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THOMAS KUHN'S CONTRIBUTION TO THE HISTORY AND PHILOSOPHY OF SCIENCE

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Abstract:

The image of science that we obtain today represents science as the cumulative, rational, experimental and effort of a number of people who have contributed to its development. In 1962, American philosopher Thomas Kuhn in 'The Structure of Scientific Revolutions' shattered our understanding of science. At first Kuhn discards the notion of cumulative research. He challenged the mechanism through which we acquire 'scientific knowledge'. Kuhn claims that science can make progress through 'paradigm shifts'. Kuhn researched the idea of revolution in science, and examined whether there is any need for revolution at all. In this assignment I will find out Thomas Kuhn's contribution to the history and philosophy of science. Also, whether he believed in a scientific revolution at all.

Keywords: *Normal Science, Paradigms, Anomaly, Crisis, Scientific Revolution*

INTRODUCTION:

As the Thomas Kuhn has indicated, the scientific revolution is the scientific paradigm, and the logical standards that precede and succeed a change in outlook are different to the point that their hypotheses are incommensurable – the new worldview cannot be demonstrated or disproved by the old worldview guidelines, and the other way around. In "Normal Science" Thomas Kuhn tested the then overarching perspective on progress. Ordinary logical advancement was seen as "development by accumulation" of acknowledged realities and speculations. Kuhn contended for a rambling model in which times of such reasonable congruity were hindered by periods of progressive science in ordinary sciences. Scientific disclosure of "Anomalies" in the midst of unrest prompts new ideal models. New paradigms then ask new questions about old data, moving beyond the "puzzle-solving"

of the preceding paradigm, change the game rules, and the "map" that guides new research.[1] Kuhn called the centre ideas of an ascendant their "paradigms" upset and in the second half of the twentieth century propelled this word into wide analogical use along these lines. In response to his work, Kuhn's suggestion that a change of outlook was a mixture of human knowledge, resources and rational promise, but not a regularly decided process, created a mayhem.

Route to Normal Science:

Kuhn provides a new methodology to understand the development of science. He terms the popular, textbook idea of science as 'normal science'.[2] 'Normal Science' means past scientific successes that scientists have acknowledged as a basis for further scientific progress. Normal science becomes popular in society, gains a high 'scientific' status, and represents the image of science on a mass level. Kuhn argues that there are two important conditions for achieving 'normal science'-first, the achievement was exceptional and significant enough to draw a community of scientists away from similar achievements; second, it gives this group the opportunity to solve all sorts of problems. Achievements with these two qualities have been referred by Kuhn as a 'paradigm'.[3]

Men whose examination is dependent upon shared paradigms focus on similar guidelines and logical practice benchmarks. The acquisition of a worldview and the more recondite type of research it provides is an indication of the development of some random logical field. World view transformations are logical unrest and is the typical formative example of developed science without a paradigm or some contender for paradigm, most of the realities that might be related to the improvement of a given science will probably appear to be equally significant. In the early times of the advancement of every technology, distinctive people defy, in different ways, a common reach of wonder, portray and translate. These introductory divergences on the pre-paradigm schools disappear with victory.

Normal Science as Puzzle-Solving:

In enterprise, normal science is highly cumulative. Normal science aims little at producing major novelties, conceptual or phenomenal results that do not fall within the narrow range are usually just research failures. Even the project whose goal is the articulation of paradigms does not aim at unforeseen novelties. Scientists become the expert solvers of puzzles. The existence of a strong network of conceptual, instrumental, theoretical, and methodological commitments is a principal source of metaphor that relates normal science to solving puzzles. Equipped with a paradigm, a scientific community acquires criteria that can be assumed to have a solution to a problem. A paradigm may also separate the group from those socially relevant problems that cannot be reduced to puzzles in the form of paradigms that help to set puzzles and limit appropriate solutions. Intrinsic meaning is not a puzzle criterion, the presence of a solution has to be defined as a puzzle, the problem has to be constrained by certain laws and steps to solve the paradigm has to give.

The Priorities of Paradigms:

Thomas Kuhn states a term called, 'paradigms', as he mentions, "a term that relates closely to 'normal science'."[4]

In order to be recognized as a paradigm, a hypothesis has to seem superior to its rivals. When an individual researcher can underestimate a paradigm, he never again needs to endeavour in these real works to re-manufacture his field, starting from the first standards, and to support the use of every presented idea. This is left to writers who read on the course. Once a paradigm has been built up, both the gathering of certainty and the enunciation of hypotheses turn out to be exceedingly coordinated exercises. The new paradigm suggests a different and increasingly unbending sense of the field. Those reluctant or powerless to owe their work to it should go on separately or join in some other gathering. Achievement of a paradigm guides a whole array of research.

Paradigms of a developed science network can be solved without raising a finger but not rules. Lack of a standard translation or a concurred decline in principles would not maintain a paradigm of research management Rules came later than paradigm in the light of the fact that Relative difficulty in finding the principles. Scientists effectively adapt new speculations alongside implementation, not in deliberation for whatever length of time the issue arrangement is recognized by the network, no norm is needed to substitute rules with ideal models that render assorted field variety rational. The scan for guidelines begins when researchers differ on whether their field's major issues have been addressed. Debates are almost non-existent in the midst of ordinary science, but normally occur just before and in the midst of logical transformations. Lack of tenets also empowers an upheaval created within one of the customs to challenge locally the ideal models and not extended to different paradigms.

Emergence of Scientific Discoveries:

Discovery is a process that requires interpretation and conceptualisation, not a singular presentation. In typical science, anomalies are disheartened as methodology of paradigms and applications are as important to science as paradigm laws and hypotheses, and they have a similar impact. They undoubtedly restrict the phenomenological area at any random time which is open for logical analysis. Not all hypotheses may be paradigms. Researchers usually create numerous theoretical and unsaid hypotheses, both in the midst of paradigm periods and in the midst of an emergency that prompts a vast change in paradigm scale. Just as inquiries and speculative theories develop like one verbalized to a match, the discovery emerges and the hypotheses becomes a paradigm. The gradual and synchronous growth of the two perceptions and the measured recognition, and the resulting disparity in paradigm classifications and strategies are periodically accompanied by obstruction. Anomalies also appear against the paradigm's base.

Scientific Revolution:

According to Kuhn, if a discovery does not fit the exploitations of a specific paradigm, it is considered as 'anomaly'. An anomaly dismisses the claim of the paradigm to understand the world; hence the followers of that paradigm try to explore the anomaly and adjust it with that theory of paradigms. When an anomaly's awareness lasts very long and cannot be adjusted to a specific paradigm, that paradigm gives birth to crisis. To solve a crisis, this paradigm must be destroyed and new methods introduced to address the problems of normal science must be introduced. A crisis can put serious insecurity into a paradigm, as it questions the ability of that paradigm to solve problems. Crises are needed to form a new paradigm. When a crisis emerges, the scientists change their attitude towards an existing paradigm and accordingly their research methodologies also change. Kuhn points out some number of characteristics of a transition from one paradigm to another- 'The proliferation of competing articulations, the willingness to try anything, the expression of explicit discontent, the recourse to philosophy and to debate over fundamentals'[5]- these all indicate a phase of transition.

Kuhn refers to this paradigm shift as a 'revolution.' According to him, there was no scientific revolution but 'revolutions' because any paradigm shift is a revolution. For example, Copernicus, Newton, Galileo, Lavoisier or Einstein everyone discarded their previous paradigms and provided a new one and thereby brought a revolution. As Kuhn puts it '....scientific revolutions are here 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.'[6] Like political revolutions, scientific revolutions occur from the growing sense of a minority of scientists that an existing paradigm has become incapable of solving the problems of one aspect of nature to which it has pioneered previously. Both scientific and political revolutions occur when a sense of malfunction takes root in a small section of the minds of the people. Kuhn also says this revolution is very relative in nature i.e. it may seem revolution to those whose paradigms have been shattered by it but others may perceive it as another phenomenon.[7] For example, X-ray discovery was a revolution to those who deal with radiation theory but astronomers won't view it as a revolution because it didn't change their paradigm, or did very little. Scientific revolutions change the path how the scientists view the universe. They adopt new tools, and look at the same problem from a different perception. But the previous one had many features included a new paradigm. In the end, the scientific method of gathering knowledge, observing and experimenting remains the same.

But a paradigm is not destroyed by every new discovery. A new theory may actually not be understood before, or the theory may ties together several previous theories without changing them. But the new theory may create anomalies, problems and then a scientific revolution will replace it. Kuhn claims paradigm change is inevitable. Hence, he opposes the common notion of science as

cumulative rather than establishing that scientific development has occurred by replacement.

Thomas Kuhn describes the Scientific Revolution process. It only exists once, and is the pre-paradigm phase where there is no consensus on a specific theory. There are several inconsistent and incomplete theories characterizing the phase. Many scientific work takes the form of long books, as there are no specific facts that can be taken for granted. Lastly, if the pre-paradigm group actors choose to follow one of these conceptual constructs, they can eventually achieve a broad consensus on the correct methods of choice, vocabulary and types of experiences that can lead to more knowledge.

Normal Sciences starts in which puzzles in the dominant paradigm definition are overcome. The normal Science continues as long as there is consensus within the discipline. Over time, advances in normal science can reveal anomalies, facts which are hard to explain in the existing paradigm concept. While these anomalies are usually resolved, often they can accumulate to the point that normal science becomes difficult and the old paradigm's flaws become evident.

If the paradigm shift is chronically unable to account for anomalies, then the community will enter a phase of crisis. In the context of normal science, seizures are often resolved in a paradigm, and science can enter the next phase.

The paradigm shift or scientific revolution is the process in which the domain's underlying assumptions are re - examined and a new paradigm is developed.

The supremacy of the new paradigm is developed after the Revolution, and scientists return to normal science and solve puzzles inside the new paradigm.

Scientific Revolution: Why and When?

According to Kuhn, as mentioned above, there was no scientific revolution but scientific revolutions occurred. After occurrence of certain specific events, scientific revolutions occur. There are events which are prerequisites for a scientific revolution occur. As written before, earlier scientific advances known as 'normal science' claim to have a complete understanding of nature and to be able to solve the problems it poses in nature. That image of normal science becomes punctured with the emergence of an anomaly. Although the followers of normal science are trying hard to adjust it to the normal science theory, some stubborn anomalies are refusing to assimilate with normal science. Such anomalies bring crisis. Crises are necessary to initiate a scientific revolution. Scientists at first don't prefer to shun the paradigm when confronted with a crisis. Because they have to find a better alternative before leaving it; rejecting a paradigm without replacing by another is like rejecting science itself.[8] Scientists very often like to wait, they do more research and experiment to adapt the crisis to normal science.

Anomalies that challenge the consistency of a concept over an aspect or functional

implementation have greater chances of succeeding. And Scientists consider more of an anomaly than any usual normal science puzzle. More and more scholars are paying attention to this. Some get effective in adapting it with the paradigm in some cases but some resistant anomalies refuse to assimilate. These resistant anomalies are against assimilation. Scientists sometimes perceive those resistant anomalies as part of their discipline. Continued efforts to resolve an anomaly result in the rules of that paradigm being partially shifted. The validity of that paradigm therefore faces serious question. Some followers became doubtful about its efficiency, even previous problems solved by this paradigm is also questioned.[9] That situation is known as crisis. All crises have two universal characteristics-first, they damage an existing paradigm and result in invalidity of its laws. Second, a crisis can end in three ways- (i) normal science become able to handle the crisis (ii) presently no solution cannot be found and the crisis is left aside for future generations (iii) a crisis may cause to emerge a new paradigm and the following struggle for its acceptance.[10] The final type of crisis evokes a revolution in the sciences. A scientist attempts to find a way out while in crisis; he formulates new ideas to solve a crisis which can lead to a new paradigm. The move to a new paradigm is considered as "scientific revolution." From previous discussions, therefore, we can conclude that a scientific revolution takes place when a crisis makes a paradigm defunct and the scientists naturally take a different look at their understanding of the universe which leads to a new paradigm.

Indeed, there was a Scientific Revolution, that is, a paradigm shift, culminating in the Scientific Society's changes.

As Kuhn puts it, “In its normal state, a scientific community is an immensely efficient instrument for solving the problems or puzzles that its paradigms define. Furthermore, the result of solving those problems must inevitably be progress.”[11] The Copernican Revolution is one of the most important paradigm changes in science history.

As for N.M. Swerdlonmentions, “The Copernican Revolution Broadly understood has all of these meanings, Astronomical, Scientific, and Philosophy, Religion, and the values resulting from no longer seeing the Earth as Unique centre of God’s creation.”[12]

“Each new Scientific theory preserves a hardcore of the knowledge provided of the knowledge provided by its predecessors and adds to it. Science progresses by replacing old theories with new, “and the history of Copernican theory, as if any Scientific Concepts evolve and replace their predecessors.”[13]

Stresses crisis as the most important factor for a scientific revolution. Kuhn opposes the previous concept that development of science is a cumulative process of creation. The new

paradigm's emergence is not a simple continuation of the previous paradigm but a replacement of the previous. Scientific revolution includes complete or partial destruction of previous paradigms.

Kuhn obviously recognizes the idea of a scientific revolution but attributes no time period to it. Each and every new discovery that demolished a paradigm is a revolution for him, from Copernicus to Einstein. The fundamental changes in the way of perceiving the world initiate a revolution for him.

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