The Popper - Kuhn Debate Reexamined

Dr. Majeda Ahmad Omar*

Abstract

The nature of scientific progress and the rationality of scientific change lie at the centre of Karl Popper's and Thomas Kuhn's thought. This paper provides an analysis of the Popper - Kuhn debate over those issues; according to which, Kuhn is portrayed as subjectivist and relativist, while Popper emerges as objectivist and realist.

The paper is divided into three parts. Popper's claims regarding scientific progress and rationality are examined in Part One. It is argued that Popper's philosophy is inherently value-driven, while defending the objective characteristics of scientific truth. Part Two explores Kuhn's conception of science, of the rationality of science and scientific progress. Kuhn argued that knowledge is relative only to the accepted paradigm. Part Three is taken up with a comparative discussion of the main issues related to the Kuhn - Popper debate.

Keywords: Rationality; Falsifiability; Paradigm; Incommensurability; Relativism; Realism.

*Department of Philosophy, Faculty of Letters, Jordanian University

PART ONE: The Thought of Karl Popper

There are three major connected strands of thought in the philosophy of Popper: Firstly, the solution of the problem of induction, secondly, the problem of demarcating science from non-science, pseudo-science, and metaphysics, and thirdly, the importance of maximizing criticism and retaining a 'critical attitude' as indispensable for rationality and crucial for the growth of knowledge.

In his *The Logic of Scientific Discovery*, Popper rejected the positivist criterion of demarcation between meaningful (scientific, verifiable) statements and metaphysical unverifiable statements. He rejected the claim that the potential for verification is that which distinguishes science from non-science. David Hume had already shown that, as a matter of logic, a universal law of science could never be verified and according to the positivists' own criterion, all universal laws of science are meaningless. Popper turned the positivist doctrine on its head by arguing that what characterises a universal law of science is that it forbids certain events. Should those events occur, the law is refuted. Popper tells us that "The game of science is, in principle, without end. He who decides one day that scientific statements do not call for any further test, and that they can be regarded as finally verified, retires from the game."[1]

Popper examines, in his *Conjectures and Refutations*, the demarcation between science and metaphysics and the logical positivist's thesis of the meaninglessness of metaphysics.[2] His answer to the question of demarcation is: that the falsifiability of a system is to be taken as a criterion of demarcation,[3] contains, along with his antifoundationalism[4] and fallibilism[5], the basis of Popper's entire philosophy.

---

[1] Popper, Karl R. *The Logic of Scientific Discovery*, London, Hutchinson, (1959), p. 53.
[2] Popper, Karl R. *Conjectures and Refutations: The Growth of Scientific Knowledge*, Chapter 11, (1972).
[3] Popper, K. R. *The Logic of Scientific Discovery*, 4th edition, (1980), p. 41.
[4] Cruickshank argues that Popper's problem-solving philosophy, with its emphasis on developing knowledge through criticism, eschews all forms of foundationalism and is better able to account for the development of substantive knowledge claims. See

Popper held that scientists should not aim for confirmation, but should operate as 'falsification agents'. Confirmation, he argued, is slow and never certain. By contrast, a falsification can be sudden and definitive. Moreover, it lies at the heart of the scientific method. Scientists use hypotheses to make predictions, but their primary aim should be to find evidence that contradicts the predicted results, leading to the rejection rather than the acceptance of hypotheses. Hypotheses that have survived severe attempts to falsify them are said to be corroborated, but not accepted as true.

Popper's falsificationism doctrine that scientists should attempt to falsify, rather than, verify, scientific hypotheses, is probably one of the most influential ideas from the philosophy of science of the twentieth century. That is not to say that its truth has been conclusively established, or even made more probable. The corroboration of a theory at a certain time is essentially a report on its degree of testability, the severity of the tests to which is has been subjected, and the way it has stood up to those tests. The corroboration of a theory will increase with its falsifiability, provided it is not falsified, because the more falsifiable it is, the more severe the tests it can potentially survive.

Other specific aspects of Popper's position include the exhortation to avoid *ad hoc* hypotheses, to be parsimonious in the proposal of auxiliary hypotheses, and to propose theories of ever greater generality and universality. All these follow from Popper's falsifiability criterion of demarcation. Thus, he argues that his criterion of demarcation must be regarded as a proposal for an agreement or convention. As to the suitability of any such conventions, opinions differ; and a reasonable discussion of these questions is only possible between parties having

Cruickshank, Justin, "The Usefulness of Fallibilism in Post-Positivist Philosophy: A Popperian Critique of Critical Realism"**,** *Philosophy of the Social Sciences, 37,* (2007), p. 263.

[5] The term 'fallibilism' comes from the 19th century American philosopher Charles Sanders Peirce. The basic idea behind the term long predates him; it goes back to ancient Greek skeptics. Fallibilism is the epistemological thesis that no belief, theory, thesis or view can ever be rationally supported or justified in a conclusive way.

some purpose in common. The choice of that purpose must, of course, be ultimately a matter of decision, going beyond rational argument.[6]

Popper goes on to say that "I freely admit that in arriving at my proposals I have been guided, in the last analysis, by value judgments and predilections."[7] Popper founds his more specific methodological rules upon these three conditions, which should enable us to enhance the aim of science. Thus, we may conclude that his entire system of philosophy is based upon a conventional decision.

Popper argues that we can conceive of science and do science, according to the standards of conventionalism. He characterises these standards as the principle of selecting the simplest system of implicit definitions; which means in practice the 'classical' system of the day.[8] In his view, conventionalism is regarded as a system which is self-contained and defensible. Attempts to detect inconsistencies in it are not likely to succeed.[9] If both conventionalism and falsificationism, and other conceptions of science, are possible ways of conducting science, and the adoption of any one of these incompatible alternatives is simply a choice, then, the question of which conception of science to choose among the alternatives requires some sort of reasoned answer.

It is only from the consequences of his definition of empirical science, and from the methodological decisions which depend upon this definition, that a scientist will be able to see how far it conforms to his intuitive idea of the goal of his endeavours.[10] In other words, the decision to prefer one way of conceiving of, and doing, science, is based upon the pragmatic and ultimately axiological consideration, that the science that would result from following Popper's falsificationism will be better than the science that would be produced by following the rules of conventionalism or instrumentalism.

---

[6] Popper, K. R. *The Logic of Scientific Discovery***.** 4th edition, (1980), p. 37.
[7] Popper, K. R. *The Logic of Scientific Discovery***.** 4th edition, (1980), p. 38.
[8] Popper, K. R. *The Logic of Scientific Discovery*. 4th edition, (1980), p. 81.
[9] Popper, K. R. *The Logic of Scientific Discovery*. 4th edition, (1980), p. 80.
[10] Popper, K. R. *The Logic of Scientific Discovery*. 4th edition, (1980), p. 55.

Popper sees his falsificationism as anti-dogmatic, open, and better because of its assumed ability to ensure scientific progress through the proposal of general bold conjectures that are incompatible with their predecessors. He writes: "we shall take the greatest interest in the falsifying experiment. We shall hail it as a success, for it has opened up new vistas into a world of new experiences. And we shall hail it even if these new experiences should furnish us with new arguments against our own most recent theories."[11]

His argument for falsificationism is not dependent upon refuting alternatives such as conventionalism or instrumentalism. Popper argues that if scientists conducted science according to the standards of falsificationism, then they would, in the long run, produce *better* science than that which would follow from adopting the standards of its rivals. Against this view, Ernst Nagel writes: "[Popper's] conception of the role of falsification . . . is an oversimplification that is close to being a caricature of scientific procedures."[12]

However, we find Popper accentuating the role of values in his philosophy. He writes: "…we may speak of 'better' and of 'worse' theories in an objective sense even before our theories are put to the test: the better theories are those with the greater content and the greater explanatory power (both relative to the problems we are trying to solve). And these, I showed, are also the better testable theories; and – if they stand up to tests – the better tested theories."[13]

In his *The Logic of Scientific Discovery*, Popper argues that "our knowledge grows through trial and error-elimination, and that the main difference between its prescientific and its scientific growth is that on the scientific level we consciously search for our error: *the conscious adoption of the critical method* becomes the main instrument of growth. ... The critical method – or the critical approach – consists, generally, in the search for difficulties or contradictions and their tentative resolution,

[11] Popper, K. R. *The Logic of Scientific Discovery*. 4th edition, (1980), p. 80.
[12] Nagel, Ernest. *Teleology Revisited and Other Essays in the Philosophy and History of Science.* (1979), p. 76.
[13] Popper, K. *Unended Quest: An Intellectual Biography*. (1982), p. 86.

and that this approach could be carried far beyond science, for which *critical tests* are characteristic."[14]

Furthermore, he writes: "…*there is no more rational procedure than the method of . . . conjecture and refutation:* of boldly proposing theories; of trying our best to show that these are erroneous; and of accepting them tentatively if our critical efforts are unsuccessful."[15]

Rationalists had long rejected unjustified beliefs as mere superstition, whereas Popper argued for criticism not justification as the characteristic of rationality. For him, reason is a critical faculty, whereby the distinctive feature of all rational discourse is the exercise of that faculty. Theories that cannot be empirically tested, such as metaphysical theories, can still be discussed critically.

According to Popper, the attitude of rational argument cannot be grounded on rational argument. Critical rationalism in the end relies on an "irrational faith in reason," a consequence of a moral decision in favour of rationalism. Popper writes: "whoever adopts the rationalist attitude does so because without reasoning he has adopted some decision or belief, or habit, or behaviour, which therefore in its turn must be called irrational."[16]

In Popper's view, rationalism requires a complementary notion of reasonableness, that is, "an attitude of readiness to listen to critical arguments and to learn from experience."[17] Reasoning is engaging in communication with others; it requires Non-epistemic values of social conduct. Central among these is the moral imperative to take others and their arguments seriously, that is, to respect them, to be ready not only to allow differences to exist but to try to learn from them. Popper chooses reason primarily because of its beneficial consequences: rationalism comprises a set of principles that are both epistemological and ethical and, set the social and political rules for the human cooperation necessary

[14] Popper, K. *Unended Quest: An Intellectual Biography.* (1982), p. 115.
[15] Popper, Karl R. *Conjectures and Refutations: The Growth of Scientific* Knowledge. (1972), p. 51.
[16] Popper, Karl R. *The Open Society and its Enemies.* Vol. II, (1945), pp. 217-218.
[17] Popper, Karl R. *The Open Society and its Enemies. Vol. II,* (1945), p. 225.

for the acquisition of knowledge. Popper felt it as a very concrete issue and understood it as a personal choice.

His critical rationalism is "fundamentally, an attitude,"[18] not a theory —that is, a disposition, a readiness to listen to each other's critical arguments, to search for one's own mistakes, and to learn from them, following the best argument in a critical debate. Therefore, it cannot be replaced by a theory of rationality .A theory of rationality is a proposed solution to the problem of rationality. Like any theory, it can be true or false. On the other hand, an attitude is neither true nor false.

When we argue in favour or against something, we have already adopted or accepted a rational attitude, no matter how tentatively. *Rationality* is just a word to describe the correct way of finding out what is going on by using unlimited criticism. It has nothing to do with discovering thoughts or assuming stances; it does not allow us to follow a procedure that would be 'right' and would lead us to the desired results. *Reason* is the negative faculty of relentless criticism. Or, to put it another way, "my rationalism is not self-contained, but rests on an irrational faith in the attitude of reasonableness: I do not see that we can go beyond this. One could say, perhaps, that my irrational faith in equal and reciprocal rights to convince others may be convinced by them is faith in human reason; or simply, that I believe in man."[19]

Hence, the solution to the problem of rationality is the very starting point of every philosophical approach, the very choice of one's lifestyle. Popper's approach to philosophy is his solution to the problem of rationality: his whole life is the very embodiment of his understanding of rationality and his solution to its fundamental problem.

PART TWO: The Thought of Thomas Kuhn

Kuhn's theory of change and growth in the sciences hinged on three core concepts: paradigms, normal science, and incommensurability. Thus, the history of science is presented as a succession of periods of 'normal

[18] Popper, Karl R. *The Myth of the Framework: In Defense of Science and Rationality.* (1994), p. xii.
[19] Popper, Karl R. *The Open Society and its Enemies, Vol. II,* (1945), p. 357.

science,' each of which is determined by a 'paradigm.'[20] Kuhn tells us that 'normal science' means "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice."[21] Everyday science is 'normal science', that is characterised by two distinctive features: puzzle-solving and a standard textbook that preserves the current paradigm. The 'scientific revolution' occurs when normal science can no longer proceed adequately within the currently accepted paradigm. Normal science can continue when the old paradigm is replaced by the new one and is approved by the scientific community.

Kuhn treats the following as examples of paradigms: Newtonian mechanics; Einsteinian mechanics (relativistic); Daltonian chemistry; the fluid flow theory of electricity; and Copernican astronomy.[22] These are considered paradigms because they constitute a way of practising research, include theories and each brings a distinct worldview with it. A paradigm becomes an achievement that defines practice for a community of researchers.

Critics found the notions of paradigms and incommensurability most problematic. Kuhn's use of the concept of 'paradigm' was criticized for its ambiguity. Margret Masterman offered one of the famous criticisms of this concept, where she showed that Kuhn, in his 1962 seminal work *The Structure of Scientific Revolutions*, used the term 'paradigm' in not less than twenty-one different senses.[23]

It is to be noted that many of these senses are mere elucidations of one another. This can be seen through her grouping of these different senses into three major categories: (1) metaphysical paradigms or metaparadigms, which are a broad set of beliefs, (2) sociological paradigms, which are universally recognized scientific achievements and

[20] 'Paradigm' comes from Greek Paradeigma and late Latin Paradigma, which means a 'pattern' followed. *The New Shorter Oxford English Dictionary, Vol. 2 (N-Z)* , (1993), p. 2093.
[21] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* Second edition, (1962), p. 10.
[22] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* Third edition, (1996), p. 6.
[23] Masterman, Margaret. "The Nature of a Paradigm", (1970), p. 61.

(3) artifact paradigms or construct paradigms, which are concrete classical texts. The first category embodies the kind of paradigm to which Kuhn's critics have referred.[24] She further points out that the second category of paradigms indicates that "something sociologically describable, and above all, concrete, already exists in actual science, at the early stages, when the theory is not there."[25] In this context, it must be mentioned that Kuhn does not equate 'paradigm' with scientific theory. His metaparadigms and social paradigms are prior to theory.[26] Masterman discusses what the distinctive and revolutionary logical characteristics of Kuhn's paradigm from a philosophical rather than a sociological perspective.

In response to these criticisms, Kuhn later in the Postscript in the second edition of *The Structure of Scientific Revolutions* (1970), he introduces the notion of 'disciplinary matrix' to denote the entire constellation of beliefs and techniques. A disciplinary matrix contains the symbolic generalizations, beliefs about which objects and phenomena exist in the world; values by which the quality of research can be evaluated; and exemplary problems and problem solutions, which he called *exemplars* rather than paradigms.[27]

In one of his descriptions, Kuhn referred to paradigms as "universally recognized scientific achievements that for a time provides the model problems and solutions to a community of practitioners."[(28)] A controversial aspect of Kuhn's ideas is the view that successive paradigms are not completely compatible. He says, for example, "Like the choice between competing political institutions, that between competing paradigms proves to be a choice between incompatible modes of community life.' Later, he says, "In so far as their only recourse to that world is through what they see and do, we may want to say that after a revolution scientists are responding to a different world."[(29)]

[24]Masterman, Margaret. "The Nature of a Paradigm", (1970), p. 65.
[25] Masterman, Margaret. "The Nature of a Paradigm", (1970), p. 66.
[26] Masterman, Margaret. "The Nature of a Paradigm", (1970), p. 67.
[27] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* 2nd edition, (1970), pp. 182-187.
[28] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* 2nd edition, (1970), p. viii.
[29] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* 2nd edition, (1970), p. 111.

Kuhn held that paradigm choice was not a rational one. It is based, however, on reasoned decisions in response to empirical data. Thus, many have argued that Kuhn had succumbed to irrationalism. This conclusion relied on the incommensurability[30] between competing paradigms. To clarify this issue, Harvey Siegel writes: "Incommensurability — the inability of competing paradigms to be directly compared, or judged according to a neutral standard — stems from Kuhn's contention that a paradigm contains its own criteria of evaluation. During debate according to Kuhn, competing paradigms are evaluated according to paradigm-bound criteria of evaluation. Since there are no paradigm neutral criteria of evaluation; because of incommensurability, there are no paradigm-neutral criteria of evaluation, paradigm debate can rely on no objective criteria of evaluation of paradigms; hence paradigm debate is irrational. The irrationality thesis thus rests on incommensurability, which in turn rests on paradigm-bound nature of criteria of evaluation of paradigms."[31]

As a consequence of Kuhn's later characterisation of incommensurability, there is no need for the notions of 'truth' and 'approximation to the truth.' Kuhn always opposed the correspondence theory of truth and criticised its applications to the relation between scientific theories and reality: as history can show, he says, there is "no coherent direction of ontological development."[32] Such expressions as 'getting closer and closer to the truth' are meaningless as a consequence of incommensurability.

Kuhn's account of scientific revolutions presents the most controversial aspects of his vision of science. Paradigms set the rules and reasons for science. Across paradigms no reasonable arguments are possible. The two sides are 'incommensurable'. At best one can appeal to such factors as the simplicity or elegance or fruitfulness of one's chosen

[30] Incommensurable basically means 'non-comparable'. This term has a well-defined mathematical meaning: Two quantities are incommensurable if they cannot be measured using a common standard of measurement.

[31] Siegel, Harvey: "Objectivity, Rationality, Incommensurability and More", *British Journal for the Philosophy of Science, Vol. 31,* (1980), p. 362.

[32] Kuhn, Thomas S. *The Structure of Scientific Revolutions.* 2nd edition, (1970), p. 206.

position. Scientific revolutions are therefore, if not irrational, at the least arational -outside reason.(33)

Accordingly, Kuhn held that science is neither the gradual accumulation of knowledge, nor the discovery of truth. The notions of truth and nearness to the truth are unnecessary in the explanation of scientific development.(34) Hence, scientific progress is not the growth of a stock of true scientific beliefs. Progress is not perceived as increasing verisimilitude, but rather as growing in problem-solving capacity.

Progress during normal science can be understood as continued success in solving problems. This continuity is also maintained despite a revolutionary change.(35) During normal science, scientific progress is relative only to the governing paradigm. Changes of paradigms are irrational leaps from one way of doing science to another. Kuhn also allows for improvement across paradigms and rejects the charge of relativism.(36)

Kuhn's account of progress poses a challenge to Old Rationalist accounts. He adopts a practical and instrumental notion of rationality,(37) according to which the choice of a theory is considered rational if it improves its power in puzzle-solving. If other factors such as power struggle or self-deception have motivated the choice of a theory, then it may fail behind its rivals in puzzle-solving. In this case, this choice is deemed as irrational.

Kuhn tells us that we should be careful about what we mean by rationality in science. If rationality is defined by specific rules of rational thinking, then much of the productive thought in science is not rational but quasi-intuitive instead. This does not mean that such thinking is irrational. For, it does not go against what reason tells us.

---

33 Kuhn, Thomas S. *The Structure of Scientific Revolutions.* Second edition, (1962), p. 94.
34 Bird, Alexander. *Thomas Kuhn.* (2000), p. 211.
35 Bird, Alexander. *Thomas Kuhn.* (2000), p. 209.
36 Kuhn, Thomas S. *The Structure of Scientific Revolutions.* Third edition, (1996), p. 207.
37 Kuhn, Thomas, S. "Rationality and Theory Choice", *Journal of Philosophy 80,* (1983), pp. 563-564.

There are tendencies to both rationality and irrationality in science. However, the former generally predominates. In this context, Kuhn speaks of the role of the social organization of science that safeguards the rationality of science and minimizes the effects of individual rationality. According to Kuhn, science as an institution may be more rational than its practitioners.(38)

PART THREE: The Popper - Kuhn Debate

In his "Falsificationism and the Methodology of Scientific Research Programmes", Imre Lakatos tells us that "[t]he clash between Popper and Kuhn is not about a mere technical point in epistemology. It concerns our central intellectual values, and has implications not only for theoretical physics but also for the underdeveloped social sciences and even for moral and political philosophy."(39) Hence, this significant debate, which took place in London in 1965, is regarded a landmark in the 20th century philosophy of science. Within the context of this famous debate, we focus on the following issues: Relativism versus Realism; The progress of science; and Rationality.

I. Relativism versus Realism

Popper objected to Kuhn's views on the grounds that they represented relativism. Popper writes: "This is a widely accepted and indeed a fashionable thesis: the thesis of *relativism*. And it is a *logical* thesis. I regard this thesis as mistaken."(40) (Italics in the original) He continues by saying: "I should like just to indicate briefly why I am not a relativist: I do believe in 'absolute' or 'objective' **truth**, in Tarski's sense (although I am, of course, not an 'absolutist' in the sense of thinking that I, or anybody else, has the **truth** in his pocket.) I do not doubt that this is one of the points on which we are most deeply divided; and it is a logical point."(41)

---

38 Bird, Alexander. *Thomas Kuhn.* (2000), p. 217.
39 Lakatos I., & Musgrave, A. (eds.). *Criticism and the Growth of Knowledge.* (1970), p. 93.
40 Popper, Karl R. "Normal Science and its Dangers", (1970), p. 56.
41 Popper, Karl R. "Normal Science and its Dangers", (1970), p. 56.

Hence, Popper holds that it is always possible to compare the various frameworks and to subject them to critical discussion. He stresses that it is a dangerous dogma that the different frameworks are like mutually untranslatable languages. Popper was not the only one who thought that Kuhn was relativist: "There is nobody else than Thomas Kuhn who contributed more to the widespread acceptance of cognitive relativism in the recent years."(42)

Popper did eventually accept that he had misinterpreted Kuhn's views. He says of the view that comparison of different scientific theories requires an agreement on the general framework, a view with which he disagrees. He writes: "... I originally had in mind Thomas Kuhn ... However, as **Kuhn** points out, this interpretation was based on a misunderstanding of his views and I am very ready to accept his correction. Nevertheless, I regard the view here discussed as influential."(43)

The following remarks clarify Kuhn's position regarding the charge of relativism. For Kuhn, paradigms give observation its structure and, thus, they define and create reality. For Kuhn, the world, in some sense, changes across paradigms. Kuhn writes: "[T]hough the world does not change with a change of paradigm, the scientist afterward works in a different world."[44]

Does this imply that the world is unreal? The answer is in the negative. But, there is more to the issue. Kuhn does not distinguish, as Popper does, between the context of discovery and the context of justification. The scientist, the subject, is not distinct from science, the object. Knowledge without a knower does not exist. The rejection or acceptance of a paradigm is not dependent on reality, but on existing rivals to this paradigm. In this sense, Kuhn does not talk about scientific progress in terms of getting close to depicting an objective reality. Hence, knowledge is subjective, but this does not imply that one can believe

[42] Watanabe, Satosi. "The Foundations of Cognitive Relativity", (1991), p. 25.
[43] Popper, Karl R. *The Myth of the Framework: In Defense of Science and Rationality*. (1994), p. 63.
[44] Kuhn, Thomas S. *The Structure of Scientific Revolutions*. Third edition, (1996), p. 121.

what one wishes. Rather, it indicates that knowledge is relative only to the accepted paradigm.

According to this logic, it is futile to talk about falsifiability, as Popper does. If paradigms create their own realities, then whenever a paradigm is confronted with insurmountable anomalies, the solution is in adopting an alternative paradigm, which makes its own reality.

In an absolute and determined sense, Popper was a realist. Hence, for him, the world exists and it exists in some way independently of us. For Popper, real science is falsifiable. This does not mean that it is false. The best kind of science yields objective knowledge. It is the kind of knowledge that he describes as "knowledge without knower".(45) Popper assigns science to what he called 'world 3', i.e., the world of disinterested ideas, which is distinct from 'world 2'or the world of subjective belief and 'world 1' or the world of mere objects. Hence the division that Popper made between 'the context of discovery' and the 'the context of justification'. In contrast, it can be argued that Kuhn, in *The Structure of Scientific Revolutions*, repudiates the distinction between the context of discovery and the context of justification. His rejection of this fundamental distinction stemmed from his conception of scientific justification. For Kuhn, scientific confirmation is seen in terms of the traditional hypothetico-deductive schema, whereby a scientific hypothesis or theory is confirmed by observing the truth of its logical consequences.

II. The Progress of Science

Both Kuhn and Popper regarded science as a deeply dynamic process. However, they disagreed on whether or not scientific progress brings scientists closer to the truth. Kuhn holds that it may not be possible to say that as science progresses it is bringing scientists closer to the truth. He writes: "... scientific progress is not quite what we had taken it to be. ... In the sciences there need not be progress of another sort. We may, to be more precise, have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to the truth.(46)

[45] Popper, Karl R. *Objective Knowledge.* (1972), p. 109.
[46] Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 2nd edition, (1970), p. 170.

Popper disagrees with Kuhn on this issue. He tells us that the aim of scientists is "to find theories which, in the light of critical discussion, get nearer to the truth."[47] A theory T_1 outdated by T_2 means that the latter appears to correspond *better* to the facts than the former.

The radical challenge of Kuhn's *The Structure of Scientific Revolutions* was not to rationality but to realism: Kuhn's thrust was actually directed not so much against the rationality of theory appraisal and theory choice as against the epistemic, or truth-like, character of the theories so chosen, since it is not possible to say that they are better approximations to the truth, that is, reality. Notturno argues that Kuhn confused and conflated the concept of truth with a criterion for truth, "by considering it nonsense to speak of truth in the absence of a decision procedure for determining whether or not a statement is true."[48] In his view, the major differences between Popper and Kuhn are not about the possibility of conclusive falsification, the existence of normal science and the incommensurability of theories. The fundamental point of disagreement between them concerns the role of truth in scientific inquiry, i.e., whether or not truth should be considered the regulative ideal of science. Although Kuhn and Popper agree that there is no such thing as an objective criterion for truth, Kuhn takes this to mean that truth plays no role at all in theory appraisal and theory choice, while Popper holds that truth plays the role of a regulative idea.[49]

The notion of incommensurability gave Kuhn the basis for an attack on 'scientific realism'; the thesis that the history of science exhibits a progressively improving set of approximations to a correct description of reality, as it exists independently of our beliefs. Here, the concept of incommensurability seems to undermine this thesis because it allows for the possibility that successive theories in a field are just different, without any reason to think that the later theory is more accurate.

---

[47] Popper, Karl R. "Normal Science and its Dangers", (1970), p. 57.

[48] Notturno, Mark A. Science and the Open Society: The Future of Karl Popper's Philosophy. (2000), p. 240.

[49] Notturno. M. A. "The Popper/Kuhn Debate: Truth and Two Faces of Relativism", in *Psychological Medicine,* Cambridge, Cambridge University Press**,** (1984), 14: pp. 273-289.

III. Rationality

At the core of Popper's philosophy lies the multi-faceted problem of rationality. Popper's model of rationality in science already presumes the existence of a particular form of community and society characterised by free critical discussion. As mentioned above, his critical rationalism is "fundamentally, an attitude," not a theory.[50] It involves a willingness to listen to each other's critical arguments in the course of a critical debate, to look for one's own mistakes and to learn from them. Hence, it cannot be replaced by a theory of rationality. A theory of rationality may be true of false, whereas an 'attitude' is neither true nor false. Hence, Popper justifies his critical rationalism by appealing to his assertion about the 'irrational faith in reason', which is a moral decision. Popper's philosophy is inherently value-driven. The problem of rationality is concerned with the choice of one's principles and values. Popper's approach to philosophy is his solution to the problem of rationality: his understanding of rationality and his solution to its fundamental problem have dominated his thought and life.

IV. Discussion

It can be argued that Kuhn's use of the term 'revolution' gave rise to the conception that he holds a radical view of science. In this respect, it is clear that he transformed the philosophy of science. For Popper, science was a community dedicated to conjectures and refutations. Scientific truths were falsifiable. This aspect distinguished science from other intellectual activities. In his own efforts, Popper did his share in making a revolution in the philosophy of science. It is true that Popper did not enjoy the acceptance that Kuhn enjoyed. For, he was considered as a critic of the Marxist social theory, which was fashionable among social scientists in the second half of the twentieth century. Popper was not portrayed as the radical philosopher of science.

After the publication of Kuhn's seminal 1962 work, "it became clear … that Kuhn had been anointed the official philosopher of science of the

[50] Popper, Karl R. *The Myth of the Framework: In Defense of Science and Rationality.* (1994), p. xii.

emerging military-industrial complex."[51] The way science is practised and seen by scientists is now characterised by 'normal science'. Upon this perspective, Kuhn's view of science motivated scientists to neglect the social and political consequences of their work. According to Fuller, it was not difficult for scientists to apply Kuhn's view of science to validate their practices which were anti-social and lacking criticism. Fuller argues that Popper adhered to the kind of rationality that requires exact social and material conditions, which must be unambiguously established and vigorously maintained.[52] Alongside this Popperian sense of rationality lie the conditions of free inquiry. Fuller attempted to put the record straight as far as Kuhn's philosophy of science is concerned. He argued that he does not perceive it as a radical theory or a revolutionary view, as it was advanced and portrayed.

Concluding Remarks

Throughout the paper, the analysis of the issues involved in the Kuhn – Popper debate shows some degree of objectivity and subjectivity in their positions. This is reflected in the areas of agreement and disagreement that can be determined.

It is not difficult to infer that there is much in common than might first appear. For, both philosophers emphasise the primacy of facts and the significance of scientific life in the context of the reliance on the history of science. They both agree that science does not progress by the accumulation of facts. They do not believe that there are rules for inducing correct theories from facts. They regard theories as imaginative posits. Neither philosopher is an inductivist. Both insist on the revolutionary aspect by which an older theory or 'paradigm' is rejected and replaced by a better one.

[51] Fuller, Steve. *Kuhn vs Popper: The Struggle for the Soul of Science.* Icon Books Ltd UK. (2003), p. 32.

[52] Fuller, Steve. Kuhn vs Popper: The Struggle for the Soul of Science. Icon Books Ltd UK. (2003), p. 107.

It is clear that the problems of the rationality of scientific change, the nature of scientific progress and the status of scientific knowledge-claims were dominant themes in the thought and work of Karl Popper and Thomas Kuhn. In this respect, Kuhn emphasised the subjective side of science and offered an account of the history of science in terms of 'paradigms', whereby the competing paradigms cannot be directly compared or judged according to a neutral standard. Against the Kuhnian perspective, Popper defended the objective characteristics of scientific truth.

It can rightly be argued that the real difference between Popper and Kuhn is not about the possibility of falsification or the existence of normal science. It is about the role of truth, the value of criticism and the nature of the tie that unites scientists into a community. Popper and Kuhn agree that there is no objective criterion for truth, but Kuhn takes this to mean that truth plays no role at all in theory appraisal and theory choice, while Popper maintains that truth plays the role of a regulative idea.(53) On his account, we are able to move from the awareness of our fallibility to criticism of our theories only if we are consciously aiming at the truth. Truth is still the regulative idea of scientific inquiry and rational discussion. Kuhn illustrates the bond uniting scientists in terms of shared beliefs: since it is not possible to prove the truth of such beliefs, scientists can not help but commit themselves to them uncritically. Popper, on the other hand, characterises this bond in truth, believing that only truth and the critical attitude enable a scientific community to be an open society.

The dispute between Kuhn and Popper can be characterised in relativist - realist terms that capture the two sides of their argument. We can employ a distinction used by the phenomenologist Franz Brentano(54) between the 'transcendent' object of consciousness and the 'immanent' content of consciousness to portray Kuhn's and Popper's positions. Thus, if we substituted 'the content of consciousness' with 'the dominant beliefs of the community of inquirers', then, Popper held that truth is always 'transcendent' of the community of inquirers, whereas for Kuhn,

[53] Notturno, Mark A. *Science and the Open Society: The Future of Karl Popper's Philosophy*. (2000), pp. 238-239.
[54] Brentano, Franz. *Psychology from an Empirical Standpoint*. (1995), pp 88-92.

truth is always 'immanent' in the community. If Kuhn located truth within a scientific paradigm, Popper found it in a 'meta-language' into which knowledge claims of the paradigm may be translated and evaluated.

In Kuhn's words, it is a dispute concerning two different ways of perceiving the same world. He writes:

"How am I to persuade Sir Karl, who knows everything I know about scientific development and who has somewhere or other said it, that what he calls a duck can be seen as a rabbit? How am I to show him what it would be like to wear my spectacles when he has already learned to look at everything I can point to through his own?"(55)

[55] Kuhn, Thomas S. *The Essential Tension: Selected Studies in Scientific Tradition and Change.* (1977), p. 269.

References

· Bird, Alexander. *Thomas Kuhn.* Princeton: Princeton University Press. (2000).

· Brentano, Franz. *Psychology from an Empirical Standpoint.* English translation, 2nd edition, London: Routledge. (1995).

· Brown, Lesley(ed). *The New Shorter Oxford Dictionary.* Volume 2 (N-Z). Oxford: Clarendon Press. (1993).

· Cruickshank, Justin. "The Usefulness of Fallibilism in Post-Positivist Philosophy: A Popperian Critique of Critical Realism", *Philosophy of the Social Sciences, 37,* (2007), pp. 263-288.

· Fuller, Steve. *Kuhn vs Popper: The Struggle for the Soul of Science.* Icon Books Ltd UK. (2003).

· Kuhn, Thomas S. The Structure of Scientific Revolutions. Second edition, Chicago: University of Chicago Press. (1962).

· Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 2nd edition, enlarged. Chicago: University of Chicago Press. (1970).

· Kuhn, Thomas S. "Reflections On My Critics", in *Criticism and the Growth of Knowledge*, New York, Cambridge: Cambridge University Press. (1970), published in *Proceedings of the International Colloquium in the Philosophy of Science,* London, Volume 4, Cambridge: Cambridge University Press, (1965), pp. 231–278.

· Kuhn, Thomas S. *The Essential Tension: Selected Studies in Scientific Tradition and Change.* Chicago: University of Chicago Press. (1977).

· Kuhn, Thomas S. "Commensurability, Comparability, Communicability", in Peter D. Asquith and Thomas Nickles, editors, *PSA 1982: Proceedings of the 1982 Biennial Meeting of the Philosophy of Science Association.* Volume 2, East Lansing, MI: Philosophy of Science Association, (1983), pp. 669–688.

· Kuhn, Thomas, S. "Rationality and Theory Choice", *Journal of Philosophy 80,* (1983), pp. 563-70.

· Kuhn, Thomas S. *The Structure of Scientific Revolutions*. Third edition, Chicago: University of Chicago Press. (1996).

· Lakatos I., & Musgrave, A. (eds.). *Criticism and the Growth of Knowledge.* New York, Cambridge: Cambridge University Press. (1970).

· Masterman, Margaret. "The Nature of a Paradigm", in Imre Lakatos & Alan Musgrave (eds.) *Criticism and the Growth of Knowledge.* Cambridge: Cambridge University Press, (1970), pp. 59-89.

· Nagel, Ernest. *Teleology Revisited and Other Essays in the Philosophy and History of Science.* New York: Columbia University Press. (1979).

· Notturno. M. A. "The Popper/Kuhn Debate: Truth and Two Faces of Relativism", in *Psychological Medicine*, Cambridge, Cambridge University Press**,** (1984), 14: pp. 273-289.

· Notturno, Mark Amadeus. *Science and the Open Society: The Future of Karl Popper's Philosophy*. Budapest, Hungary: Central European University Press. (2000).

· Popper, Karl R. *The Open Society and its Enemies.* Vol. II, "The High Tide of Prophecy: Hegel, Marx, and the Aftermath". 5th Rev. ed. London: Routledge & Kegan Paul, 1945. [1966].

· Popper, Karl R. "Normal Science and its Dangers", *Criticism and the Growth of Knowledge.* Cambridge: Cambridge University Press. (1970). pp. 51–58.

· Popper, Karl R. *Conjectures and Refutations: The Growth of Scientific Knowledge.* First published (1963) Fourth edition (revised). London and Henley: Routledge and Kegan Paul. (1972).

· Popper, Karl R. *Objective Knowledge.* Oxford: Oxford University Press. (1972).

· Popper, Karl R. *The Logic of Scientific Discovery.* First published 1959, London: Hutchinson. (1975).

· Popper, K. R. *The Logic of Scientific Discovery.* 4th edition. London: Routledge. (1980).

· Popper, K. *Unended Quest: An Intellectual Biography.* Glasgow: Fontana/Collins. (1982).

· Popper, Karl R. "The Myth of the Framework", (M. A. Notturno, editor), *The Myth of the Framework: In Defense of Science and Rationality.* London and New York: Routledge, Chapter 2, (1994), pp. 33–64.

· Siegel, Harvey. "Objectivity, Rationality, Incommensurability and More". *British Journal for the Philosophy of Science, Vol. 31,* (1980), pp. 359-384.

· Watanabe, Satosi. "The Foundations of Cognitive Relativity", *Annals of the Japan Association for the Philosophy of Science, Vol. 8,* (1991), pp. 23–48.

Received 28/10/2009