UNIT 2 LOGICAL POSITIVISM: BASIC IDEAS, IMPLICATIONS AND CRITIQUE

Contents

2.0 THE OBJECTIVES

Logical Positivism had been a prominent school of the philosophy of science. This lesson is meant to introduce students to the philosophy of science of logical positivism. Its objectives are:

- To situate logical positivism in its historical setting.
- To discuss the meaning of the terms, viz., logical and positivism
- To familiarize oneself with the central philosophical and epistemological tenets of logical positivism
- To examine critically the various claims of logical positivism
- To cultivate in students the habit of critical thinking leading to a coherent vision of reality.

2.1 INTRODUCTION

Mechanical Philosophy of Nature was the dominant worldview in the 18th and 19th centuries emerging from the Newtonian or classical physics. It looked at the cosmos as a huge machine, say, a giant clock. In many significant ways Logical Positivism could be considered a reincarnation of the Mechanical Philosophy of Nature. As Frederick Suppe points out, "mechanistic materialism was quite dominant in Germany in the nineteenth century, especially in the first half." Logical Positivism originated in the German world in the first half of the twentieth century from the Vienna Circle of M. Schlick and the Berlin Circle of Hans Reichenbach. "It arose as a convergence of three streams of developments: The empiricism of Hume, Mill and Mach; the methodology of empirical science as developed by Helmholtz, Mach, Poincare, Duhem, Boltzmann, and Einstein; and symbolic logic and linguistic analysis, as developed by Frege, Whitehead, Russell, and Wittgenstein." Logical positivism could be described as "a philosophical movement risen in Austria and Germany in 1920s, primarily concerned with the logical analysis of scientific knowledge, which affirmed that statements about metaphysics, religion, and ethics are void of cognitive meaning and thus nothing but expression of feelings or desires; only statements about mathematics, logic and natural sciences have a definite meaning. Its members included Rudolf Carnap (1891-1970), considered the leading figure of logical positivism, Herbert Feigl (1902-88), Philipp Frank (1884-1966), Kurt Grelling (1886-1942), Hans Hahn (1879-1934), Carl Gustav Hempel (1905-97), Victor Kraft (1880-1975), Otto Neurath (1882-1945), Hans Reichenbach (1891-1953), Moritz Schlick (1882-1936), Friedrich Waismann (1896-1959)."[i]

Einstein's theory of relativity had its indirect impact on the origin of logical positivism as the logical positivists explored the philosophical significance of the theory of relativity. Also the developments in quantum mechanics and the related epistemological and philosophical issues boosted the growth of logical positivism. The developments of formal and symbolic logic also exerted influence on logical positivism. By 1930s logical positivism was a prominent philosophical movement across Europe and USA.

2.2 THE GOAL OF LOGICAL POSITIVISM

Logical positivism is a particular approach to knowledge in general and to science and philosophy in particular. Vienna circle was a group of scientists, mathematicians and philosophers. They were reacting against the intrusion of mathematics in science. They believed that metaphysics is harmful to science. They criticized the use of metaphysical categories like Vital force (Henry Bergson) , Substantial Form (Aristotle), etc. The two-fold goals of the logical positivists could be articulated as follows:

1. They wanted to demonstrate the meaninglessness of metaphysics in general and science in particular.
2. They wanted to establish a firm foundation for science. They did not want metaphysics to be its foundation. This approach of the logical positivists was in sharp contrast with the method advocated by the Kantians.

2.3 LOGICAL POSITIVISM – CLARIFYING TERMS

Logical positivism is a combination of the two approaches upheld by positivism and symbolic logic. Positivism is a particular school of knowledge which advocates that valid knowledge must be based on sense knowledge. Any knowledge which is not based on senses is meaningless. It could be noted here that positivism is the extreme form of empiricism as the empiricists do not claim that knowledge not based on senses is invalid or meaningless, though they too advocate that knowledge should begin with sense experience. According to A. F. Chalmers, Logical Positivism is "an extreme form of empiricism according to which theories are not only to be justified by an appeal to facts acquired through observations, but are considered to have meaning only insofar as they can be so derived."

The recourse to ‘logical’ in logical positivism is on account of their emphasis on the use of symbolic logic. Symbolic logic is developed by formulating logical principles in symbolic and mathematical terms. For instance, if P stands for a statement, then in Px, x is a mother; In Qx x is a woman, then Px Qx = if P, then Q. Px = Qx is a simple illustration of symbolic logic. This follows certain mathematical rules. Therefore symbolic logic is called mathematical logic. They advocated the use of symbolic logic in the analysis of science. Symbolic logic has the advantages of clarity and exactness and anything in science should be translated in terms of symbolic logic. If science is formulated in mathematical logic, then science is clear, distinct and exact. The principal function of the philosophy of science is the logical analysis of science.

2.4 IDEA OF SCIENCE

Logical positivists had a very narrow perspective towards science, whereby they thought of science as a set of laws, theories and principles. In tune with their focus on symbolic logic they conceived science as having two aspects; viz.,T and C.

T = Theoretical aspect

C = Corresponding rules

Every theory must be put in the symbolic form of T and C. Corresponding rules are rules which concretize the theory. It puts theory in contact with observable consequences. Corresponding rules are the interpretative system. These rules specify also the reliable experimental procedure.

For example, Boyle's law concerning the behavior of gas states that when the volume increases the pressure decreases. Gases are made up of molecules. These molecules move fast and they collide with each other. When Boyle proposed these things, its assumptions were merely theoretical. Nobody had observed molecules or collision between them. However Increase of pressure or decrease of volume or vice versa can be observed. This observable part belongs the 'C' part and the unobservable part belongs to the 'T' part. Science must be constructed mostly out of 'C.'

2.5 SCIENTIFIC KNOWLEDGE

Scientific knowledge can be had in two ways through empirical research and logical analysis. Empirical research is done by conventional science whereas logical analysis is done by the philosophy of science. A scientific statement has two parts, viz., Form and Content. For instance, the Newtonian idea of the law of gravity states that all physical bodies in the universe attract each other. It has a universal logical form which can be formulated mathematically. Therefore by Form is meant the structure or the logical model which covers the form of scientific explanation, law and theory. The content in this law refers to the force of attraction, nature of bodies, etc. A philosopher of science should be busy with the form of scientific explanation than with the content of the explanation. Content is the concern for conventional scientists. This is because they believe that the scientific character resides in the form. Form makes a statement a scientific

statement. A particular phenomenon is explained by science when that is deduced from certain given laws and existing conditions.

2.6 AREA OF INQUIRY IN PHILOSOPHY OF SCIENCE

Is a philosopher of science obliged to study every bit of science? For logical positivists, the answer is, no. According to them, a scientific activity has two aspects:

1. The context of Discovery
2. The context of Justification

The context of discovery refers to all the personal, contextual and philosophical factors and processes that are involved is a new discovery. The context of justification refers to all that go into establishing the theory scientifically. The context of discovery is not the concern of Philosophy of science. It should be left to historicists, psychologists, sociologists, and others. The context of justification is the concern of the philosophy of science.

Their discard of the context of discovery conversely implied that the worldview of the scientist was irrelevant as far as the scientific work was concerned. A worldview refers to a cluster of factors like the cultural, social, religious, and personal aspects of the scientist. The educational background, family upbringing, prejudices and preferences, etc., also become part of the worldview. Logical positivists believed that these factors had no bearing on the science of the scientist. Every scientist from any part of the world with any type of background would arrive at the same scientific results as long as he/she proceeded scientifically.[ii]

Check Your Progress 1

Note: a) Use the space provided for your answer

b) Check your answers with those provided at the end of the unit

1) What is the goal of Logical Positivism?

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2) Write a short note on Scientific Knowledge.

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2.7 MEANING AND VERIFICATION

Logical positivists advocated the verification theory of meaning. The verification principle states that a contingent proposition is meaningful if and only there is an empirical method for deciding whether it is true or false. For example, the statement that 'light travels along straight path' can be experimentally verified and therefore a meaningful proposition. Whereas, there is no empirical method to prove the proposition that 'God exists.' Therefore this statement is false. It could be noted that logical positivists were atheists or agnostics in one way or the other.

According to logical Positivism, inductivism is the right method of scientific inquiry and that alone is capable of constituting authentic knowledge. It also believes that inductivism is an effective means to formulate infallible scientific generalizations on the basis of factually significant statements. "We say that a sentence is factually significant to any given person, if and only if, he knows how to verify the proposition which it purports to express – that is if he knows what observation would lead him under certain conditions to accept the proposition as being true or reject its opposite as being false." The factual significance of a statement is identified with verifiability, and verifiability in turn is identified with observation. The statement that can never be verified by observation is considered as insignificant and an insignificant statement is treated as unauthentic. Logical positivism is generous enough to recognize two kinds of verification – 'verification in practice' where the actual verification is possible and 'verification in principle' where only a possibility of actual verification is envisaged.

Logical positivism makes a distinction between authentic and pseudo statements. Consequently, it bifurcates the human claims-to–know into two irreconcilable systems – science

and non-sciences. It has no doubt about the infallibility of authentic claims and the fallibility of psuedo claims. The inductivistic verifiability alone is the criterion to make such a bifurcation, and by means of the verification principle it grants permission to the scientific hypothesis to remain part of the authentic claims though a `conclusive verification' of hypothesis is not possible.

2.8 THE PRIMACY OF OBSERVATION

Logical Positivists made a sharp distinction between observation and theory, in other words, between O-terms and T-terms; O-terms are not problematic, whereas T-terms are confusing and misleading. Quantities pertaining to colour, length, warmth, etc., are examples of O-terms. Electric fields, electrons, atoms, etc., are examples of T-terms. Theories must be subsequent to observation. T-terms get their meaning and cognitive significance only through their connection with O-terms. If a T-term can somehow be connected with O-term, it will have legitimacy. "Sense observation was absolutely fundamental for LP (Logical Positivism). In a way scientific knowledge originated and terminated in observation, since all valid knowledge should be based on observational data and must be validated by observation. It made a sharp distinction between observation and theory, observational terms and theoretical terms. The former were usually reliable and non-problematic, whereas the latter problematic and messy. LP did not *reject* theoretical terms but said that they had validity and meaning as long as and in so far as they were related to observational terms. In fine, observation was the final court of appeal, as far as LP was concerned."

2.9 RATIONALITY OF SCIENCE

Logical Positivists looked at science as a privileged form of knowledge, a unique form of knowledge. Aristotle had called scientific knowledge *episteme* which meant firm, immutable, and certain knowledge. "It was different from *doxa,* which was only opinion, yielding only probable knowledge. This also meant that science and scientists were a breed apart, away from the ordinary run of things. In its extreme form Logical Positivism claimed that scientific knowledge was completely rational; irrational or even non-rational elements had no place in science. Scientific knowledge was unchanging since once something was established as science, it would remain essentially immutable (some modifications by way of extending the domain of its

application, etc., were possible). Hence science gave eternal and universal truths. Scientific knowledge was objective, uncontaminated by personal elements. The passions and prejudices of the scientist exerted no influence on scientific knowledge."

2.10 CRITICAL EVALUATION OF LOGICAL POSITIVISM

Several recent developments in the philosophy of science have challenged the claims of logical Positivism and exposed their shallowness and untenability. Logical Positivism is no longer held as a viable philosophy of science. The decline in the influence of logical positivism was natural and essential on account of the bombastic and absolutist claims made by them.

The elitist view of science upheld by logical positivism was a sort of rational mythology. New schools of the philosophy of science arose in an attempt to demythologize the extreme claims of logical positivism. The schools of Historicism (also called Social Constructivism) and Historical Realism (Critical Realism) have struck a major blow to logical positivism.

Let us critically examine the various claims of logical positivism:

1. **Negation of Metaphysics:** The metaphysical antagonism of logical positivism poses a fundamental question. Should science use metaphysics? Logical positivists' very denial of metaphysics implies metaphysics. The illusory faith of the logical positivists in the infallibility of scientific claims resides in the hope that every fact could be explained in terms of theories based solely on observation. A scientific law is universal and has its basis in observation. But, is its universality observable? If not, how can logical positivists justify their acceptance of these laws? Again, what is the validity of the fundamental methods of science like induction and inference? Logical positivists' denial of metaphysics is finally a metaphysics of scientific megalomania. Alan Wallace's observation has an explicit message to them. "A disinterest in metaphysics may result not in abstention from such concerns, but in unconscious, unintelligent adoption of a particular form of metaphysics."[iii] Denial of metaphysics and its necessary prelude of observation as the ultimate criterion of truth seem to be philosophically a very minimalist approach to Reality.

2. **Distinction between Discovery and Justification:** Their distinction between the context of discovery and the context of justification betray a very naïve and parochial vision of

science. The process of discovery or the moment of discovery is cherished as one of the most exciting aspects of the scientific enterprise. The irrational imaginative leap taken by Max Planck in the discovery of the quantum hypothesis, or Einstein's personal conviction of the inherent harmony of the cosmos which led him to the formulation of the relativity theory, etc., are classical examples of the significance of the context of discovery. Delinking justification from context is a mere idealization of science.

3. **Absolutization of Mathematics:** They over-emphasized the importance of mathematics in science. There is no perfect or ultimate axiomatisation or mathematization possible in science. There are several phenomena in contemporary science which cannot be adequately formulated mathematically. The quantum paradoxes like regeneration, mechanincal stability, wave-particle duality, probability, uncertainty, etc., encountered in the subatomic world are examples to it. The anti-metaphysics attitude of the logical positivists forced them to attribute natural laws to the "software" of the universe. It reduces reality to a mere process of computation. The classical physicists' radical conviction of translating reality into mathematizable quantities was a scientific practice based on this view. To this assumption, Einstein has given a severe jolt: "As far as the laws of mathematics refer to reality, they are not certain; as far as they are certain, they do not refer to reality."[iv] Eventually logical positivists themselves had realized that only a very few theories could be mathamatized completely. So they had partly given up the idea of mathematizing the whole scientific theories. Law reductionism in some ways seems to be scientifically presumptuous because it would mean, "such elementary laws are *more intelligent than we are ourselves.*"[v] Ultimately, this tendency to reduce everything to mere laws is the projection of an extreme faith in the omnipotence of those laws without daring to look at the power and mystery behind them.

4. **Meaning Invariance:** As for the logical positivists, the meaning of scientific theories does not change. They claim that even in the case of the transition from the geocentric worldview to the heliocentric worldview there was only a minor change. There is no radical change in science. Logical positivists were very much in the line of Aristotle. New findings may be added, but no radical change. But this is not the case in science.

Scientific theories are always changing and evolving. The concepts, meaning, theories and explanation of science are often radically replaced.

5. **The Distinction between O-terms and T-terms:** Logical Positivists made a sharp distinction between Observational terms and Theoretical terms. But no absolute distinction is possible between these two terms. As science develops more and more, many T-terms become O-terms. The very concept of absolutely independent and objective observation is questionable in several aspects of the present-day science. Today many scientists and philosophers of science say that most observations are theory laden. For example, our observational statement that 'sun rises in East' is still governed by the geo-centric worldview. On the basis of the uncertainty principle in quantum physics, physicists have argued that "microrealism"[vi] is an illusion in the quantum world. In the wider sense, the collapse of microrealism implies that in the ultimate analysis the world is "non-separate" from us. In quantum theory the measuring device plays an important role in our picture of Reality. Associating the collapse of the wave function with the observer's consciousness, physicist John Wheeler and colleagues have said that it is consciousness that creates Reality. In Wheeler's words: "Nothing is more important about the quantum principle than this, that it destroys the concept of the world as 'sitting out there,' with the observer safely separated from it by a 20-centimetre slab of plate glass.... To describe what has happened, one has to cross out that old word 'observer' and put in its place the new word 'participator.' In some strange sense, the universe is a participatory universe."

6. **Verification Theory of Meaning:** As for logical positivists, verifiability (empirical) becomes the criterion for meaningfulness. According to logical positivism, inductivism is the right method of scientific inquiry and that alone is capable of constituting authentic knowledge. It also believes that inductivism is an effective means to formulate infallible scientific generalizations on the basis of factually significant statements. But this should be noted that the very verification theory itself cannot be subjected to the verification method. Thus in the formulation itself, this principle is self-defeating. It could also be noted that the very inductive method of science goes contrary to the claims of logical positivism. For instance, to treat water as H_2O is a universal statement. In every kind of

water we find the combination and make the absolute statement that water is H_2O. Can it be valid for all time and space? As a logical positivist one is supposed to go only by observation and verification and one has not experimented with every water molecule to conclude that water is H_2O. Given their principles, one's conclusion is not authorized by the premises. The logical positivists' model of the philosophy of science unambiguously propagates both methodologism and methodological monism.

7. **Karl Poppers' Critique:** Karl Popper launched a massive assault on the verification method of the logical positivists. Popper is considered to be the bridge-builder between logical positivism and historicism. According to him the greatest problem in philosophy is the problem of the growth knowledge and the best way to know the growth of knowledge is to know the growth of the scientific knowledge. Instead of verifiability, he advocated falsifiability as the criterion of meaning in science. Scientific knowledge is to be assessed in terms of *Falsification*. The notion of falsification is his unique contribution to the philosophy of science. History of science shows that science is a series of conjectures and refutations. A scientist proposes a hypothesis. Instead of trying to establish it, he tries to refute it. If the hypothesis is refuted, it should be given up. If the hypothesis is refusing to be refuted, it is corroborated and becomes hypothesis two and subsequent hypotheses are added. One can always find positive instances in everything that one brings out in each subsequent hypothesis. This technique, Popper calls the Falsification. The criterion of demarcation between science and non-science is the falsifiability. A scientific statement is a statement that can be subjected to the method of falsification. He stresses the role of observation and at the same time doesn't make a sharp distinction between theory and observation.

8. **Historicist Criticism:** Historicism arose mainly as a reaction against logical positivism. Its main aim was to demythologize the logical positivist understanding of science. Historicists were of the opinion that there are non-rational elements also in science as opposed to the logical positivists' view. Historicists emphasized the history of science. They studied about what went on in the past and what is going on in the present. The historicists looked at science as it is, whereas the logical positivists looked at science as it should be. Historicists

showed that there are also irrational elements in science. Science is a mixture of rational and irrational elements. There are also subjective elements in science. Historicists also emphasized the concept of ***Weltanschauung.*** *Weltanschauung* or worldview is a collection of factors like background, training, passions, bias, prejudices, etc., of the scientist. The worldview of the scientist plays a crucial role in science. The worldview colors and controls the world of the scientist. Philosophy of science is meant to identify this worldview. The unique claim to truth by science of the logical positivists is proved to be mythical. Science is just one among many other disciplines.

2.11 LET US SUM UP

- In many significant ways Logical Positivism could be considered a reincarnation of the Mechanical Philosophy of Nature.
- Logical Positivism wanted to demonstrate the meaninglessness of metaphysics in general and in science in particular.
- Logical positivism is a combination of the two approaches upheld by positivism and symbolic logic.
- For logical positivists, the context of discovery is not the concern of Philosophy of science. The context of justification is the concern of the philosophy of science.

- A philosopher of science should be busy with the form of scientific explanation than the content of the explanation.
- The verification principle states that a contingent proposition is meaningful if and only there is an empirical method for deciding whether it is true or false.
- Logical Positivists made a sharp distinction between observational terms and theoretical terms.
- The various claims of logical positivism are loaded with serious philosophical problems and have lost their relevance in the contemporary scientific and philosophical context.

Check Your Progress II

Note: a) Use the space provided for your answer

b) Check your answers with those provided at the end of the unit

1) What do you understand by rationality of science?

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2) Write a short note on Verification Theory of Meaning.

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2.12 KEY-WORDS

Vienna Circle: The Vienna Circle was a group of philosophers who gathered around Moritz Schlick when he was called to the Vienna University in 1922, organized in a philosophical association, of which Schlick was Chairman. Among its members were Gustav Bergmann, Rudolf Carnap, Herbert Feigl, Philipp Frank, Kurt Gödel, Hans Hahn, Tscha Hung, Victor Kraft, Karl Menger, Richard von Mises, Marcel Natkin, Otto Neurath, Olga Hahn-Neurath, Theodor Radakovic, Rose Rand and Friedrich Waismann. With the exception of Gödel, members of the Vienna Circle had a common attitude towards philosophy, characterized by two main beliefs: first, experience is the only source of knowledge; second, logical analysis performed with the help of symbolic logic is the preferred method for solving philosophical problems.

Quantum Physics: Quantum physics is a branch of science that deals with discrete, indivisible units of energy called quanta as described by the Quantum Theory. There are five main ideas represented in Quantum Theory: 1. Energy is not continuous, but comes in small but discrete units. 2. The elementary particles behave both like particles *and* like waves. 3. The movement of these particles is inherently random. 4. It is *physically impossible* to know both the position and

the momentum of a particle at the same time. The more precisely one is known, the less precise the measurement of the other is. 5. The atomic world is *nothing* like the world we live in.

2.13 FURTHER READINGS AND REFERENCES

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2.14 ANSWERS TO CHECK YOUR PROGRESS

Answers to Check Your Progress I

1. Logical positivism is a particular approach to knowledge in general and to science and philosophy in particular. Vienna circle was a group of scientists, mathematicians and philosophers. They were reacting against the intrusion of mathematics in science. They believed that metaphysics is harmful to science. They criticized the use of metaphysical categories like Vital force (Henry Bergson) , Substantial Form (Aristotle), etc. The two-fold goals of the logical positivists could be articulated as follows: They wanted to demonstrate the meaninglessness of metaphysics in general and science in particular.They wanted to establish a firm foundation for

science. They did not want metaphysics to be its foundation. This approach of the logical positivists was in sharp contrast with the method advocated by the Kantians.

2. Scientific knowledge can be had in two ways through empirical research and logical analysis. Empirical research is done by conventional science whereas logical analysis is done by the philosophy of science. A scientific statement has two parts, viz., Form and Content. For instance, the Newtonian idea of the law of gravity states that all physical bodies in the universe attract each other. It has a universal logical form which can be formulated mathematically. Therefore by Form is meant the structure or the logical model which covers the form of scientific explanation, law and theory. The content in this law refers to the force of attraction, nature of bodies, etc. A philosopher of science should be busy with the form of scientific explanation than with the content of the explanation. Content is the concern for conventional scientists. This is because they believe that the scientific character resides in the form. Form makes a statement a scientific statement. A particular phenomenon is explained by science when that is deduced from certain given laws and existing conditions.

Answers to Check Your Progress II

1. Logical Positivists looked at science as a privileged form of knowledge, a unique form of knowledge. Aristotle had called scientific knowledge *episteme* which meant firm, immutable, and certain knowledge. "It was different from *doxa,* which was only opinion, yielding only probable knowledge. This also meant that science and scientists were a breed apart, away from the ordinary run of things. In its extreme form Logical Positivism claimed that scientific knowledge was completely rational; irrational or even non-rational elements had no place in science. Scientific knowledge was unchanging since once something was established as science, it would remain essentially immutable (some modifications by way of extending the domain of its application, etc., were possible). Hence science gave eternal and universal truths. Scientific knowledge was objective, uncontaminated by personal elements. The passions and prejudices of the scientist exerted no influence on scientific knowledge."

2. As for logical positivists, verifiability (empirical) becomes the criterion for meaningfulness. According to logical positivism, inductivism is the right method of scientific inquiry and that alone is capable of constituting authentic knowledge. It also believes that inductivism is an effective means to formulate infallible scientific generalizations on the basis of factually significant statements. But this should be noted that the very verification theory itself cannot be subjected to the verification method. Thus in the formulation itself, this principle is self-defeating. It could also be noted that the very inductive method of science goes contrary to the claims of logical positivism. For instance, to treat water as H_2O is a universal statement. In every kind of water we find the combination and make the absolute statement that water is H_2O. Can it be valid for all time and space? As a logical positivist one is supposed to go only by observation and verification and one has not experimented with every water molecule to conclude that water is H_2O. Given their principles, one's conclusion is not authorized by the premises. The logical positivists' model of the philosophy of science unambiguously propagates both methodologism and methodological monism.