paradigm'. Even for the use of the term paradigm, Kuhn has been immensely attacked. Margarete Mastermann has given twenty two different meanings of the term paradigm, as used by Kuhn. In order to avoid such a complicated use of the term paradigm and also because of the significant role of the scientific community, Kuhn prefers the term, 'disciplinary matrix' instead of a 'paradigm'. He explains the term, disciplinary matrix as follows:

'Disciplinary, because it is the common possession of the practitioners of a professional discipline, and matrix because it is composed of ordered elements of various sorts, each requiring further specification.'

Kuhn further explains that there are three components of a disciplinary matrix, viz., symbolic generalizations, models and examplars. Symbolic generalizations are most often in a logical form, like \((X) \ (Y) \ (Z) \ \emptyset \ (x, y, z)\). The members of a scientific community accept such generalizations without any question. Models are like analogies. Hence, symbolic generalizations and models can easily become familiar to the scientists. The examplars
perform little differently. Examplars are the solved problems ready with the paradigm or now a disciplinary matrix. Hence, the scientific community does not hesitate to accept them. These examplars provide a guide line to the scientists to solve the unsolved puzzles. The examplars thus have a central role to perform in the process of normal scientific research. Hence it is necessary to see in detail how a scientific community functions with the help of these three components.

The symbolic generalizations are always in a logical form, or otherwise, expressed in words, e.g., $f = ma$ is a symbolized logical form, action equals reaction of chemical components are in fixed proportion of weight, these are the linguistic expressions of symbolic generalization. These symbolic generalizations function differently in pure mathematics than in a scientific theory. In a pure mathematical system they are used either as substitutions of identity or as syntactic substitutions. Whereas, in the scientific theories, these symbolic generalizations function mostly as generalization sketches or as schematic forms. But, they are likely to vary according to the given problems. They vary according to the applications as well, e.g., the problem of free fall, $f = ma$ becomes
When used in scientific theories, these symbolic generalizations provide an entry point to mathematics and logic.\(^1\)

Introduction of the symbolic generalizations have some interesting conclusions. The empirical content of the scientific theories enters from the top as well as from the bottom. On the one hand, the scientists agree with the fact that the empirical content provide a base for a scientific theory and accordingly the symbols are changed into the signs. On the other, the scientists also agree that there are scientific theories which are eliminated from empirical content without any deduction. But Kuhn argues that whatever route one may choose, the symbolic generalizations cannot be discarded at any entry point. Hence, they function at the top as well as at the bottom.

It seems that, by way of symbolic generalizations, Kuhn is emphasizing a non-empiricist stand. The symbolic generalizations function in such a way that not an empiricist nor even a realist can start without them.
The main point here is how these symbolic generalizations are attached to the nature? How to make use of one symbolic generalization in case of different applications, i.e., how one phenomenon is explained either in terms of combinations and recombinations of different symbolic generalizations or otherwise with one single symbolic generalization?

In order to answer these questions, Kuhn refers back to the training of a research student within a particular discipline. This training is done by use of models and exemplary solved problems. Examplars, as one of the components of a disciplinary matrix play a very fundamental role in the process of scientific pedagogy. The students get acquainted with the solved problems with the help of the examplars. At the same time, the students are also used to deploy methods, techniques which are used to solve these examplars. This means that the examplars function on two important fronts. Firstly, the students learn how to use the methods and techniques given and secondly, how to deal with the puzzles with acquired methods and techniques. Thus, while being acquainted with the solved problems, they can also use this ready material to solve the unsolved puzzles. With the help of examplars the students learn to see the resemblance relation between
the solved problems and the unsolved puzzles. The training of the examplars enables a student to model the problem accordingly. In short, the study of examplars trains a student in a particular discipline and at the same time it enables a student to use them as models, to solve the unsolved puzzles.

The three components of a disciplinary matrix and their function, thus, highlights the necessity of training in a particular discipline. This training is useful for a researcher as it enables him to see the resemblance and not the correspondence between two types of problems. Here, Kuhn is mainly focusing on the similarities between the previously solved problems or the examplars and the unsolved puzzles that are posed by the governing paradigm. Kuhn says that the research activity is exposed to nature by these similarity relations. These similarity relations tell a research scientist what to resemble and how to resemble.

Superficially, it seems very easy, rather mechanical to look for these resemblances. But it is not so easy to locate a problem and to locate its resembling examplar. In order to locate such resemblance relation, it needs a special kind of
training. Here, Kuhn is giving an analogy of a child and his learning to differentiate between swans, ducks and geese by use of the resemblance relations. The child does not need any kind of generalizations as all swans are white, to identify swans from geese and ducks.

So Kuhn is suggesting, that, on the basis of the examplars, the research students model their problems, then try to solve them with the help of methods and techniques which are also acquired by the study of the examplars. In the Kuhnian terms what the students learn from the examplar is 'to recognise the "actual descents" and "the potential ascents" as ingredients of nature, that is to learn something prior to the law, about the situation that nature does and does not present.' This process of learning resemblance relations is tacit and is learned by 'doing science rather than acquiring rules for doing it.'

What a scientist, thus, acquires through his training within a particular discipline, is the scientific intuition. As these intuitions are possessed by the special kind of training, they can be shared by the other scientists as well. This characteristic of sharability of scientific intuitions
may help to abolish some of the charges made against Kuhnian thesis of scientific change.

Kuhn's interpretation has often been charged as subjective and hence irrational. Such criticisms are mainly against the science pedagogy. Karl Popper has criticized Kuhn on this point. According to Popper, in Kuhnian thesis science pedagogy or training within a specific paradigm has been overemphasized. Such a kind of making and formation of a scientist builds a consensus on the respective paradigm. When led by the consensus on the paradigm, the scientists can never be critical about it. They treat the given paradigm as an ideal, hence hardly doubt it. The consensus on a particular paradigm may, therefore, limit the individual originality or spontaneity.

Kuhn himself has suggested that in a paradigm based science, or in a normal science, some new discoveries do arise. But the domination of the existing paradigm does not allow them to enter into the field. Thus, it seems, that there is hardly any scope for individual initiative within the bounds of a normal, paradigmatic science.

However, the scientists become critical at the time of theory choice. They have to take a decision
about a new paradigm. Yet, here again, Kuhn is not giving any precise grounds for the theory choice. He has not mentioned any particular criterion for theory choice, Hence, the theory choice has been criticized as subjective and also irrational. Subjective because every scientist is free to judge, but the question is on what accounts?

Imre Lakates goes a step further and comments that the decision of accepting a new paradigm can be described as mob-psychology. According to Lakates, though the scientists are free to judge the rival paradigms on their own, it is quite likely that some leading scientists may follow a new paradigm and so do the others. In such a case the paradigm choice is nothing but a decision of 'mob psychology' and hence irrational.

Kuhn, agrees with some of these criticisms and later on gives five criteria of theory-choice. They are accuracy, consistency, scope, simplicity and fruitfulness. Any scientist can judge the alternative paradigms according to these criteria of theory-choice. He can ask the relative weight of two theories on the basis of these criteria, i.e., the scientists may not agree on the point of accuracy; for some, the new
paradigm may be accepted on the criterion of consistency rather than accuracy. Some scientists may agree on the point of accuracy but may not agree with the relative accuracy. How such disagreements are tenable? How far a common decision by such disagreements is tenable? These are the important questions.

Kuhn solves this question by treating these criteria as value judgements. He says that the value judgements are such where the rational men do disagree. Such disagreements can be further discussed. And hence men who first disagree may agree subsequently. So, value choices, lead to a possible persuasion and more over, it is a rational persuasion. The paradigm choice as value judgements, thus, does not remain an experience of conversion. It becomes a rational persuasion followed by the values of the paradigm.

This process of acceptance of a new paradigm, in the place of the old one, Kuhn calls a 'Scientific Revolution'. This revolution or paradigm change, is of a peculiar kind. With the new paradigm the methods and techniques of the old one may also be replaced by some new one. It may bring out some new and radical changes on both theoretical and empirical levels,
'led by a new paradigm scientist may adopt new instruments and look in the new places, and none-the-less, during revolutions scientists see new and different things, when looking with familiar instruments in places they have looked before.'

Along with the paradigm, even the 'World-View' changes. The world of his research seems incommensurable with the one he had inhibited before.

On this point of incommensurability, Kuhn has been immensely criticised. It is said that the notion of incommensurability leads to a kind of relativism. Kuhn has described, as seen above, different paradigms with differing world-views. The two paradigms - the old and the new one - suggest different theories, and hence different symbolic generalizations and exemplars. Both dealing with altogether different problems. Kuhn says that the problems of the old paradigm - both solved and unsolved problems may have answered in some new way with some new methods and techniques. None-the-less, some old problems may be discarded by the new paradigm as being unscientific. So, the two traditions, the old and the new, are meaningful only within their own frameworks; within their respective paradigmatic bounds. The question is how should any communication be possible between the two paradigms,
since Kuhn is describing them as two incommensurable traditions.

However, it is important to see whether such a kind of extreme relativism is possible at all? It is true that scientific advance is not a linear process. It develops with some breaks in the tradition. Does this mean that a break or revolution, in Kuhnian sense, can totally separate the old normal science from the new one? Kuhn is suggesting that the problems of the old paradigm are not directly responsible for the emergence of a new paradigm. The scientific knowledge, therefore, does not develop as a complex cumulative chain where a theory $T_1$ is superseded by another theory $T_2$ and so on. One may argue that the old paradigm may not be directly responsible for the scientific revolutions, still it is the same old paradigm that prepares the ground for a scientific revolution. Hence, in a sense, it may have some indirect influence on the new paradigm. If the same point is looked at from a different view it may focus the problem of incommensurability with a new perspective.

One such approach can be seen in Kuhn's theory itself. Kuhn is explaining the development of scientific knowledge with revolutionary changes, the
change in a normal research tradition or, otherwise, a break of the discipline into a sub-discipline. His classification of the scientific community in terms of different disciplines and sub-disciplines suggests the same. This type of classification also describes how a paradigm functions as a controlling mechanism over a particular discipline. But at the same time it also controls the other disciplines indirectly, because there are not only subdisciplines within a particular discipline but more importantly, there are various combinations of these disciplines such as biochemistry. While controlling a particular discipline, the same paradigm indirectly controls the other disciplines, simultaneously. This type of control we can describe as intradisciplinary and interdisciplinary control respectively. Such direct and indirect, or in other words, intradisciplinary and interdisciplinary control is possible only when there are some common sharable elements within the two paradigms. As such, one can say that the scientific community not only agrees with the respective controlling paradigm alone, but it also has some indirect consensus on some other paradigms at the same time. So a question can be posed, as to what possible commensurable elements there can be, within the two alternatives or competing paradigms?
A similar charge against Kuhn has been made by Stephen Toulmin. He has pointed out that the scientific revolutions are not so radical as Kuhn is suggesting nor even the distinction between the normal science and the revolutionary science can be held so strongly. Toulmin is suggesting that even within the normalcy of the paradigm there are some modifications or changes. But these changes are different in kind from that of within the revolutionary period. The changes during the normal period are always within the limits given by the controlling paradigm, hence, can be labelled as the variation. On the other hand, changes during the revolutionary period are more wider in scope as they are changing and replacing the existing paradigm itself and thus, can be coined as 'changes' in its proper sense.

He further suggests that, only when normal scientific research becomes rather critical the revolutionary changes take place. Hence, the change includes the variations but not vice-versa. Moreover, he suggests that growth of scientific knowledge is not just a revolutionary process, but there are certain evolutionary elements involved in this process. According to Kuhn, the advanced normal scientific
research itself raises the need of a revolutionary research. Toulmin also says that it is the normal scientific research that prepares a route for a revolutionary process. On the contrary, the same revolution provides a stuff for the further evolutionary process, i.e., the normal scientific research process. The advance of scientific knowledge can be, thus, described as a evolutionary - revolutionary evolutionary process as Kuhn has described the same as normal - revolutionary - normal process. Now, the question is that, though we can distinguish between normal - revolutionary - normal periods, whether a watertight periodization among them is possible. It is a difficult task to mark when a normal scientific research begins and when it breaks down and the revolutionary changes come into the picture. Hence, it is questionable whether the revolutionary paradigm is totally incommensurable with the old one.

Moreover, it has been argued by Kuhn that though the same old terms are used in a new paradigm, they refer to something novel. Their meaning has been changed within the new framework. Along with the new paradigm the meaning of the old terms also changes. They also acquire a new meaning. It is this meaning
variance that calls for the changes in world-view. Shapere has criticised this meaning variance. According to him, Kuhn has not analysed the point of meaning variance in a clear and neat fashion. More specifically, Kuhn has not provided us any criteria of change of meaning. For Shapere, the changes of meaning are, in fact, changes in its application. Kuhn has not made clear that whether they are changes of meaning or are changes of application. 

Further, Shapere explains that such difficulties exist due to the relativistic position. That they are mainly the consequences of the dependence of a normal tradition on a governing paradigm. Such difficulties are also connected with the notion of incommensurability within two paradigms.

In the wake of the above questions, there arises a need to reconsider the very process of paradigm change. An overview of Kuhn's philosophy of science leads us to conclude that the concept of paradigm change or change is a central problem of Kuhn's thesis. Since he takes a historical approach towards the growth of scientific knowledge, the problem of change has to be a center of emphasis in the advance of scientific knowledge. At present it is necessary to see whether Kuhn has given a sufficient
account of paradigm change. In fact, what Kuhn provides are the conditions which ask for a new paradigm. These conditions suggest a need for paradigm change. These conditions provide the necessary grounds for a paradigm shift. But are they sufficient to explain paradigm shift? In short, it can be said that Kuhn is suggesting the grounds for a paradigm change. However, he does not explain what is actually meant by paradigm change. Hence, a reconsideration of the notion of paradigm change itself is needed. Such a reconsideration may be helpful to answer some of the above discussed criticisms of Kuhnian thesis as well. One may therefore, argue in the following terms.

The growth of scientific knowledge can be considered from two points of views. These can be treated as two different approaches, but these can never be separated from each other. One is an objective approach while the other is a subjective one. The objective approach asks for how new tradition represents the old one, or how there can be a continuity from the old thinks to the new thinks. Secondly, the subjective approach asks for how a new discovery arises or what it is that leads a scientist to discover something novel. Thus, the
objective approach is a historical one. While the subjective approach refers to human psychology.

The above two approaches, the objective and the subjective may lead to a new way of looking at the problem of paradigm change. It may help us to understand what 'change' really means, by throwing a new light on the problem of incommensurability. Such an approach may focus upon the problem of 'change' and the problems related to change, with a different perspective.

Apart from these problems, Kuhn's model of paradigm change has some other important consequences. The most striking is an immense impact on the social sciences in particular. The social scientists usually treat the Kuhnian model of paradigm change as an ideal one and then try to explain their own disciplines in terms of it.

Kuhn has described the scientific activity in terms of the activity of a scientific community. To practice science collectively, the scientists do commit to a governing paradigm. Hence, the paradigm control seems to be a social control. Some of Kuhnian notions, such as a scientific community,
consensus, commitments of a paradigm and paradigm control can function as the sociological variables. These sociological bearings of the Kuhnian thesis attract the social scientists.

It is at this juncture, that a critical study is needed in order to state the possible relevance of Kuhn to the particular social sciences. In fact, a comparative study of the development of both natural and social sciences is needed. To consider the possible relevance, we have to start from the subject matter or the point of emphasis of the respective sciences.

The social sciences are a later day development than the natural sciences. Hence, philosophers of natural sciences assign an inferior status to them. On the other part, the social scientists are struggling for an equal status. To achieve this purpose they are trying to use the Kuhnian model of normal-revolutionary - normal process as an exampler. Hence the development of both the sciences becomes crucial. Whether the Kuhnian model is applicable to social sciences depends solely on the process of development.
Another important consequence of these sociological bearing is that the Kuhnian model has a possibility of being considered from the point of view of sociology of knowledge. Today, the sociology of knowledge is viewed from an hermeneutical point rather than the causal one. Hence, it may be interesting to see whether the hermeneutical interpretation of some of Kuhnian notions, such as scientific community or consensus. With this hermeneutical perspective we can have a contextual study of Kuhn's thesis of paradigm change, it is interprets the respective problem within the proper context.

In this thesis an attempt has been made to consider the Kuhnian model from an hermeneutical point of view. But before coming to this perspective, it is necessary to see why the Kuhnian model has been chosen. What is its uniqueness that gives it such an importance? In order to do that we have to consider the very development of the philosophy of science.

To consider the developments prior to Kuhn, we can begin from the positivist philosophers of science. They emphasize more upon the sense experience or observations and experiments. According to them the observations and experiments can be used as the principles
of verification. Thus, for them, only that knowledge is meaningful and scientific which we can verify conclusively. But later they accept the verification in its weak sense also rather than as conclusive. On the other hand, Popper considers these observations and experiments as falsifying the given hypothesis and suggests a deductive method of the possible falsification. Popper, thus, gives a theory of growth of scientific knowledge as falsification suggests a theory of successive change.

Kuhn approaches the same problem from a different angle. We have seen earlier that Kuhn has taken a non-empiricist's stand. Moreover he has emphasized an historical approach and has explained how history can help to philosophize the development of ideas. Hence, it seems that Kuhn is directly approaching the growth of scientific knowledge.

It, therefore, seems to be appropriate to consider the development of philosophy of science itself and then to approach towards the respective Kuhnian problems.
NOTES

2. Ibid., p.10.
3. Ibid., p.42.
4. Ibid., p.41.
5. Ibid., p.52.
6. Ibid., p.176.
7. Ibid., p.176.
8. Ibid., p.176.
9. Ibid., p.177.
10. Ibid., p.177.
11. Ibid., p.177.
16. Ibid., p.191.