Scientists claimed that we can only know by empirical research (preferably by experimenting), and from these empirical research we can develop theories that can be tested by rigorous methods. As long as these theories continue to undergo successive (and in principle infinite) tests, it can be said that these theories reveal universal truths - at least temporarily. If someone could present a sufficiently repeated and verified hypothesis, that person could also claim that this truth is certain. It is not always clear what we mean when something is certain; but it is clear that precision means that we rely on the simplest, every time we use the equation, we will get the same mathematical results. When information about a particular object of investigation was insufficient to suggest such universal truths, it was said to be the fault of scientists who have not yet been able to reach that level of knowledge. But the epistemological expectation was that the community of scientists would eventually create members who could prove universal truths regarding the object of study.

Strengths of the Theory:

1) The underlying observation propositions can be understood by any observer capable of using their senses normally. No personal, subjective element is involved. The validity of observation propositions when they are obtained correctly does not depend on the observer's taste, opinion, hopes and expectations.

2) The distinctive reliability of science comes from the objectivity of induction based on observational propositions. Observational propositions are robust and reliable, because it is the direct use of the senses that ensures their accuracy.

3) The reliability of the observation proposals is transferred to the laws and theories obtained from the observation proposals provided that the necessary conditions for legitimate inductions are met.

Problems of the Theory:

A) Induction Problem:

Can The Induction Principle Be Verified By Itself?

In line with the theory's own acceptance, the verification of 'induction' itself can only be done in two possible ways.

These are to use logic or to experiment.

The Logic Argument: In deductive reasoning, if the premises are correct, the result necessarily takes the correct value. However, in an inductive proposition, the accuracy of the premises does not guarantee the accuracy of the result with a "logical imperative".

For example,

It has been observed that "n" number of swans are white ".

Regardless of the number of 'n' in this proposition and the number of repetitions of the proposition, there is no logical requirement that the last swan to be observed will not be black.

So, based on the plurality of observations, the proposition of “all swans are white” may have a 'false' value, although all of its premises are true. There is no logical contradiction between all the swans observed being white and not all swans are white.

Experiment Argument:

It has been observed that induction works in many cases. For example, the optical laws, which are deduced from the results of the laboratory experiments, were applied in the design of the optical tools and these tools served adequately. Likewise, the laws passed from observations regarding the positions of the planets were able to predict planetary movements. However, the more the number of these examples is increased, the argument put forward to confirm induction based on them is cyclical because it uses the induction itself, which is supposed to need validation.

The induction principle has worked successfully in the X1 case.

The induction principle has worked successfully in the X2 case.

So the principle of induction always works.

This reasoning itself is inductive. In this case, the demand that all knowledge should be derived from induction by experiment leaves the principle of induction unconfirmable, which is the basis for the inductive position.

Secondly, it is uncertain how many observations will constitute the “many numbers” that will provide the condition “the number of observation propositions that constitute a generalization must be many”.

From potentially infinite observations, how many observations will be considered to meet the 'large number' condition?

Thirdly, while providing the condition that “observations should be repeated under very different conditions”, how will “different conditions” be determined and what will be the necessary and unnecessary differentiation?

For example, when investigating the boiling point of water, the variables such as purity of water, pressure, heating method, heating time, shape, color, weight of the container in which the water is in, gender of the experimenter, identity, and the place where the experiment is performed will be taken into account or not?

Neo-Positivist Response

Probable Expressions

The generalization made from a limited number of observations cannot be confirmed with certainty, but they are probable in proportion to the number of observations.

In this case, the principle of induction becomes as follows:

"If many 'A' have been observed under very different conditions and if all these observed 'A's have' B 'property without exception, then all' A 'will probably have' B 'property”.

Explanations related to probable laws do not contain deductive certainty. Instead, they are considered almost certainly or highly probable.

An example of possible expressions can be given as follows: The U Experiment is designed to draw one ball at a time from a bag full of balls of the same size and mass but of different colors. If B symbolizes the possibility of drawing a white ball from the bag for the first time, and 600 out of 1000 wholesale in the bag is known to be white, the expression of the probable result of the experiment is O (B, U) = 0.6.

In the U´ experiment, where the red balls were placed on whites this time, but the same numbers were preserved, the conditions were changed to affect especially empirical results. In this case, the question is whether the probable result of the experiment will change. Because the probability of drawing a white ball mathematically the first time is still 0.6. However, basic alternatives are not equally likely in this new experiment. Similarly, there are no equally possible basic alternatives in nature. If a simulation is made, it is not possible to determine whether the red balls with fewer than white numbers are located on the whites in the comfort of a controlled experiment. In this case, it would be misleading to leap from the fact that the red ball is encountered in every orientation to nature and that the nature consists of red balls. When science turns to nature, basic alternatives and relative frequencies of their releases are determined as a result of long-term repeated experiments (induction). The probable laws of science are also based on the relative frequency, which is mainly based on induction. Equal probability or high probability of probability due to the openness of induction is always open to correction in the light of empirical data on the phenomenon.

B) How are Theoretical Laws or Disclosures Exceeding Empirical Laws and Generalizations revealed and verified?

Theoretical laws (abstract laws / hypothetical laws) that are an important part of science are laws that contain terms that do not refer to observable things (things that can be directly observed or simply measured).

Theoretical laws especially come to the fore with their submissions to 'micro events' in physics. If 'sizes' remain the same in a sufficiently large area or over a wide enough time period, this is the macro-event for physics. However, this is a micro-event if the sizes vary immeasurably at very small intervals.

In the development of physics, since the incidence of micro-events increases, the definition of theoretical laws is done through the category of “things that cannot be observed”, regardless of whether they are micro or macro, even though theoretical laws are generally referred to such events.

Theoretical laws are more general than empirical laws. However, such laws are certainly not inductive generalizations of empirical laws.

For example, (a) the iron rod expands when heated, (b) objects made of iron expand when heated, (c) all metals expand when heated, (d) all solid objects expand when heated, the process from (a) to (d) is an inductive generalization and (d) an empirical law.

In this process, each stage is testable and open to verification. As can be seen, in all cases the law refers to what is observable (iron, copper, metal, solid body) and measurable (heat, length).

However, theoretical law refers to the molecular behavior of the iron rod. Roughly expressed, the theoretical law establishes a relationship between the expansion of heated iron and the molecules of the body. Once this relationship is established, the phenomenon will be explained in a more general and inclusive way.

The important question posed by this level of theoreticalization concerns how this relationship can be established 'scientifically'.

In the context of scientificity, the question of whether this relationship is established from phenomenon (phenomenon) to theory or from theory to phenomenon is important in terms of philosophy of science. Carnap emphasizes that theoretical laws are not directly derived from facts as higher and more inclusive models of explanation.

The term 'molecule' has never been revealed as a result of observations. Therefore, regardless of the amount of observational generalizations, it will never produce a theory of molecular processes. Such a theory has to be exposed in another way. The theory is expressed as a hypothesis, not as a generalization of facts. Hypotheses are then tested in a similar way to the established test paths of an empirical law. (...) Regardless of whether the empirical laws derived are known and validated laws, or whether they are new laws, to be verified by new observations, verification of such derived laws provides indirect verification to the theoretical law.

Therefore, the scientist does not reach a theory that this law can also be derived from, based on an empirical law or a fact that is the basis of that law. Regardless of the amount of observational generalizations, these generalizations cannot spontaneously transition to theory as a link in the induction chain. On the contrary, the scientist tries to construct a more general theory in which a variety of empirical laws can be tested or verified.