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Two Critics of Logical Positivism: Karl Popper and Thomas Kuhn

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Abstract

Criticisms of the understanding of science and philosophy put forward by logical positivism are varied. Some of them are philosophers who, with a radical objection, reject almost all the principles of positivism and claim that a philosophy that excludes metaphysics will cease to be philosophy. On the other hand, there have been philosophers who have not completely abandoned the ideal of scientific thought, but have proposed different criteria or perspectives, stating that the principles of Logical positivism are wrong. In this study, we will discuss the thoughts of Karl Popper, who offers alternative perspectives on the nature, validity and limits of scientific knowledge, and Thomas Kuhn, who criticized Popper as well as positivists, which we can include in the second group.

Keywords: Logical Positivism, Karl Popper, Thomas Kuhn, Falsificationism, Paradigm Shift.

Mantıksal Pozitivizmin İki Eleştirmeni: Karl Popper ve Thomas Kuhn

Özet

Mantıkçı pozitivizmin ortaya koyduğu bilim ve felsefe anlayışına yöneltilen eleştiriler çeşitlidir. Bunların bir kısmı radikal bir karşı çıkışla pozitivizmin neredeyse tüm ilkelerini reddederek, metafiziği dışlayan bir felsefenin felsefe olmaktan çıkacağını iddia eden filozoflardır. Öte yandan, bilimsel düşünce idealini tümüyle terk etmeyen ancak Mantıkçı pozitivizmin ilkelerinin yanlış olduğunu ifade ederek farklı ölçütler veya perspektifler öneren filozoflar da olmuştur. Bu çalışmada ikinci gruba dâhil edebileceğimiz, bilimsel bilginin mahiyeti, geçerliliği ve sınırlarına yönelik alternatif bakış açıları sunan Karl Popper'ın ve pozitivistlerin yanı sıra Popper'ı da eleştirmiş olan Thomas Kuhn'un düşüncelerini ele alacağız.

Anahtar Kelimeler: Mantıksal Pozitivizm, Karl Popper, Thomas Kuhn, Yanlışlamacılık, Paradigma Kayması.

Introduction

From 17th century onwards, the Western civilization has witnessed a great process of transformation that includes the age of enlightenment, the industrial revolution and the scientific revolution. In the course of this radical transition, it became compulsory to determine what is worthy of the name "knowledge" and to redraw the boundaries of science in order to separate it from pseudoscience and metaphysics. Although different views were put forward, the approach that was widely adopted from the 19th century onwards has been "positivism". Positivism, a term first used by Auguste Comte (1798-1857), is the philosophical view that we can arrive at universal laws only through rational and logical thinking on the objective data we obtain through the senses, and that any metaphysical speculation must be considered unscientific. Positivism has been the mainstream paradigm of the scientific world until it was replaced by neo-positivism in the 20th century (Bourdeau, 2022).

With the rise of scientific thought in general and positivism in particular, philosophers began to emulate the scientific method and to claim that it is possible for philosophy to achieve objective truth and certainty, just like the physical sciences. This new philosophical way of thinking, based on logic-mathematical theory and positivism developed by Russell and Whitehead, was called Logical Positivism or Logical Factualism and advocated by philosophers in Europe called the "Vienna Circle". The Vienna Circle was a group of philosophers who, under the leadership of Moritz Schlick, held weekly discussions between 1924-36 on problems in the "philosophy of science". Its most important representatives were Moritz Schlick, Hans Hahn, Philipp Frank, Otto Neurath, Olga Hahn-Neurath, Viktor Kraft, Theodor Radacovic, Gustav Bergmann and Rudolf Carnap (Uebel, 2022). The common goal and philosophical project of these group was to eliminate metaphysics, to determine scientific criterion for the meaningfulness of propositions and to give philosophy a content that did not violate positivist ideals.[1]

> In the context of the scientific worldview, the logical positivist view accepted the philosophy of science as an intermediary activity that helped science; moreover, by

[1] It is important to remark here that the members of Vienna circle "were by no means of one mind in all important matters; occasionally they espoused perspectives so radically at variance with each other that even their ostensive agreements cannot remain wholly unquestioned. (Uebel, 2022).

> reducing philosophy to the philosophy of science/scientific philosophy, it assigned a very central position to this discipline (philosophy of science) (Öztürk, 2012: 174).

According to the logical positivists, philosophy should be grounded in the ideas obtained through the senses and in the concepts that are their representation, that is, in language. Thus philosophy should limit itself to the task of revealing the relations between concepts in a logically consistent and valid way. In Ayer's words, who was among the leading body of logical positivism; "[the philosopher] himself ... must limit himself to the work of explanation and analysis" (Ayer, 2010: 29) because "philosophical propositions, in terms of attribute, are linguistic rather than factual ...; they describe the definitions or the formal consequences of the definitions" (Ayer, 2010: 35).

> Since philosophy is neither a branch of logic and mathematics, nor a natural science comparable to physics or biology, it must strictly limit itself to careful analysis of concepts. (...) According to the 'linguistic turn' carried out more generally by twentieth-century philosophers, this task is then interpreted first and foremost as a task involving the analysis of language (West, 1998: 15).

Representatives of logical positivism have authored detailed and comprehensive works to put this bold project into practice. In order to identify philosophical propositions and distinguish them from metaphysical ones, a number of criterion have emerged such as the "criterion of verifiability", "criterion of significance", the "criterion of validity", "correspondence theory of truth" which are similar to the formulas expressing the laws of physics (Ayer, 2010: 35).

> Logical positivists argued that they were in fact the product of a socio-political atmosphere that they described as "dark"; therefore, they tried to correct or reshape the existing conditions with a positive understanding of philosophy and a scientific worldview (Cevizci, 2010: 1066).

As it would be expected, Logical Positivism have received mixed reactions from philosophers. Some philosophers rejected the founding principles of Logical Positivism, claiming that a philosophy that excludes metaphysics will cease to be philosophy. According to them, despite all its efforts to construct a scientific philosophy and a secular worldview, the propositions and claims of Logical Positivism are not acceptable. According to Stuart Shanker, the main reasons for this situation are that the arguments of the movement are defended in a very crude and harsh language, whereas their arguments are open to criticism and have weak foundations, and especially their approach to the elimination of metaphysics (Shanker, 2004: 194). Indeed, the Logical Positivists,

who set out claiming that they would be based solely on facts, after a certain point realized that they were incapable of grounding even their own postulates in the world of facts, that most of the principles that science assumes are not factual, and that no human being can be completely immune from the assumptions of the paradigm in which he or she lives, and therefore cannot be completely objective and rational. They had to admit that the total exclusion of values and morality from philosophy was problematic, and that even the existence of the external world was not amenable to scientific proof, so that in order to get out of solipsism one had to assume a set of presuppositions that were not based on fact. The view of philosophers who reject the basic claims of Logical Positivism are reflected in the following statement of Arthur Passmore: "Logical positivism… is dead, or as dead as a philosophical movement ever becomes" (Passmore 1967: 57).

On the other hand, there have been philosophers who have not completely abandoned the ideal of scientific thought, but have proposed different criteria than the ones offered by the Circle. The aim of this article is to present two major figures of the philosophy of science in 20th century with respect to their critiques on Logical Positivism: Karl Popper and Thomas Kuhn. After establishing how and why both philosophers criticized Logical Positivism, we will try to outline the approach they proposed. In the last part, we will try to contrast their views with regard to their criticisms of Logical Positivism and of each other.

1. Karl Popper: Falsifiability as the Criterion of Demarcation

The Australian philosopher Karl Popper (1902-1994) is one of the greatest critics of Logical Positivism. He even "asserts that the honor of killing Logical factualism belongs to him" (Çüçen, 2012: 157). However, he does not take a stand totally opposed to positivism and the attempt at scientific thinking, but rather to establish a coherent and valid theory of science.

> Popper criticized the Vienna Circle's search for a criterion of empirically meaningful statements, and suggested instead that empirical science be demarcated from pseudoscience with respect to methodology practiced (Losee, 2001: 144).

According to Logical Positivists, a statement must be meaningful in order to be scientific, and if a statement is meaningful, it must possess "factual content", i.e. correspond to the facts. However,

according to Popper, it is possible that there are statements that are not supported by any phenomenon but are nevertheless scientific. From this point of view, the inference that all the propositions of metaphysics should be regarded as meaningless because they are not based on facts must also be unfounded and false. Yet, according to Popper, "metaphysical perspectives guide the formulations of grand hypotheses to be subjected to the testing of empirical tests" (Çüçen, 2012: 159). With this statement, Popper points out that science can never be completely independent of theory, but on the contrary, it is hypotheses that prioritize observation and experimentation that guide science.

Popper's critique is mainly directed at the fact that Logical Positivism has not been able to formulate a valid criterion for the validity and scientificity of statements. In order to justify his case, Popper first draws attention to the problem of induction which is one of the main methods used by empirical sciences. In his own words;

> Now it is far from obvious, from a logical point of view, that we are justified in inferring universal statements from singular ones, no matter how numerous; for any conclusion drawn in this way may always turn out to be false: no matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white (Popper, 2005: 4).

Following Hume's skeptical position, Popper asserts that the inductive propositions which presented as laws of physics are based on repetitive observations, thus it is invalid to conclude that they are universal statements proven to be true. However, it is not the case that Popper denies the possibility of any statement to be scientific altogether. According to him, we need a principle of induction which will put our inferences into a logically acceptable form. Thus he proposes an alternative approach:

> Theories are, therefore, never empirically verifiable. (…) But I shall certainly admit a system as empirical or scientific only if it is capable of being tested by experience. These considerations suggest that not the verifiability but the falsifiability of a system is to be taken as a criterion of demarcation. (…) It must be possible for an empirical scientific system to be refuted by experience (Popper 2005: 18).

Popper's theory is actually a kind of reverse reading of inductive theory. Induction is mistaken in saying that a generalization can be reached from a large number of observations, but we cannot say the same for the opposite case. A proposition can be regarded as absolutely false as soon as a

single fact is observed which contradicts or falsifies this proposition. In other words, certainty can only be achieved through falsification, not by verification. Therefore, a scientist should put forward scientific propositions in accordance with the criterion of falsifiability. The criterion that will make a statement scientific here is that the statement put forward is suitable for falsification in principle and that the conditions under which it will be falsified must be clearly stated. Based on this determination, Popper points out that the theories of philosophers such as Marx, Freud and Adler cannot be scientific either, because it is unclear under what conditions they will be considered wrong.

> According to Popper, the principle of falsifiability actually includes the 'testability principle' because if a statement is suitable for testing, it has the possibility of falsification, and thus has the right to be scientific (Çüçen, 2012: 161).

Proceeding from this determination, Popper distinguishes between falsifiable and non-falsifiable hypotheses, saying that the propositions of metaphysics cannot be scientific because they cannot be falsified, even if they are meaningful.

> For there is no possible observation that can falsify them, such as the proposition that "God is a cause without a cause." The same applies to the propositions of logic and mathematics. Because these propositions do not say anything about the world (Cevizci, 2010: 1085).

It follows from this that if a scientist aims at absolute certainty, he will have set himself an impossible goal, and his efforts will inevitably end in failure. However, what the scientist should aim for is to approach certainty, that is, not to be "wronged". A scientific theory that conforms to the principle of testability is considered to be close to certainty as long as it cannot be falsified despite repeated observations, so the success of a scientific theory is in a sense directly proportional to the duration of non-falsification.

> Science never pursues the illusory aim of making its answers final, or even probable. Its advance is, rather, towards an infinite yet attainable aim: that of ever discovering new, deeper, and more general problems, and of subjecting our ever tentative answers to ever renewed and ever more rigorous tests (Popper, 2005: 281).

Popper states that his theory is valid in the social sciences as it is in the natural sciences. When it comes to social phenomena and tendencies, it would be unfounded and wrong to speak of a law that determines the course of history inductively on the basis of observations made, just as it is in

the natural sciences. Even if social conditions are regularly repeated, they are not in the character of the immutable regularities of the physical world, since they are based on differences in history and culture. Therefore, Popper directs at least as much criticism of Logical Positivism towards historicists in his The Misery of Historicism. Popper defines historicism as follows;

> Suffice it to say that by "historicity" I mean an approach that recognizes that historical premise is the main goal of the social sciences and that this goal can be achieved by revealing the "rhythms" and "patterns", "laws" and "orientations" that lie at the root of the evolution of history (Popper, 2008: 3).

History has to be much more unpredictable because its subject is human, because people can voluntarily interfere with the flow of events and change even a prediction that is actually true to make it wrong. Popper points out that historicism is dangerous as well as wrong. According to Popper, the historians' belief that history has universal laws and that prophecies about the future can be made from them is dangerous because it can lead society to a totalitarian structure.

Therefore, the way to look at history in a correct way is not to put forward some theories of historical development, but to turn to the past from a certain point of view, with a certain understanding of history. The goal here is not certainty or absoluteness, but simply to be able to see history as faceted as possible with a multitude of perspectives.

2. Thomas Kuhn: History of Science as a Consecutive Course of Paradigms

In the 1962 book *The Structure of Scientific Revolutions* by the American philosopher Thomas Kuhn, he sets out a whole new perspective on the nature and validity of science. The work, which had a groundbreaking effect on the world of science and philosophy and deeply shook it, has become a theory that the debates on the philosophy of science must come to terms with today. In this work, Kuhn criticizes both Logical Positivism and Karl Popper, who tried to set a new benchmark for science by opposing it. According to Kuhn, the very attempt to find the criterion to which scientific propositions should conform is based on a number of common assumptions about the nature of science, and he thinks that precisely these grounds should be questioned. In other

words, the problem Kuhn sees with regard to the dominant view of science lies much deeper, fundamentally

Kuhn bases his view of science in this work not on some theoretical reasoning, but on the history of science itself. According to Kuhn, when we look at the history of science going back to the present day, we do not encounter a single conception of the universe and science claimed by the Logical Positivists and Popper. However, they accept some assumptions as an indisputable and absolute truth. For example, both views are based on a realist ontology in accordance with the modern vision of the universe and claim that there is a reality independent of it, apart from the knowing man. They also aim to find a criterion by which to distinguish between science and non-science. Whether this is the affirmative theory, as positipodists suggest, or the falsifying theory, as Popper suggests, both ultimately seek a distinctive element for science. What they have in common is their belief that science always proceeds in a cumulative fashion and that there is only one universal and historically universally accepted method of doing science. However, when we look at history, we see that new theories can invalidate old ones and develop completely different perspectives on the structure of the universe and the earth, and completely change the methods used by scientists. Kuhn calls the dominant view of science, which was accepted by almost all scientists in a given period, a 'paradigm'. In a general sense, a "paradigm" is a "disciplinary matrix" or "the sum of all the beliefs, values, techniques, etc. shared by the members of a particular community". (Kuhn, 1970). Although he uses this concept in different meanings – such as point of view, scientific method, metaphysical fiction, theoretical framework, tradition, etc. – he stated that the two meanings he actually meant were sampling and organizing principle (Çüçen, 2012: 174).

Kuhn argues that the concept of paradigm is of great importance for our understanding of changes in the history of science. According to him, a scientific paradigm is a closed and self-consistent theoretical system built on unique assumptions, assumptions and postulas. When a scientist makes observations and experiments, that is, when he deals with facts, he always has in his eyes the glasses of the paradigm he is involved in. Therefore, a scientist cannot actually look at facts in an objective and theory-independent manner as he thinks. It is also wrong to compare paradigms with each other, to compare them, because paradigms are almost like two separate planets where different laws of physics apply. There is no external reference point to make such a comparison

possible, no absolute and objective criterion beyond science by which to evaluate the contents of paradigms.

Each scientific paradigm contains its own symbolic generalizations, metaphysical principles, scientific values, and common illustrations, and can only be judged in accordance with them. But if it is not possible to compare paradigms with each other, what is the basis for one paradigm to assert itself as a mainstream paradigm by ending the dominance of another? Kuhn introduces the concept of 'anomaly' to explain this situation. Anomaly is the name given to phenomena, data and situations that cannot be explained by the current paradigm or that contradict the basic assumptions of the paradigm. When scientists encounter an anomaly, they first try to adapt it to the current paradigm through various hypotheses or to ignore it. But when so many anomalies arise that the scientific paradigm cannot ignore, it may become imperative to make a change in the paradigm. The loss of dominance of a paradigm occurs when a new paradigm that solves anomalies emerges and is approved by the scientific community.

> The change of science as a continuous activity is the result of a stage related to approval. Therefore, the theory that is much more favorable and more approved than the theory of true or false science is accepted as science (Çüçen, 2012: 172).

Kuhn argues that these paradigm shifts, which he considers to have occurred continuously in the history of science, are part of the process of the emergence of science and that these changes always follow a common stage pattern. Kuhn calls these stages the pre-scientific period, the normal/normal scientific period, crises, revolution, ordinary period.

The pre-scientific period is the period in which a certain paradigm is not yet dominant and scientists try to explain phenomena by using various and different theories, experiments and methods. When the explanatory power of one of the perspectives used in this process becomes significantly higher than the others, this perspective becomes widely adopted by scientists and becomes the dominant paradigm. The dominant paradigm is used by scientists as long as they can explain facts in a coherent way. This period is what Kuhn calls the period of normal science. Normal science is "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 further practice" (Kuhn 1970: 10).

This period is divided into three parts: the process of collecting facts, the process of testing theory and the process of developing theories. Accordingly, scientists first collect data on facts through experimentation and observation, then these data are subjected to testing within the framework of the paradigm, and as a result, scientific theories consisting of all the data that successfully passed the test are formed.

However, in the normal scientific period, as we have just mentioned, situations begin to arise that are contrary to the paradigm or that the paradigm is insufficient to explain. Kuhn sees the tendency of scientists to ignore and ignore anomalies as proof that scientific activities are not actually entirely rational. However, when anomalies multiply beyond ignoring, science enters a phase of crisis. The typical feature of this universe is that, just as in the pre-scientific period, different perspectives are developed and a new system is searched for a coherent and closed system that explains the current anomalies and a chaos prevails in the world of science.

The fourth stage is the stage of revolution, in which one of the new paradigms put forward as a result of these searches comes to the fore, invalidates the old paradigm and becomes the new dominant paradigm. However, this is not an easy and smooth transition process. Because the new paradigm is met with fierce resistance by the scientists who represent the previous paradigm in the first place. The revolution is the result of an increase in the number of scientists, their effectiveness, and their success adopting the new paradigm, and eventually becoming more widespread and powerful than the old paradigm.

> Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practritioners has come to recognize as acute. (Kuhn, 1970: 23).

After the revolution has taken place and the resistance of the representatives of the old paradigm has been eliminated, the usual period of science begins again. Just like in the previous paradigm, scientists continue their research within the framework set by the new paradigm – until anomalies reappear and the crisis period is re-entered. According to Kuhn, the history of science shows us that this process is constantly repeated. Considering how the paradigms put forward by Aristotle, Newton and Einstein followed each other, it is clear that science proceeds not cumulatively but through revolutions.

Conclusion

Although Popper and Kuhn differ in their views on the historical progress and structure of science, they actually agree on the point of drawing attention to the weaknesses and inconsistencies of the positivist conception of science. First, both have put forward their criticisms of positivist science's claim to certainty. Popper admits that it is not possible to prove the truth of scientific propositions with the principle of falsifiability and therefore to claim certainty. Certainty must remain an ideal that can only be approached but never achieved. Popper's confessional statement about the nature of the modern natural sciences sums it up beautifully:

> Science does not rest upon solid bedrock. The bold structure of its theories rises, as it were, above a swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and if we stop driving the piles deeper, it is not because we have reached firm ground. We simply stop when we are satisfied that the piles are firm enough to carry the structure, at least for the time being (Popper 2005: 94).

Kuhn, on the other hand, by considering the history of science as a process of being, shows that science can in fact claim neither certainty, universality, nor generality, and therefore the claims of the positivist conception of science are unfounded. Although the views of these two philosophers focus on the history and philosophy of science, they actually show us very important and fundamental dilemmas regarding the ancient problem of knowledge, that is, the conditions and processes by which man acquires knowledge of facts. When we take into account the points that Popper and Kuhn have pointed out—as has been demonstrated countless times throughout the history of philosophy—we once again come across the fact that man is limited and determined in terms of his access to knowledge of the external world.

The views of these two philosophers towards the dominant scientific paradigm in the period in which they lived, albeit from different angles, received many positive and negative reactions from the world of science and philosophy, but in any case they had a great impact on philosophy and the history of science. At the beginning of the twentieth century, especially in the philosophy of Continental Europe, the materialist, metaphysical and religious, purely secular worldview offered by the positivist paradigm of science began to examine the causes of the crisis that ultimately drew

the Western world into and how it could be solved. One of the most important points to which the criticisms are directed is that the methods used in the natural sciences are also used in the human and social sciences. At the core of the criticism leveled at Popper, in particular, by Adorno, one of the leading philosophers of Critical Theory, is the idea that positivism's approach to man and society is not legitimate.

> For Popper, critical rationalism is both natural and a method that can be applied to the social sciences. Adorno thinks differently. ... Adorno criticizes positivism for separating the particular from the general and thus never reaching its real object, that is, society (Dellaloğlu, 2014: 34).

Western scientists today, although inherently committed to positivist principles, seem to take all these criticisms into account more than ever before and take into account the weaknesses in their postula. However, despite all these criticisms/self-criticisms, positivist ideals have penetrated so deeply into the world of today, or in Kuhnist terms, into today's paradigm, that it is very difficult and even impossible for us, who are largely the product of the age in which we live, to step outside this paradigm and look at it objectively from above and in its entirety. However, this fact should not prevent us from trying to analyze this paradigm as much as our intellectual capacities and limits allow, in order to understand, make sense of and solve the crisis that manifests itself in every field in our age.

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