

An Essay on the Key Points ‘Science : Conjectures and Refutations’ of Carl Popper

by KK Sharma

“Science : Conjecture and Refutations¹” by Carl Popper deals with his philosophical thoughts on the dilemma of science and non-science. His paper, presented at Peterhouse, Cambridge in the summer of 1953, describes a basic criteria for any theory to be converted or considered as it being scientific. Basic argument forwarded in the paper is that, *‘the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability’*. Carl Popper (1902-1994) dealt with social and political theories and challenged Carl Marx’s socialism in its later modified avatar, Freudian psychoanalysis, astrology as was practised in the early 20th century and Adler’s social engineering based primarily on observations and past experiences. The paper presents Popper’s argument as to when a theory can be treated as true or be acceptable? His postulation transcends philosophy and scientific boundaries, blurring them to the extent of attempting to convert every theory into a scientific proof. His explanations given in the paper weave a thread over various disciplines; as he calls every myth, belief, theory or practice into question. He exhorts all disciplines not to accept anything as a complete truth. Even scientifically experimented truths may some day fail or be falsified due to some new evidences, which may not be available in present times. His complete discourse in the paper is in relation to the objectivity - subjectivity or a strong need to have a critical analysis, rather than have a dogmatic thinking. Born to a lawyer father and a mother with music expertise, no wonder; Popper displayed avid disregard to then dogmatic ‘taken for granted’ theories, just because these were based on some observations or experiences. All that he wanted was subjecting each idea, thought or theory to a test or testability with the sole objective to prove it wrong or as he calls it ‘to falsify’ it.

To advance his thoughts, he has quoted examples of the critical analysis of Albert Einstein for his theory of gravitation & Relativity. He also attempted to prove that this critical analysis was totally absent in other contemporary theories of **Carl Marx, Sigmund Freud and Adler**. Having been a young marxist in Vienna, he saw the hollowness of this theory first-hand. He also looked at the Sigmund Freud’s psychoanalysis with scepticism and found it to be unscientific. In relation to the Adler’s social theories, his work with the children in Vienna gave him deeper insights to so-called ‘individual psychology’ and proved that the theory had no scientific basis. He termed all these theories alongwith the Astrology, as practised then with primitive instruments, as ‘beliefs’ or ‘metaphysics’ or ‘pseudo-sciences’, unable to stand the testability measures. Einstein’s theory on the other hand is shown as the one which was subjected to tests and falsification and came out trumps. Compared to this, he considered Adler and Marxist theories as ‘alleged scientific theories’. In his views, Einstein’s theory was ‘risky’ as it subjected *and still subjects* itself to a proof through empirical methods. His theory was also tested through Sir Arthur Stanley **Eddington’s eclipse observation** published in 1920 and hailed as a water-tight proof of Einstein’s Theory² of gravitation (That light indeed is attracted towards heavenly bodies or that light bends).

¹ ‘Philosophy of Science: a Personal Report’, *British Philosophy in Mid-Century*, ed. C. A. Mace, 1957(Carl Popper, Science : Conjecture and Refutations).

Carl Popper also depended on the common perceptions of the time, that admirers and believers would constantly perpetuate acceptance and 'truthability' of a theory as they closed their minds to criticism and refused to subject these beliefs to a scientific testability or falsifiability. His '*induction*' analysis was also the basis of his insistence on proof and testability. Theory of induction simply banked on some previous or prior experiences and interpolation of the same for a new situation. Thus he believed that confirmation of any theory should only be accepted, if it was a '*result of risky predictions*³'; that is to say that it was refuted through a carefully conducted test. Such a scientific theory will prohibit certain things from happening (at least at that time frame). Irrefutability is a must in any scientifically proved theory. He also stated that every organised and truthful test applied on a theory was actually to prove it wrong or to falsify it. Carl Popper also spoke about 'corroboration' of a theory through tests. His explanation of demarcation – between '*science*' and what he calls, '*non-science*' or '*pseudo-science*' was purely based on the criteria of falsifiability or testability and of course refutability. It was this thought process with which he criticised Ludwig **Wittgenstein's** theory of verifiability as published by the latter in '*Tractatus Logico-Philosophicus* (1921),⁴ in so-called Vienna intellectual circle. He was laying down the concept of demarcation in terms of testability and was not ready to accept verifiability or meaningfulness as proofs of scientific character. This led to the circle not making him a member in the early 1930s.

Carl Popper has dwelt at length on **David Hume's 'Problem of induction'** from Part IV to VII in the paper. Hume divided perceptions between "impressions" or sensations and "ideas," which are copied from these impressions⁵. He developed a theory about mental behavior being governed by custom. Use of induction by an individual could be justified only by the *idea of "constant conjunction" of causes and effects*. Popper also described that all the observations used to verify or 'falsify' a theory, are in themselves conjectural. Now the choice is that we build our knowledge through induction – that is by the past experience or by a process of laying a conjecture and then trying to refute it with a view to reject or confirm it. In the paper, Popper describes 'induction' as illogical and irrational, though that is how we acquire most of the knowledge – but it is not scientifically proved. Hume's psychology, as per Popper was a result of repetitive reinforcements, which converted actions into habits and we believed in those habits. His argument is that, repetition results are just that – repetition, and get embedded in our sub-conscious but do not become laws. Similarly habits or customs are not rules, but just habits. Hume based his 'problem of induction' on repetition with similarity or resemblance. As per Popper, this idea has been used in a very 'uncritical' way. This repetition can never be perfect, as the cases can not have perfect similarity. Thus *similarity-for-us is a product response involving interpretations which may be inadequate*. Whereas for Hume, even the first repetition was based on similarity. Popper discussed two options based on Hume's theory – acquisition of knowledge can be either by a non-inductive process, thus a rationale decisions or by repetition and induction – a kind of belief begetting belief.

² Dyson, F.W.; Eddington, A.S., & Davidson, C.R. (1920). "A Determination of the Deflection of Light by the Sun's Gravitational Field, from Observations Made at the Solar eclipse of May 29, 1919". *Phil. Trans. Roy. Soc. A* 220: 291–333.

³ 'Philosophy of Science: a Personal Report', *British Philosophy in Mid-Century*, ed. C. A. Mace, 1957(Carl Popper, Science : Conjecture and Refutations).

⁴ For the introduction, see Russell, Bertrand. Introduction, *Tractatus Logico-Philosophicus*, May 1922.

⁵ Hume, D. *An Enquiry Concerning Human Understanding*, page. 108 (from wikipedia).

Popper also brings in the observation vs. hypothesis debate in the paper. Observations would definitely lead the hypothesis, because they could not provide a valid explanation based on old theoretical framework. Popper also believed that inborn ideas were nothing but expectations and did not express conscious. The paper do accepts that individuals may have expectations or knowledge, which is unrelated to the testability of an observation. Kant had written about the 'law of causality'⁶, which was supposed to be a part of individual's mental belief. This 'instinctive' expectation is somewhat of the same type. Popper refutes **Kant's theory** that knowledge is possible from nature, but it is the humans who impose laws on nature. Nature usually resists any imposition of human laws and mostly succeeds. Thus it forces humans to discard its own laws, a proof of refutability. Popper stipulates that the role of deductive logical reasoning or logical argument remains important for the critical approach as against observations. He has stressed that the critical attitude in a conscious attempt to make theories or conjectures go through fire of tests and falsifiability in order to make them survive. Here his 'touching story' of some Indian community vanishing, since they believed tigers to be holy creatures, appears to be a myth advanced by old rulers in India to pursue their passions of tiger-hunting. But the argument against untested myths is powerful enough.

The logic of science requires to eliminate psychological prejudices and as Popper advances, demarcation of science and non-science has to be based on testability or falsifiability. Demarcation of the two ends of science and induction has been explained as actually the same thing. The paper repeatedly exhorts on the incorrect inferences on induction or observations being considered as 'the method' to verify or test a theory. Thus Popper summarizes his argument as, induction being a myth far removed from any scientific method. Here he is right in laying down a sequence for a scientific validation – starting with conjectures but refutes jumping to conclusions based on a single observation. There is definitely a requirement of repeated observations and experiments for refuting a hypothesis. Inductive method does not provide the criteria for demarcation – science from non-science or gives a faulty demarcation. The argument continues in the paper on impossibility to justify a law by observation or experiment or universality of such derived law and strong need of 'empiricism' to decide on a theory being scientific or not.

In the end the paper gives a sequence an observation to theory and its validity. We look at a problem-situation and theory is allowed to explain various observations. Testing these statements or any number of theories with an aim to falsify or eliminate them will leave us with a confirmed theory. The argument of Popper rests on the old problem of demarcation – distinction of magic from science, rationality of the scientific or critical procedure and of the role of observation within these. The probability stems from conjectures and any hypothesis needs to be tested to prove that the probability holds good. In the end, a high degree of corroboration is needed to test an hypothesis or to confirm a probability. From researcher's point of view, any statement of impending event with a high probability is of less interest than something whose probability is less. It is only through verification, subjecting theories to repeated tests, that it emerges as a science with high probability. Falsification here is rather adamantly used as the main criteria of Popper for the demarcation line between science and non-science.

⁶ Kitcher., Patricia (intro.); W. Pluhar (trans.), I. Kant (author) (1996). *Critique of Pure Reason*. Indianapolis: Hackett. xxviii.

Many philosophers of Popper's own period and even later, have criticized his interpretation and philosophy of science. Popper's mistrust of inductive reasoning has led to claims that he misrepresents scientific practice. Distinction of science from other human studies and activities can not always be measured through tests and falsifiability and thus criticism is valid to an extent. On the contrary, scientists generally take all the measures to defend their findings against falsification. In their book *Fashionable Nonsense* (published in the UK as *Intellectual Impostures*) the physicists Alan Sokal and Jean Bricmont criticized falsifiability on the grounds that it does not accurately describe the way science really works. They argue that theories are used because of their successes, not because of the failures of other theories⁷. Charles Taylor has accused Popper of exploiting his worldwide fame as an epistemologist to diminish the importance of philosophers of the 20th century continental tradition. According to Taylor, Popper's criticisms are completely baseless, but they are received with an attention and respect that Popper's "intrinsic worth hardly merits"⁸.

One can see that Popper fell into a trap of his own argument, against which he based his theories on. He too made up his mind on sociology, Marxism, psychoanalysis, astrology - that these were not sciences, and then debated on each one to prove his own theory about these disciplines. In fact in the paper, he has relied on his own experiences or observations to debunk Marx and Adler's theories. Popper had described Marxism as not being a science due to its alteration by the supporters for making it reliable, once it was refuted. Here belief begets belief and reinforces a theory and Popper is not in favour of this. Many philosophers have disagreed with Popper on the question of scientists being engaged in falsifications. Many assumptions, outside the influences and the very medium under which a theory is being tested, can bring in a large number of variables. Critics believed that science grows by a gradual build-up of knowledge. Popper himself has recognized in his paper, that science can make mistakes and on the other hand, 'pseudo-science' may stumble on the truth. Critics also question Popper's inability to define pseudo-science in the beginning. There are many questions about the falsification or veracity-hunting with a view to prove everything as a science.

Popper, in spite of the criticism, gave to the world, an important requirement of testing observations and hypothesis, before arriving at any conclusion. This remains the bedrock of modern research for all researchers and research oriented project.

⁷ http://en.wikipedia.org/wiki/Falsifiability#Sokal_and_Bricmont.

⁸ Taylor, Charles, "Overcoming Epistemology", in *Philosophical Arguments*, Harvard University Press, 1995, ISBN 0-674-66477-9