

KARL POPPER: On Observation

By

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Karl Popper's popularity and influence have been, and still quite extensive so much so that his philosophy is now considered as a "20th century classic."¹ Among others, Popper is well-known for his approach to 'theory' which serves as a point of convergence of all his philosophical

*Translations will be done literally if possible, but otherwise, I will just aim for the more proximate sense of the sentence.

¹"... Il est un philosophe qui est de toute évidence devenu un "classique de xxe siècle." Cf. Renée Bouveresse, (ed), *Karl Popper et la Science D'aujourd'hui*. (Paris: Aubier, 1989), p. 7. It took a little time for Popper's thought to be in upswing in the anglo-saxon and german-speaking world. Italy, likewise, received the Popperian philosophy with vivacity through Antiseri, Pera, Baldini etc... Meanwhile, the ideas of Popper set foot in Spain via a group called "Teorema." Cf. Gerard Radnitzky, *Entre Wittgenstein et Popper*, (Paris: Librairie Philosophique J. Vrin, 1987, p. 172. It's curious to know however, that at first, the French intellectuals have been noted for their "exceptionnelle indifférence" with regards to Popper's works. - "La très grande notoriété acquise par les travaux de Karl Popper parmi les pays anglo-saxons et les pays de langue allemande contraste avec l'exceptionnelle indifférence que les milieux intellectuels français ont toujours manifesté à l'égard de sa pensée..." Cf. Jean Baudouin, *Karl Popper*, (Paris: Presses Universitaires de France, 1989), p. 4. G. Radnitzky described the French reception as tainted with a lot of hesitation a propos to the late translation of *The Logic of Scientific Discovery* in French. "La réception de Popper a eu lieu très différemment en divers pays: avec beaucoup d'hésitation en France - la *Logik der Forschung* n'y a été traduite qu'en 1974..." Cf. G. Radnitzky, *Entre Wittgenstein et Popper*, op. cit., p. 172. Renée Bouveresse cited the French distrust and ignorance as responsible in making the name of the Austrian thinker almost unknown to the community of French philosophers - "... le nom du penseur autrichien était presque inconnu, non seulement du grand public, mais d'une large part de la communauté philosophique française, pleine de méfiance et aussi d'ignorance à l'égard du type de philosophie pratiqué dans les milieux anglo-saxons." Cf. R. Bouveresse, *Karl Popper et la Science D'aujourd'hui*, op. cit., p. 7.

assertions. As it appears, he may be said to have provided a well elaborated description of a theory. In his 'theory of theory', Popper has traced the 'genesis' and the further 'maturity' of theory.² In his *evolutionary* explanation of epistemology, Popper showed how a theory fits into the Darwinian model of error-elimination and the subsequent entanglement with a new *problem*.³ In his more recent concept of verisimilitude^{3a} (which largely used the framework of Tarski's theory of truth), Popper

²Popper's theory of theory states that the genesis or origin of a theory may be traced back from "inborn expectations" which are not 'a priori' valid and are not conscious. Cf. Karl Popper, *Objective Knowledge*, (Oxford: Clarendon Press, 1972), p. 165, 260. The fact that inborn expectations are not conscious triggers the question on which comes first, consciousness or expectations. Cf. K. Popper and J. Eccles, *The Self and its Brain*, (Berlin: Springer International, 1977), pp. 426-431.

³In the later development of Popper's philosophical system, his theory of theory was treated within the context of evolutionary epistemology. W.W. Bartley explains why. "Evolutionary epistemology results from pursuing the ramifications of Popper's understanding of the fundamental task of epistemology. This task is ... to clarify and investigate the process by which knowledge grows. In this context, 'knowledge' refers to the objective products of certain evolutionary processes, ranging from the endosomatic cognitive structures of men and animals to the most abstract scientific theories. For this evolutionary approach, Popper has employed biology. This is evident in his later work i.e., *Objective Knowledge, The Self and its Brain*, and *The Unended Quest*. Popper has found in biology an evolutionary theory, a new argument for objectivism and realism ... a help also for his battle against relativism and historicism." Cf. W.W. Bartley, "Philosophy of Biology against Philosophy of Physics" in G. Radnitzky, *Evolutionary Epistemology, Rationality and the Sociology of Knowledge*, (La Salle: Open Court, 1987), p. 18, 21.

That problems or questions are "theory-initiators" is one of Popperian hallmarks. In the production of theory, we start and we end in problems. We, in this case, is even extended to all organisms. "... Tous les organismes, non pas seulement l'homme, mais tous les organismes, possèdent constamment des questions au monde et s'efforcent constamment de résoudre des problèmes." Cf. Konrad Lorenz and Karl Popper, *L'avenir est ouvert*, (Paris: Flammarion, 1990), p. 65. Problem-solving in fact, is even identified with the process of knowledge as a whole. "Popper's philosophy marks a major achievement: the first and only unified theory of knowledge. One single coherent process of knowledge, a problem-solving process, is seen as stretching from the earliest inklings of life to the latest advances of science and technology." Cf. Günter Wächtershäuser, "Light and Life: On the Nutritional Origins of Sensory Perception," in G. Radnitzky (ed.), *Evolutionary Epistemology, Rationality and the Sociology of Knowledge*, op. cit., p. 121.

This unified method is what Popper has dreamed of, or what he has already presupposed as existing. J. Baudouin notes that Popper reaffirms with particular solemnity the unity of method of natural sciences and social sciences. Cf. J. Baudouin, *Karl Popper*, op. cit., p. 11. It is the contention of Popper that the logic of explication is the same in both natural and social sciences, that is, that which one searches is always a causal deductive explication. - "En affirmant qu'il y a une unité de méthode entre les sciences sociales et celles de la nature, Popper dit que la logique de l'explication est la même dans les deux cas: ce que l'on cherche, c'est toujours une explication causale déductive. But after Winch and O'Hear, this idea of unified method became weak." Cf. Jaques Ruelland, *De L'épistémologie à la Politique. La philosophie de l'histoire de Karl Popper*, (Paris: Presses Universitaires de France, 1991), p. 202, 203. Meanwhile, Derksen argues that the concept of falsifiability which makes the idea of unified method more alluring, is a false unifying factor, or better, as he calls it "a fake cement." Cf. A.A. Derksen, "The Alleged Unity of Popper's Philosophy of Science: Falsifiability as Fake Cement," in *Philosophical Studies*, 48 (1985), p. 313. Finally, M. Schmid is reluctant to accept this alleged unity of Popperian System because it appears to him that Popper's 'theory building' and 'explanation' don't always evince the consistency and accuracy one might expect. Cf. Michael Schmid, "The Idea of Rationality and its Relationship to Social Science: Comments on Popper's Philosophy of Social Sciences," in *Inquiry*, 31 (1988), p. 451.

^{3a}Popper's concept of verisimilitude is one of the more highly controversial proposals in his scientific agenda. Popper's definition of verisimilitude is as follows,

proposed a way of knowing that scientific knowledge in general progresses by comparing the truth-content of two competing theories.

With such a collection of exposition about 'theory', one may easily be tempted to say that all that matters is theory and about theory, and whatever does not speak about theory does not matter. Certainly, the question about theory is central in the philosophy of science, but the latter is far from being equated as the philosophy of science. The latter may speak of something more. For instance, 'observation' is also considered as central in philosophy of science. It is therefore the aim of this paper to show what Popper thinks about observation and to try to expose his position regarding some key issues on observation.

The Silence of Popper Concerning Observation

In the epistemology of Popper, it might be rightly observed that he was much more preoccupied in formulating a good presentation of a 'theory.' However, observation has been an essential part of his 'theory.' He for example, required that basic statements must be testable, intersubjectively by 'observation.'⁴ Since basic statements are integral part of

The intuitive claim for more verisimilitude is done if and only if either:

- | | | |
|--------------------------------|---|-----------------------------|
| a) (Ct) of (T2) > (Ct) of (T1) | : | (Cf) of (T2) < (Cf) of (T1) |
| b) (Cf) of (T1) > (Cf) of (T2) | : | (Ct) of (T1) < (Ct) of (T2) |

where, Ct= truth content Cf= falsity content

T1=Theory 1

T2=Theory 2

In simplified form, the definition is formulated as,

$$Vs(T2) = (Ct) \text{ of } (T2) - (Cf) \text{ of } (T2)$$

and supposedly, the result will be, $Vs(T2) > Vs(T1)$.

Cf. Karl Popper, *Objective Knowledge*, op. cit., p. 233-234.

Popper's definition of verisimilitude is simply unacceptable to Kuhn and Feyerabend who contended that the definition will not be valid in a case that has immeasurable theories. "No sería válida para el caso en que hubiera teorías incommensurables." Cf. Javier Echeverría, *Introducción a la Metodología de la Ciencia. La Filosofía de la Ciencia en el Siglo XX*. (Barcelona: Barcanova, 1989), p. 99. Rivadulla, who studied amply the matter concluded, "La comparación de la verosimilitud de dos teorías falsas no es viable." (*ibid.*) This conclusion of Rivadulla echoes the classical and often cited critique of Tichy on Popper's definition of verisimilitude. See Pavel Tichy, "On Popper's Definitions of Verisimilitude," in *The British Journal for Philosophy of Science* 25 (1974), 155-160. Karl Popper himself has acknowledged the faulty mark in his definition. Cf. Karl Popper, *Realism and the Aim of Science*, (New Jersey: Rowman and Littlefield, 1983), p. xxxv. However, he simply dismissed the 'better founded' objection as having no significant impact on his theory and thus, is negligible. His disposition is approximated by G. Radnitzky who may be called his faithful disciple. Radnitzky declared that the controversy does not very much disturb his popperian position. "... Les difficultés rencontrées avec la définition formelle de la «vérisimilitude» ne me dérangent pas beaucoup." On the contrary, David Miller, a philosopher who subscribes to the Popperian system in general, expressed his disagreement on those critical rationalists who present verisimilitude as unproblematic. "Je ne peux pas être d'accord avec ces rationalistes critiques pour qui l'approximation de la vérité constitue une idée très importante et précieuse, sans qu'il soit permis de poser aucun problème ... Il est très importante que les recherches concernant la verisimilitude soient poursuivies d'urgence et avec rigueur." Cf. Renée Bouverese, *Karl Popper et la Science D'aujourd'hui*, op. cit., p. 120. Mongin demonstrates the eventual collapse of verisimilitude. See Philippe Mongin, "A Note on Verisimilitude and Relativization to Problems", in *Erkenntnis*, 33(3), 1990, 391-396.

⁴Karl Popper, *The Logic of Scientific Discovery*. (Illinois, Hutchinson and Co., 1972), p. 102.

a theoretical system, 'observation' evidently assumes a serious role when one speak about a theory. Nonetheless, it was recognized at least by Ackermann and Johannson, that Popper seemed to remain less explicit regarding the concept of observation inspite of its scientific role in his 'research programme.' Ackermann gives a reason for the desiderata by saying that "he (Popper) is quite clearly most interested in the evolution of theories to which he thinks that philosophy has a contribution to make. The determination of the conventions for observational statements within the special sciences depends on expertise far removed from the general methodological speculation."⁵ The reason given implies that Popper took it as a business of an epistemologist to deal on theories- the making of a theory, the why of a theory etc . . . -rather than observation in itself which is less speculative.

Johannson, for his part noticed the silence of Popper concerning 'observation' as the latter voluntarily refrained from defining observation. "I have no intention of defining the term 'observable' or 'observable event'. . . I think that it should be introduced as an undefined term which becomes sufficiently precise in use: as a primitive concept whose use the epistemologist has to learn, much as he has to learn the use of the term 'symbol'. . ."⁶ Johannson explained this silence of Popper as something brought about by the assumption that 'observation' is the task of professional scientists. It is the professional scientist who could teach the philosopher about observation. "A physicist can tell a philosopher that collisions between atoms and photons can be observed in cloud chambers, something which a philosopher as philosopher, would never have been able to discover."⁷

It may be conjectured also that such silence must have been caused by Popper's careful avoidance of giving the impression that he is no different after all from the traditional empiricists who reduce theories to observations and who consequently insist that theories are justified or verified by observations. Hence, if traditional empiricists would speak often about observation, Popper would proceed to the opposite direction of not jut being silent about observation but even put rationalistic influence on observation. For he too believed that no term is untheoretical or that an observation is the result of an interpretation.

The proceeding citations of Popper throughout this paper concerning observation attest that 'observation', though meagerly treated by Popper, is not at all discarded as non-essential. Likewise, the following presentation

⁵R. Ackermann, *The Philosophy of Karl Popper*, (Amherst: University of Massachusetts Press, 1976), p. 24.

⁶Karl Popper, *The Logic of Scientific Discovery*, op. cit., p. 103.

⁷Ingvar Johannson, *A Critique of Karl Popper's Methodology*, (Stockholm: Esselte Studium, 1975), p. 44. J. Agassi when further by saying that the problem of observation, the problem of why an observation report was made, and what is the guarantee that it is true, belongs to science and not to philosophy. Cf. J. Agassi, "Sensationalism" in *Mind*, 75 (1966), pp. 1-24.

would give a signal that Popper is not totally dropping out empiricism from his agenda. In fact, Popper confessed that he was and still is, an empiricist of some sort though not a naive empiricist. 'Of some sort' - because he intended to place himself between the classical empiricism in the Humean and Baconian tradition, and rationalism in the Cartesian tradition. Hence, he may be said to be both an empiricist and a rationalist of some sort, believing in the importance of both observation and reason, though in a different way. The empirico-rational combination may be seen for instance in Popper's solution to the problem of induction, where he enumerated major accepted points. Among these main points are "(iii) acceptance of the principle of empiricism: scientific theories are rejected or adopted (though only temporarily and tentatively) in the light of the results of experimental or observational tests."⁸ On the other hand, Popper's modified rationalism is exemplified in his next point, "(iv) acceptance of critical rationalism: scientific theories are rejected or adopted (though temporarily and tentatively) as being better or worse than other known theories in the light of the results of rational criticism."⁹ Popper's empirico-rational view is a modified version in the sense that, though he accepted some vital principles from both approaches, Popper rejected the description that observation (the empirical element) and reason (the rational element) are sources of knowledge "in the way they are interpreted as sources of knowledge down to the present day."¹⁰

By dealing with 'theory', Popper may be said to have shown his rationalist-spirit e.g., World 3 and its objectivity¹¹. Meanwhile, by dealing with 'observation', he may be said to have shown his empiricist-spirit. For he explained that his empiricism stems from the view that "though all experience is theory-impregnated, it is experience which has to finally decide the fate of a theory, by knocking it out . . .".¹² Experience in this citation may refer well to observation and observation statements or reports, or to sense-perceptual experiences in general - which are the main ingredients of an 'empiricist-spirit'.

Although Popper showed lesser preoccupation with observation, attending more to the development of a theory of theory, he nonetheless presupposed a theory of observation in applying the latter to his main agenda. Thus the rest of the chapter is envisioned to give a general view of how observation "stands" in the Popperian system as a whole.

⁸*Realism and the Aim of Science*, op. cit., p. 33.

⁹*Ibid.*

¹⁰*Conjectures and Refutations*, op. cit., p. 5.

¹¹Popper has presented three ontological worlds which are engaged in the formation of knowledge. World (1) may be described as the physical world, world (2) as the world of our conscious experience, and world (3) as the world of the intelligibles or ideas in the objective sense (cf. *Objective Knowledge*, op. cit., p. 154).

¹²Paul Arthur Schilpp, *The Philosophy of Karl Popper*, (Illinois: Open Court, 1974), p. 5. Most writers would prefer to entitle this same book of P.A. Schilpp simply as "Replies" since it contains the famous replies of K. Popper to his critics. However, I chose to maintain the original title as my way of acknowledging the job well done by P.A. Schilpp.

The Function of Observation and Evolution

Being a non-essentialist, Popper is understandably not so fond of definitions. This may be one reason why he felt the term 'observable' undefined. As he found the question 'What is truth?' unfruitful,¹³ he likewise found the question 'What is observation?' equally unfruitful. That the term 'observation' or 'observable' should be introduced as an undefined term¹⁴ may be taken as an instance of the methodology of Popper, that is, "definitions are never really needed, and rarely of any use, except in the following sort of situation: we may by introducing a definition show that not only are fewer basic assumptions needed for a good theory but that our theory can explain more than without the definition."¹⁵ It means that only in situations wherein a theory needs to be fortified that definitions may be utilized.

Though deprived of definition, one may still have a glimpse of what observation is, by attending to the manner of its usage in Popper's philosophical system. To situate first where observation fits in the Popperian programme, it may be said that "observation is a part of critical attitude—the tradition of free discussion of theories."¹⁶ It simply means that observation serves as a weapon of criticism and in fact, an observation might be claimed as significant only if it has been used to criticize theories. To submit theories into criticism means to subject them to batteries of tests. Thus, "repeated observations function as tests which a hypothesis must undergo in the course of our critical examination of it."¹⁷ Notice that a mention was made about repeated observations. It will be a mistake to presuppose that Popper, just because of "repeated observation," has finally sided with the classical empiricist view that by learning through repetition of observation, discovery is produced. Repeated observation as used here, pertains not to the repeated impact on the senses but rather to the repeated and varied attempts to test a theory.

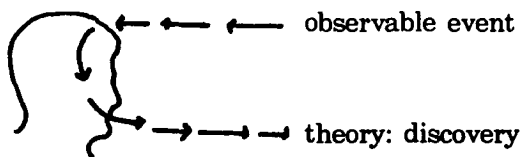


Figure 1

¹³*Objective Knowledge*, *op. cit.*, p. 309.

¹⁴*The Logic of Scientific Discovery*, *op. cit.*, p. 103.

¹⁵*Realism and the Aim of Science*, *op. cit.*, p. xxxvi.

¹⁶*Conjectures and Refutations*, *op. cit.*, p. 50; see also *ibid.* p. 152.

¹⁷*Objective Knowledge*, *op. cit.*, p. 346.

If one takes 'repeated observation' as the repeated impact on the senses (see Fig. 1), he definitely will fall back into the hands of classical empiricism which asserts that theories are derivable from observation.

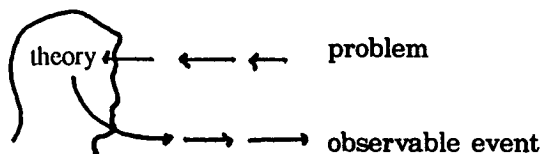


Figure 2

In order to avoid the trap of falling back to classical empiricism, it must be kept in mind that repeated observations are meant to test theories and not to produce theories (see fig. 2). Incidentally, with fig. 1, it appears that man passively waits for repetition to impose regularities upon man. On the otherhand, with fig. 2, man actively tries to impose regularities upon the world.

For Popper 'to test' mainly means to refute or to falsify. Hence, if observation is to be used to test a theory, it means that the same observation is summoned to allow the possibility of refuting or falsifying a theory. For as Popper indicated, "The possibility of refuting theories by observation is the basis of all empirical tests. For the test of a theory is, like every rigorous examination, always an attempt to show that the candidate is mistaken, that is, that the theory entails a false assertion."¹⁸ Evidently, Popper has also placed observation within the parameter of negativism.

From what has been presented so far, observation can be described as something performed (act of observing) or verbalized (observation statement or report), meant to criticize or to test negatively by falsification or refutation. By asserting this function of observation, Popper segregated himself both from the group of those who would draw verifying or confirming inferences from observations, and from those who trace back everything about knowledge from observations. As far as the first group is concerned, Popper has combatted everything that pertains to verification and he has distanced himself from the word 'verification' ever since. However, it is different with the term 'confirmation' or 'confirmed'. For instance, Popper spoke about Einstein's gravitational theory as 'confirmed' by the finding of Eddington's expedition, and likewise mentioned something about "confirming evidence that should not count, except when it is the result of a genuine test of the theory . . .".¹⁹ Confirmation implies the task of making firm, to put beyond doubt and also to verify, and "confirmation in the sense of the old idea of verification, refers to a sentence as better

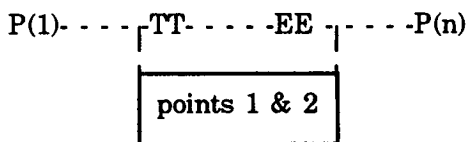
¹⁸*Conjectures and Refutations*, op. cit., p. 53.

¹⁹*Ibid.*, p. 36; see also *ibid.*, p. 288, *The Logic of Scientific Discovery*, op. cit., p. 395 f.

confirmable the more nearly verifiable it is, or the more nearly deducible from observation sentences."²⁰ With the use of the term 'confirmation' or 'confirmed' by Popper it seems that he has rescinded his antipathy with the verificationists. However, this is not the case. The reason is quite historical. Popper admitted that he made use of the term 'confirmation' (by observation) but in the sense of corroboration. Though with some hesitation, Popper left everything as is, hoping that the term confirmation would be held in the sense he originally proposed. But problems started to creep in when the verificationists started using 'confirmation' not in the sense of corroboration. For instance, Carnap used 'logical probability' as synonymous to 'degrees of confirmation'.²¹ Popper must have regretted to have used the term 'confirmation' instead of 'corroboration'. Popper must have regretted to have used the term 'confirmation' instead of 'corroboration'. What he could do is simply to refrain from using 'confirmation', and this he did ever since the 'mistake' in his decision became quite visible to him.

The second group refers to the classical empiricists who still maintain that everything passes through the senses first before it reaches our intellect. Therefore sense-experience i.e., observation, is the origin of what the intellect has; what the intellect knows. Popper calls this "tabula rasa-model" as the "bucket-theory of the mind" which for him is a mistaken common sense theory of knowledge. Theories, crude expectations, raw interpretations, primitive instincts or dispositions give direction or orientation to observation, not the other way around. This point will be elaborated further in one of the proceeding sections.

Popper also linked observations (1) **stimuli** "that may release cascades of new developments in our dispositional outfits,"²² and may destroy even the frame of our expectations.²³ Observations are also stimuli in the sense of (2) **challenges** inviting or provoking the scientist to come up with new myths.²⁴ At this point Popper's equation in describing the evolutionary conjectural knowledge may be presented.



²⁰*Ibid.*, p. 287.

²¹*The Logic of Scientific Discovery*, *op. cit.*, p. 252 n.

²²*Realism and the Aim of Science*, *op. cit.*, p. 98.

²³*Objective Knowledge*, *op. cit.*, p. 345.

²⁴*Conjectures and Refutations*, *op. cit.*, p. 128.

where,

p(1) = original problem
 TT = Tentative Theory
 EE = Evaluative Error Elimination
 P(2) = Succeeding Problem

Figure 3

We may situate points (1) and (2) in the manner presented in fig. 3. A theoretical system has been constructed to face problem (1). Through observation tests the theoretical system has undergone the purgative phase of error elimination. Point (1) might be interpreted as having a theoretical framework that has been destroyed as a result of the observation tests. Point (2) would now allow the scientist to go on and search for a new theory in order to answer the problem and be able to explain the observations that have brought down to ruins the previous theory. A classical example of this phase of knowledge where observation plays a major role is the one of Tycho and Kepler. "Kepler tried in vain to interpret Tycho's observation by means of his original circle hypothesis. The observations refuted this hypothesis and so he tried the next best solutions - the oval and the ellipse. He found out that the observations could be explained by and be made to agree with the new hypothesis (of the ellipse), although with the assumption that Mars did not travel with uniform velocity."²⁵

Another function of observation is the role of (3) posing problems, helping us to try out and weed out conjectures.²⁶ This function of observation may be situated in the manner presented in fig. 4 below.

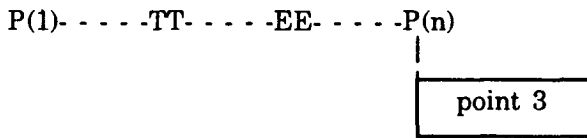


Figure 4

Assuming that a theory has been corroborated by a series of severe tests, the same theory is now temporary shelved in WORLD 3. An observation

²⁵*Ibid.*, p. 188.

²⁶Karl Popper and John Eccles, *The Self and its Brain*, (Berlin: Springer International, 1977), p. 109. With the use of the diagram presented above, it is made explicit that the evolutionary process of theory starts and ends with problems. This theory of theory may be called, to use Andler's term, *panproblémisme* which upholds the primary role of problems and problem-solving. - "Le panproblémisme affirme que tous les organismes vivant accomplissent des résolutions de problème ou pratiquent «la méthode des essais et des erreurs»." Cf. Pierre Jacob, (ed.). *L'âge de la Science*, v. 2, (Paris: Editions Odile Jacob, 1989), p. 49.

however may serve as a stimulus to pose a new problem. The problem might be a conflict between a new observation and a theory or a new observation that consistently remains compatible with one theory but has become adverse to another one. Hence, the scientist is provoked to enter into a new process of discovery by trial and error-elimination.

By formally designating a negative character to observation as a test, it may now be less difficult to see how observation is associated with concepts like "weeding out conjectures," "elimination and rejection by severe criticism" and finally, "refutation and falsification." However, amidst this collection of negative concepts, observation in a restricted sense may also act as a defender of a theory. Popper, time and again, would stress that instead of overly protecting a theory, one is advised to severely test a theory and constantly find a possible loop hole. In the advent that an observation 'seems' to support or defend a theory, the real implication is that, the observation has simply weaken another theory.²⁷ This support or defense, although toned down to a certain extent, is also vital to a critical and productive argument. A theory has to be criticized in its strongest form²⁸ and the support from observation may prove to be very useful. Notice that Popper made use of the term 'seems' which played down the idea of 'support'. It would appear that what is demanded is to focus more one's attention to the weakening of an alternative theory than to the 'supported' theory. If ever, the alleged 'supported' theory may be simply described as 'less-weakened' or 'unweakened theory'. The hesitation to use the term 'support' is better understood if one would realize that 'support' may connote 'confirmation' or 'verification'. Moreover, to concentrate on the supportive role of observation is almost the same as justifying a theory by observation, that is, giving positive reason for a theory.²⁹ By doing so, things will be in contradiction with what had been indicated earlier, that is, Popper saw observation and its role mainly in the negative sense, as a test for refuting or falsifying a theory.

A weakening of an alternative theory was mentioned as a consequence of the seemingly supportive role of an observation. What may have happened in this case was that an observation has become a crucial factor for the two theories. It was crucial in the sense that it contradicted the alternative theory while remaining compatible with the first theory. It should be remarked however, that observation does not always stand as the sole crucial and decisive factor for a choice. Popper explained,

"In general, more than observation is needed. Also needed is a critical discussion of the merits of the two theories. Such a discussion must consider whether they solve the problem which they are supposed to solve, whether they explain what they are supposed to explain,

²⁷*Objective Knowledge, op. cit.*, p. 206.

²⁸*Ibid.*

²⁹*Realism and the Aim of Science, op. cit.*, p. 33.

whether they do not merely shift the problem, for example by an unstable ad hoc assumption; whether they are testable, or how well they are testable."³⁰

With such a list of requirements, observation can hardly be described as the main dish but only an appetizer, if one may use an analogy. No wonder, Popper could say straightforwardly that "we are not so much observers as thinkers."³¹

Observation and Basic Statement

A scientific theory i.e., a falsifiable theory, may be described as that which is capable of dividing the class of basic statements into 2 non-empty sub-class of contradictory statements and potential falsifiers.³² Now, observation has the main task of falsifying a statement or system of statements. But first of all, observation has to be verbalized and formulated into a statement. For as Popper declared, "It is only with in a language that critical argument and knowledge in the objective sense become possible."³³ If observation has to perform its role of falsification within the context of critical discussion, it has to be expressed-made more explicit and more evident - to be, in Popperian terminology, verbalized in an 'exosomatic descriptive language.'

The moment an observation is verbalized in a descriptive language, it may be termed as an observation statement. Thus, observation statement is all about what has been observed or what is observable. Popper meanwhile described a basic statement as "assertion that an observable statement is occurring in a certain individual region of space and time."³⁴ Since both observation statement and basic statement deal with what is observable, that is, both statements are assertions about the occurrence of an observable event, then observation in itself, may be considered as a basic statement.

However, though observation statements may become basic statements, not all observation statements may be counted as basic. Popper first of all would call statements *basic* when they refer to "that class of statements which we can assume to be of unquestioned empirical character"³⁵ and also to "the class of all those statements which may function as tests of empirical theories, that is as potential falsifier."³⁶ Observation statements

³⁰*Ibid.*, p. 55.

³¹*Objective Knowledge*, *op. cit.*, p. 304.

³²*The Logic of Scientific Discovery*, *op. cit.*, p. 86.

³³*Objective Knowledge*, *op. cit.*, p. 122; see also A.P. Schilpp, *The Philosophy of Karl Popper*, *op. cit.*, p. 1123.

³⁴*The Logic of Scientific Discovery*, *op. cit.*, p. 103.

³⁵*Conjectures and Refutations*, *op. cit.*, p. 386.

³⁶*Ibid.*, p. 387. In connection with what has been explained above regarding the identification of observation statements with basic statements, Alan Chalmers' inclination of

may not be 'basic' formally and materially speaking, i.e., they may not serve as potential falsifiers formally and materially speaking.

Formally speaking, an observation may be empirical but not basic if it has the logical form of a disjunctive, conditional and negated basic statements. The statements with such logical forms are called 'instantial statements'.³⁷ If one would insist of making these instantial statements as test statements, then he has "to obtain for any theory an overwhelming number of verifications, indeed an infinite number."³⁸ Moreover, instantial statements, negated basic statements in particular cannot either adequately serve as falsifying or test statements of the theory which they instantiate because any theory for that matter is 'verified' by almost all instances (i.e., by all and in all places).³⁹

Materially speaking, what is demanded for an observation statement in order to be basic is that it should be 'observable'.⁴⁰ It means to say that the event described in the observation statement must be an observable event. By 'observable event, Popper meant that the statement is about "the relative positions of physical bodies or that it must be equivalent to some basic statement of this 'mechanistic' or 'materialistic kind'".⁴¹

The 'observable' was described so as to evade a possible accusation of falling back to 'psychologism' with which Popper was inimical. To evade psychologism may also be a reason why an observation statement must not turn out as description of one's perception, which otherwise, may serve as psychological statement.⁴² In the first place, when Popper coined the term 'basic statement', it was also with the intention of avoiding the connotation of perception statement.⁴³ The observational reports that a scientist may choose for testing a theory must not be about observational experiences related to what have happened to the observer. The report that is essential for testing is about the object, about 'physical bodies'.⁴⁴ By reason of this insistence on what an observational report must be all about, the character of observational statements as test statements may be described as physicalist in contradistinction to a psychological statement. Moreover, the preference for physicalist statements over psychological

identifying his «énoncés d'observation» with Popper's «énoncés de base» must be qualified further with the understanding that *not all* «énoncés d'observation» are «énoncés de base». Cf. Alan Chalmers, *Qu'est-ce que la Science?*, (Paris: Editions la Découverte, 1987), p. 90.

³⁷*Ibid.*, p. 386, 387; see also *The Logic of Scientific Discovery*, *op. cit.*, p. 267, n°1, p. 258, n°4.

³⁸*The Logic of Scientific Discovery*, *op. cit.*, p. 101 n°1.

³⁹*Ibid.*, p. 258, n°4.

⁴⁰*Ibid.*, p. 102.

⁴¹*Ibid.*

⁴²*Ibid.*, p. 47.

⁴³*Ibid.*, p. 35 n°2.

⁴⁴*Conjectures and Refutations*, *op. cit.*, p. 267.

statements is also consistent with the methodological rule that only the easily testable (intersubjectively) must be accepted as empirical statements, and much more, as basic statements.

The 'Observables'

E.D. Klemke in his *Introductory Readings in Philosophy of Science*⁴⁵ gave examples to distinguish 'observables' from 'non-observables entities'.

terms used for 'observables'

red, circular, cup
nucleus

terms used for 'non-observables'

valence, molecule, charge
electron

He remarked that an entity or property is observable if and only if normal observers in standard conditions can ascertain the presence of the entity or property by direct observation. Otherwise, the entity or property is unobservable.⁴⁶ By reason of linking observable with direct observation, it may be said that an entity or property is observable because it can be directly observed, while an entity or property is non-observable because it cannot be directly observed. Moreover, one may say too that observable entities are simply directly observables while non-observable entities are indirectly observables.

It has been mentioned previously that for Popper "observable event simply involves position and movement of macroscopic bodies."⁴⁷ However, although he indicated his readiness to elucidate the terms 'observables' and 'observable event', he opted to leave the terms undefined and simply assumed that the terms will be better understood with their continuous use.⁴⁸ At this point, it seems Popper has been applying 'Ockam's Razor' to a very large extent, trimming down his predicaments to the most minimum. However, faced with the distinction between observable entities and the non-observable entities (which will be discussed next), it would appear that there is an exegency to elaborate sufficiently what an observable entity is.

⁴⁵E.D. Klemke et al., *Introductory Readings in Philosophy of Science*, (New York: Prometheus Books, 1980), p. 144. See also Frederick Suppes, *The Structure of Scientific Theories*, (Chicago: University of Illinois Press, 1977), p. 80.

⁴⁶*Ibid.* In more or less similar terms, Pierre Jacob describes the division of entities as 'the publicly observable' and 'the not publicly observable'. "... D'un côté, il y aurait le langage «observationnel» contenant des énoncés composés du vocabulaire logique et de termes désignant tous des entités *publiquement observables* 'Oiseau' et 'rouge' feraient partie du vocabulaire dit «observationnel» parce que les entités qu'ils désignent sont publiquement observables. De l'autre côté, il y aurait le langage «théorique», contenant des énoncés composés du vocabulaire logique et de termes désignant tous des entités *non publiquement observables*. 'Proton' et 'nucéaire' feraient partie du vocabulaire dit «théorique» deparce que les entités qu'ils désignent ne sont pas publiquement observables." Cf. Pierre Jacob, *L'empirisme Logique*, (Paris: Les Editions de Minuit, 1980, p. 128.

⁴⁷*The Logic of Scientific Discovery*, *op. cit.*, p. 103.

⁴⁸*Ibid.*

What Popper did about the question on the distinction between the observables and the non-observables was simply to dismiss the whole matter as altogether a mistaken affair. He judged that the distinction between the directly and the indirectly observables will just lead to nowhere.⁴⁹ He cited an example by comparing Newtonian force and acceleration. One need not give up Newtonian force, which causes acceleration, in favor of acceleration just because Newtonian force is considered as non-observable. As Popper reasoned out, "Accelerations cannot be observed any more directly than forces."⁵⁰ Finally, Popper's basis for the rejection of the distinction between the observables and the non-observables or theoretical entities, is his contention that all terms are theoretical, though some are more theoretical than others;⁵¹ and for him also, most observations are more or less indirect.⁵² That 'all terms are theoretical' is explained by a major assertion of Popper that "universal terms cannot be reduced or correlated with any specific sense-experience."⁵³ Hence, in this sense, even observable entities may be counted as non-observables or theoretical entities. By reason of his lack of one to one correspondence between the universal term and the specific sense-experience, the assertion that most observations are more or less indirect, would appear to have been duly supported.

In the context that those who adhere to the distinction between the observables and the non-observables also deny the reality of the non-observables, this same group may be categorized as 'anti-realist'. According to this point of view, electrons, for instance, are fictions. Theories about them are tools for thinking, and that the theories about tiny states, processes and entities are constructed only in order to predict and produce events that interest us.⁵⁴ Popper himself interpreted Reichenbach's position as anti-realist and instrumentalist. He summarized the attitude of Reichenbach in the following way.

"... If you want to know more- if you want, for example to get an idea of how atoms or electrons or photons interact, then you must have forgotten that unobserved entities (such as atoms or electrons or photons) are nothing but interphenomena introduced for our conveniences."⁵⁵

'Interphenomena' in the citation above means that the non-observable entity is posited as a result of its being interpolated between two observable

⁴⁹*Conjectures and Refutations*, op. cit., p. 118.

⁵⁰*Ibid.*

⁵¹*Realism and the Aim of Science*, op. cit., p. 211.

⁵²*Conjectures and Refutations*, op. cit., p. 118.

⁵³*The Logic of Scientific Discovery*, op. cit., p. 95.

⁵⁴Ian Hacking, *Representing and Intervening*, (Cambridge: Cambridge University Press, 1984), p. 21.

⁵⁵*Realism and the Aim of Science*, op. cit., p. 126.

entities or events; and as indicated, for convenience's sake. In the thinking of O'Hear for instance, the talk about non-observable entities is simply a fiction and just a bridge enabling us to move from one observable event to another.⁵⁶

On the other hand, the realists contend that atoms or electrons or photons are as real as falling into a ditch or to be married with somebody you love. Some realists would say that observability does not provide a good way to sort objects of science into real and unreal.⁵⁷ Observability is not enough reason to claim that a non-observable entity does not exist. A fairly good example can be given to support this view. The observability of the neutrino has gone through 3 phases. Harold Brown recounted.

"... An initial phase, in which observations made in the course of the experiments led to the postulation of the neutrinos although these experiments did not themselves count as observations of neutrinos, which were believed to be unobservables; a second phase, in which the neutrinos were observed for the first time, and a third phase, in which neutrinos are observed almost as a matter of course in the process of testing other theories and observing various kinds of objects and processes."⁵⁸

Mary Hesse suggested that only predictions about observables can be of any interest in the application of theories to the world. Hidden causes of observables cannot be known and (thus) are not relevant to the logic of science.⁵⁹ Applied to the initial phase of the observability of neutrinos, the contention that hidden causes of observables are not relevant to the logic of science, is rendered as nothing but a hasty judgment, and also unfruitful

⁵⁶Anthony O'Hear, *What Philosophy Is: An Introduction to Contemporary Philosophy*, (England: Penguin Books Ltd., 1985), p. 133.

⁵⁷Ian Hacking, *Representing and Intervening*, *op. cit.*, p. 171.

⁵⁸Harold Brown, *Observation and Objectivity*, (Oxford: Oxford University Press, 1987) p. 68.

⁵⁹Peter Achinstein and Stephen Barker, *The Legacy of Logical Positivism*, (Baltimore: John Hopkins Press, 1969), p. 90. Javier Echeverría cites the position of Van Fraassen as another possibility in understanding the talk about the distinction between 'theoretical' and 'observational'. Van Fraassen proposes another distinction (i.e., 'to observe' and 'to observe that') after insisting that the distinction observable and non-observable refers to physical entities but not to concepts or terms which are theoretical. - "... La distinción teórico-observacional no es aceptable, pero sin embargo, sí cabe mantener (en el caso de Van Fraassen), la distinción observable/no observable referida a las entidades físicas, pero no a los conceptos o términos, que siempre son teóricos... Pues bien, es característico de la actividad del científico *observar que*, y no puramente *observar*; de ahí que la distinción teórico/observacional de la concepción heredada sea inválida" (cf. Javier Echeverría, *Introducción a la Metodología de la Ciencia*. (Barcelona: Barcanova, 1989), pp. 201-202.

A very extreme position is for instance upheld by those who assert that descriptions are *absolutely* theoretical since they are impregnated by theory. In this stream belongs Paul Feyerabend's 'changes of signification' and the thesis of 'incommensurability' which obliterate the distinction between theory and observation. Cf. G. Radnitzky, "Réflexions sur Popper" *Archives de Philosophie* 48 (1985), p. 92.

advise. The neutrinos would have been rendered non-existent or unreal even upto this day.

Popper, leaving the term 'observable' undefined, continued to downplay any tendency to come up with its formal definition. He would even describe the term 'observable' as misleading. However, he remained with his position that all terms are theoretical and elaborating further he explained that "all 'observables' are calculated and inferred on theoretical grounds rather than observed or directly measured. Thus, what is observable always depends upon the theory we use."⁶⁰ But he seemed to have simply taken the question on the reality of the unobservable very lightly and has appeared to have resorted to intuition in settling the matter. He went on to say,

"... One should not quarrel about words; no more about the word 'observable' than about the word 'real'. Definitions as usual lead to nowhere, but most of us know what we mean when we say that there are such things (observable things) as elephants, or electrons or magnetic fields or (more difficult to observe) propensities, such as propensity to attract, or to understand, or to criticize, or the propensity of an experiment to yield some specified results."⁶¹

From the citation above, one may think of the terms "more difficult to observe" as a substitute for the non-observables, and logically, the "less difficult to observe" as a substitute for the observable, and that these, substitute-terms would suggest a realist-view. It has to be noted nonetheless, that the sense of "more difficult to observe" or the "less difficult to observe" is not at all the same as that of the observable or the non-observable. The Popperian terms are 'less final' if not 'not final' as compared to the context of the 'observables' which are treated as certain and final, at least in the traditional empiricism. It may be said then that in accepting the reality of the 'non-observables' or better, 'the more difficult to observe', Popper is a realist. However, by using the latter terminology in contradistinction to the 'less-difficult to observe' entities, he qualified himself not as a naive realist but a critical realist.

Things would have been neatly presented if the substitution of the terms 'less difficult to observe' and 'more difficult to observe' had been explicitly done by Popper himself. Unfortunately, not only he did not make or mention or hint something that may allude to such substitution; he also declared the non-observability of abstract term like force. For he insisted that we can only observe concrete things.⁶² This insistence may be taken as something consistent with his earlier physicalist description

⁶⁰Karl Popper, *Quantum Theory and the Schism in Physics*. (New Jersey: Rowman and Littlefield, 1982), p. 85.

⁶¹*Ibid.*

⁶²*Conjectures and Refutations*, *op. cit.*, p. 186.

of an observable event as involving position and movement of macroscopic bodies⁶³ - in other words, concrete bodies. Hence, Popper has made the distinction between abstract and concrete entities, and by emphasizing that "we can never observed anything like Newtonian force",⁶⁴ he likewise accepted a distinction between what can be observed or the observable and what can never be observed or the non-observable. However, there is a little twist of ideas when it comes to the question on the reality of the unobservable or theoretical entities. Though Popper admitted the distinction, he did not consider abstract entities like the Newtonian force or acceleration as unreal. This inference is implied in his explanation about the measurement of forces. He conceded that "since forces are so defined that they may be measured by measuring accelerations, we can indeed measure forces; and we may at times measure a force not by measuring an acceleration, but for instance with the help of spring balance."⁶⁵ Ingvar Johansson suggested that with the previous citation from Popper, a distinction was also made between "establishing (measuring) a property and observing it."⁶⁶ The idea of measuring a property, for instance, of Newtonian Force, implies a reality of entity even if it is not observable. Otherwise, no measurement will be obtained.⁶⁷

Conjectural and Fallible Observation

The reason why Popper can be called a "critical realist" is that he applied rational criticism to theories.⁶⁸ One of the major points of Popper

⁶³*The Logic of Scientific Discovery*, op. cit., p. 103.

⁶⁴*Ibid.*

⁶⁵*Ibid.*

⁶⁶Ingvar Johansson, *A Critique of Karl Popper's Methodology*, (Stockholm: Esselte Studium, 1975), p. 45.

⁶⁷With all the seemingly half-hearted indications on Popper's stand regarding the distinction between theoretical and observable entities, G. Radnitzky found a more schematic description of Popper's position. Popper appears to refuse the distinction in certain cases while accepting differences in other instances. - «La position de Popper et plutôt que, selon certains points de vue, il n'y a *pas de différence* entre les énoncés de base et les énoncés théoriques. Dans un cas comme dans l'autre nous ne possédons pas des méthodes infaillibles pour découvrir la valeur de vérité d'un énoncé particulier. On ne peut pas plus déclarer probables des énoncés d'observation que des énoncés théoriques. Mais il y a cependant certain *différences*. (One of the differences cited is as follows) . . . L'assertion selon laquelle une théorie particulière est vraie signifie qu'elle correspond bien à un nombre indéfini de faits *tandis qu'un* énoncé de base, par définition, décrit un événement qui est possible logiquement et qu'il est logiquement possible d'observer, un événement qui est individué par les indicateur d'espace et de temps (cf. G. Radnitzky, "Réflexion sur Popper", op. cit., p. 93).

⁶⁸"Critical Realism is a position resulting from the application of 'rational criticism' or critical tests to theories. In this way, critical realism distinguishes itself from naive realism. Indeed, Popper favors realism but he insists that it has to be a realism criticized - "realismo crítico". W.R. Darós therefore noted that "Popper se propone -aceptar el realismo como la única hipótesis sensata- como una conjetura que no posee otra alternativa sensata . . . Popper se inclina a conjeturar y preferir la teoría del realismo crítico, de un realismo consciente de sus propios supuestos, criterios y límites en el momento de establecerlo y postularlo." Cf. W.R. Darós, "Realismo crítico y Conocimiento en Carlos Popper", en *Pensamiento*, num. 182, 46 (1990) p. 182.

about theories is that, they are to be subjected to tests and even after having passed the tests, theories are to remain open to possible falsification. Thus, theories are always conjectural and never absolutely certain, that is, they are *fallible*.⁶⁹ The critical approach applied to conjectures or hypothetical theories is also applied to test statements i.e., to basic or observation statements. Popper stressed that "all observations and observation statements are conjectural and theoretical in character."⁷⁰

Let us deal first with the assertion that observation statements are theoretical in character. To call a statement (or a term) theoretical would mean that the same statement cannot be correlated to a specific sense-perception. In other words, a theoretical statement transcends experience. Therefore, to call observation statement (or the terms in the statement) theoretical means that it cannot be correlated to a specific sense-perception and so transcends experience. Popper gave an example of a singular observation statement in order to explain the issue.

"... the use of universals such as 'glass' or 'water' in a statement like 'Here is a glass of water.', necessarily transcends experience. It is due to the fact that words like 'glass' or 'water' are used to characterize the law-like behavior of certain things which may be expressed by calling them 'dispositional words'."⁷¹

What is dispositional is also theoretical, meaning to say that from one perception alone, it cannot be established whether something is what it is because that something exhibit a certain 'law-like behaviour'. Ingvar Johansson took the same example of 'glass' to illustrate this law-like behaviour.

"From one perception alone, it cannot be established whether, for example, something is a glass, because for something to be a glass

Meanwhile, with the use of rational criticism, the popperian approach may be described as a subscriber to Critical Rationalism which (in the case of the Popperian System) is built on three pillars, namely, realism, fallibilism and 'méliorisme' or optimism. Cf. G. Radnitzky, *Entre Wittgenstein et Popper*, *op. cit.*, p. 124.

⁶⁹The statement that 'Knowledge (theory) is conjectural' or 'Knowledge (theory) is fallible' is but an abbreviation for: since our methods for ascertaining the truth-value of a particular statement about empirical reality are fallible, in principle, there cannot be any certain knowledge about reality. Cf. G. Radnitzky, "Réflexions sur Popper", *op. cit.*, p. 80. Popper stressed that though scientific truth remains as a fundamental value, we can only aspire for scientific truth but we can't expect for certitude. - "Nous pouvons aspirer à la vérité scientifique, et nous le faisons. La vérité reste la valeur fondamentale. Mais nous ne pouvons pas atteindre la certitude." Cf. K. Lorenz et K. Popper, *L'avenir est ouvert*, *op. cit.*, p. 61.

Notwithstanding the insistence on the fallibility of our theories, Popper advises all the subscribers of fallibilism to be on guard against total or absolute fallibilism and tolerance - "Popper nous met en garde contre deux modes intellectuelles qui dominent dans le monde intellectuel d'aujourd'hui, la totalisation du faillibilisme et la totalisation de la tolérance. Cf. G. Radnitzky, "Réflexions sur Popper", *op. cit.*, p. 88.

⁷⁰Objective Knowledge, *op. cit.*, p. 30.

⁷¹The Logic of Scientific Discovery, *op. cit.*, p. 424 *x appendix.

means that if you throw it to the floor then it will go to pieces; and if you do this or that, then such and such a thing will happen."⁷²

Therefore, it is not only the abstract explanatory theories that transcend experience but also ordinary singular observation statements. This transcendence in its turn, poses as the reason why singular observational statements cannot be verified by sense experience and that they cannot be certain—that is, they are fallible. Thus, Popper gave a non-certitude character to basic statements. One may also apply the same non-certitude character to observation statements that are basic. Thus, observation statement is "anything but 'basic' in the sense of 'final'; it is basic only in the sense that it belongs to the class of statements which is used in testing theories."⁷³ But just as this transcendence is the reason why observation statement is said to be uncertain, this same transcendence is also said to be the reason why observation statement is conjectural. For an 'uncertain' statement is understandably a conjecture. As Johannson has put it, "Universal and singular statements are both hypothetical since they refer to merely imagined sense-data."⁷⁴ Negativism therefore, has also reached the level of test statements. For to simply have a mere conjecture which is uncertain, is to simply be exposed to the possibility of committing mistakes. Fallibility is the negative counter part of certainty. However, just as a positive import is possible for a fallible theory, so it is for a fallible observation statement. As Sergio Fernandes saw it, "It was precisely because we err that we can learn."⁷⁵

⁷²Ingvar Johannson, *A Critique of Popper's Methodology*, *op. cit.*, p. 10.

⁷³*Conjectures and Refutations*, *op. cit.*, p. 388.

⁷⁴Ingvar Johannson, *A Critique of Popper's Methodology*, *op. cit.*, p. 191.

⁷⁵Sergio Fernandes, *Foundations of Objective Knowledge*, (Dordrecht: D. Reidel Pub. Co., 1985), p. 33. Renée Bouveresse offers a positive appraisal of error and fallibility. He describes error as normal and not a scandal. In fact, it is considered as the gate towards the birth of science. It is in accounting its limits that its strength increases. Man has no way of escaping from error since his conjectures are not 'a priori' in agreement with the universe. Nonetheless, though we cannot escape from error, we can eliminate it. - "Il est faux de considérer l'erreur comme un scandale: elle est, au contraire, normale. L'homme n'ayant au départ aucune chance d'y échapper, ses conjectures n'étant pas a priori accordées à l'univers sur lequel elles portent en d'autres termes, il n'y a pas d'état de grâce naturel de l'homme lui donnant accès à la vérité: l'homme est fallible. L'erreur ne renvoie à aucune faute, on ne peut l'éviter, on peut simplement l'éliminer... C'est au contact de l'erreur que la science peut naître, c'est en tenant compte de ses limites que sa puissance peut s'accroître." Cf. Renée Bouveresse, *Karl Popper*, (Paris: Librairie Philosophique, J. Vrin, 1978), p. 12.

Jean Baudouin gives another encouraging remark about error. He said that to be error-prone or fallible paves the way to an open world and since it is open, man can keep the possibility of deciding freely. - "C'est parce que notre connaissance est 'fallible' que le monde reste ouvert. Et c'est parce que le monde demeure fondamentalement infini que l'homme garde la possibilité de décider librement." Cf. J. Baudouin, *Karl Popper*, *op. cit.*, p. 14.

Finally, G. Radnitzky assigns a positive character to fallibilism since it is capable of effecting an improvement in our image as man. - "Le faillibilisme est de plus une contribution apportée par la méthodologie popperienne à l'amélioration de notre image de l'homme (l'homme come chercheur) et par conséquent à l'anthropologie philosophique." Cf. G. Radnitzky, *Entre Wittgenstein et Popper*, *op. cit.*, p. 128.

The application of non-certitude character and the concomitant conjectural character to basic observational statement may also be explained in another angle, in a shorter way but not very different from the first explanation on transcendence. General theories are treated as uncertain, i.e., conjectural. Since particular observation statements are, to use Popper's terminology "soaked in theory", they are equally affected by conjectural character.⁷⁶ One may take this application of conjectural character to observation statements as a manifestation of the consistency in Popper's methodology, and to extend further this trait of consistency, Popper also has to assert that just as we cannot demand that theories must be true, neither can we demand that our basic observation statements are true.⁷⁷

That we cannot demand our basic observation statements to be true, or better claim that they are true, is not largely because of the fault of the measurements we undertake. Nonetheless, we do not ignore that there is a need to maintain a certain degree of precision. As Popper noted, "... the prevailing technique of measurement determines a certain range - a region within which discrepancies between the observations are permitted by the theory."⁷⁸ Errors in measurements may understandably give rise to 'false' singular observation statement. However, the most important reason why we cannot demand and claim the truth of our observation statements is because "there is no criterion of truth even at the level of the test statements."⁷⁹ Hence, test statements are also treated as approximations of the truth; and one may arrive at a decision on which test statement is more proximately true by test - also by refutations. Popper finally declared, "Thus, every statement (or basic statement) remains essentially conjectural, but it is a conjecture which can easily be tested."⁸⁰

Test, Objectivity and Conventionalism in Observation

Just as rational criticism in the level of universal statements or theories is constituted by tests - by refutation, so it is in the level of singular observational basic test statements. Conjectural theories are not just naive or 'wild guesses'⁸¹ (although theories may primitively start from

⁷⁶*Conjectures and Refutations*, op. cit., p. 387; see also Anthony O'Hear, *Karl Popper*, (London: Routledge and Kegan Paul, 1980), p. 73.

⁷⁷P.A. Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. xx. In short, since there is a substantial link between theory and observation, i.e., observation statements presuppose theories, the former also inherit the mark of fallibility. Thus, Alan Chalmers went on to say, "... Les énoncés d'observation sont tout aussi faillibles que les théories qu'ils présupposent et de ce fait ne constituent pas un fondement solide sur lequel bâtir des lois et des théories scientifiques." Cf. Alan Chalmers, *Qu'est-ce que la science? Récent développement en philosophie du sciences*, (Paris: Editions la Découverte, 1987), p. 52.

⁷⁸*The Logic of Scientific Discovery*, op. cit., p. 124.

⁷⁹Sergio Fernandes, *Foundations of Objective Knowledge*, op. cit., p. 33.

⁸⁰*Conjectures and Refutations*, op. cit., p. 124.

⁸¹'Wild guesses' in this case, are not completely at random or totally blind as one may be tempted to think of. Popper presented a classic example to uphold the stated claim. "A blind man

them) but refined guesses because they have been subjected to tests and are open to further tests. Similarly when one speaks of a conjectural observation statement, he mainly refers to a refined observation statement which is subjected to tests and remains open to further tests. By applying rational criticism to conjectural observation statement, the latter becomes not just any cheap observation-guess but a testable observation.

There are however, factors necessary for an observation statement to be inter-subjectively testable. Observations have to be repeatable, that is, maintaining a certain regularity and reproducibility in order to be testable. Popper clearly indicated,

"We do not take even our own observations quite seriously, or accept them as scientific observations until we have repeated and tested them. Only by such repetitions can we convince ourselves that we are not dealing with a mere isolated 'co-incidence' but with events which, on account of their regularity and reproducibility, are in principle inter-subjectively testable."²

Without repetition, observations are mere coincidence. A certain degree of regularity is essential for an observation to be instructive. Otherwise, it will turn out to be just a chimerical, without scientific relevance, and the tests will almost give a negative result. Having an isolated coincidence would most likely mean that error has been committed in the experiment. Note however, that this degree of regularity or the demand for repetition is not meant to justify the observation statement nor to say that from such repetition we learn about something instructively new. That we cannot justify observation statement or claim the truth of it, is explained by our inability to verify by sense-perception this same observation statement. That we cannot verify the statement by sense-perception is due to transcendence. On the other hand to say that we learn or discover something by repetition (repeated impact on our senses) is to vascillate in the original assertion that knowledge does not grow by the accumulation or repetition of observation, but rather by trial and error.³ The reason of the demand for repetition refers to none of the possible reasons cited, that is, it is neither for justification nor for learning something new. The simple reason for the repetition is to allow the observation itself to become testable.

who searches in a dark room for a black hat which is -perhaps- not there . . . The searcher at least acts as if he had a problem. The trial movements of the searcher will not be completely random because of the following reasons: 1) The searcher has a problem to solve, this means he has some knowledge, however fuzzy, previously acquired by essentially the same trial and error method; this knowledge serves as a guide, it eliminates complete randomness. 2) Randomness and idea of (probabilistic) independence in the consequence of trials are hardly applicable: the tosses with a penny may be random, but only with respect to a definite property - heads or tails." Cf. K. Popper, "Campbell on the Evolutionary Theory of Knowledge", in G. Radnitzky, *Evolutionary Epistemology, Rationality and the Sociology of Knowledge*, op. cit., p. 117.

²The Logic of Scientific Discovery, op. cit., p. 45.

³K. Popper, *Realism and the Aim of Science*, op. cit., p. 40.

Testing of observation statements is to be carried out inter-subjectively by other statements and thus, resulting also into either the falsification or corroboration of singular observation statements. It is by this capacity of observation statements to be inter-subjectively tested that they may be claimed as objective. Thus, 'objectivity' as Popper explained,

"... is not the result of disinterested and unprejudiced observation. Objectivity, and also unbiased observation are the results of criticism, including the criticism of observational reports. For we cannot avoid or suppress our theories, or prevent them explicitly, so that they may be criticized."⁸⁴

Objectivity does not prohibit interpretations and expectations from setting-in even in observation. Objectivity treats all statements beforehand as "theory-soaked". Objectivity as applied to observation is therefore not so much as to be unprejudiced observation statement as to be unbiased observation. To be unbiased observation, observation statements need only to resort to intersubjective tests in order to eliminate and weed-out possible errors in the conjectural observations. However, to allow the entry of "prejudiced" observation statement is not the same as allowing statement of personal subjective experience. Personal convictions and intense belief on a certain observation event do not make an observation objective. More often, subjective experiences simply make the testability of an observation statement difficult, if not impossible. If observation statements attain objectivity by subjecting them to tests and by remaining open to possible refutation, then it may be presumed that the objectivity of the test statements for the previous observation statements must also be hinged on their capacity of being inter-subjectively tested. It would appear then that objectivity demands a testing that is ad infinitum. To this question, Popper simply answered that "we do not establish anything by this procedure; *we do not wish to justify the acceptance of anything*. We only test our theories critically, in order to see whether or not we can bring a case against them."⁸⁵ That is to say, to insist that a statement is

⁸⁴*Ibid.*, p. 48. In theory, many scientists and philosophers of science may be convinced and lured by the critical attitude applied to observations and theories in order to preserve objectivity. But not a few would question its applicability or practicability. Pierre Aigrain, for instance, concludes that critical experience is conceivable but not realizable in the temporal limits of the evolution of science. - "Quand on parle de l'origine de la vie, on se trouve devant une situation où l'application de la règle de Popper est difficile et où on se contente d'observations: en effet, l'expérience critique est concevable mais non réalisable dans les limites temporelles d'évolution des sciences." Cf. Pierre Aigrain, *Simple Propos D'un Homme de Science*, (Paris: Hermann, 1963). p. 36.

⁸⁵*Conjectures and Refutations*, *op. cit.*, p. 388. Underline is mine. Káty Ricard expressed the same popperian sentiment by saying that the unjustified anticipations (that is to say, assertions remaining as hypothetical hence, never certain, verified or justified statements) constitute the only manner of interpreting nature. He then added that observation (as a test) is not for confirming a theory but for falsifying it (which is the same as "bringing a case against it"). - "... Les anticipations injustifiées constituent le seul moyen d'interpréter la nature. Toutes les lois ou théories doivent être considérées comme hypothétiques ou conjecturales, c'est-à-dire comme

to be tested by another test statement, and this in turn by another, is approximating the attitude of the verificationists who would insist on the certitude of the statement. It may be taken for granted however, that the minimum requirement is that the observation statement must be capable of undergoing inter-subjective tests, which is not the same with having undergone all or the greatest possible number of inter-subjective tests. After all, is not the observation statement basic not in the sense of being final?

To say that to insist on endless tests is not the proper attitude adopted in the proposed Popperian programme, may tell somebody to stop the test. But 'where should the test stop' was not settled by the citation previously cited. Popper however, has a ready answer to this question.

"Every test of a theory, whether resulting in its corroboration or falsification, must stop at some basic statement or another, which we decide to accept. If we do not come to any decision, and do not accept some basic statement or other, then the test will have led nowhere. . . for this has no natural end. Thus, if the test is to lead us anywhere, nothing remains but to stop at some point or other and say that we are satisfied, for the time being. It is fairly easy to see that we arrive in this at a procedure according to which we stop only at a kind of statement that is especially easy to test. For it means that we are stopping at statements about whose acceptance or rejection, the various investigators are likely to reach agreement."⁶

This citation may be presented in an outline form below.

Problem:	Objectivity & Test, ad infinitum
Solution:	Stop at some basic statements
Why:	Guide for preference - 1) easy to test 2) satisfied for the time being
How:	We decide to accept Various investigators are likely to reach agreement

Observation statement in the Popperian programme is asserted to be objective in view of its being testable. The test however is admitted to be liable to proceed ad infinitum if nothing is done. Hence the solution is to stop at some basic statements which have the qualities of being easily testable and may allow an observer or a group of observers to be satisfied for the time being. "To be easily testable" may be taken for granted as something 'observable' (the material requirement) and as a statement, something logically clear in its formulation (formal requirement.) "Satisfied for the time being" would refer to the consequent satisfaction or "degree

des suppositions . . . On se sert, de l'observation non pour confirmer une théorie, mais pour l'infirmer." Cf. Káty Ricard, "Science, Métaphysique et Théologie, Une lecture de Karl Popper", in *Etudes*, 367 (décembre, 1987) pp. 629-630.

⁶*The Logic of Scientific Discovery, op. cit., p. 104.*

of confidence"⁸⁷ produced by an observation statement after having passed some severe tests; "for the time being" alludes to the conjectural nature of the statement and therefore still fallible and may be refuted later on.

Stopping at a certain basic statement is a decision to be made, notably by a common agreement. At this point, Popper may be accused of having resorted simply to conventionalism in solving the problem on "testing ad infinitum", and thereby subscribing to arbitrariness. Hence, a contradiction would seem to have emerged, that is, it seems that observation statement is said to be objective by way of arbitrary means. According to Popper, the 'conventional' or the 'decisional' element in our acceptance or rejection of a proposition involves in general no element of arbitrariness at all. He likened the common agreement or decision of various investigators to a jury who has come to a common decision after a prolonged deliberation in finding the truth. Popper asked, "Who would say that a jury which has long and seriously debated the issue decides 'completely arbitrarily'?"⁸⁸

The freedom to make a decision, for choosing the basic particular statement, is not to be taken as something arbitrary. Certain norms or rules have to be followed anyway, namely, that statements are easily testable and may satisfy the investigators for the time being. However, even Popper himself would admit that "decision which are 'somewhat arbitrary' come in (only) when we have to make up our minds on whether our tests are, for the time being, satisfactory, and may be concluded; or whether we are to try another test."⁸⁹ Popper explained this 'somewhat arbitrary' by accepting that logically speaking, the decision may be considered as arbitrary since the accepted statement has not been logically derived from other statements.⁹⁰ Likewise, he also contended that "even this

⁸⁷The degree of confidence mentioned in the text above does not refer to degree of certitude nor to verification nor to justification.

⁸⁸P.A. Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. 1110. There may be arbitrariness or conventionalism involved in the acceptance of a theory within the context of popperian approach. Renée Bouveresse formally recognized Popper's conventionalism when he wrote about the utility of «énoncé de base» or basic statement, which is conventionally accepted by a scientific community. - "L'essentiel de la thèse de Popper est qu'un énoncé de base n'est pas utilisable parce qu'il est certain, mais parce qu'il a été accepté conventionnellement par la communauté scientifique: il n'y a donc de convention en science qu'au niveau des énoncés de base que la plupart des empiristes croyaient indiscutables." Cf. Renée Bouveresse, *Karl Popper*, op. cit., p. 35.

But the most that can be said about this conventionalism, if ever, is that, borrowing Kyburg's terms, "it is not conventional in the very strong sense". This means that it is not the case in which a different convention could just as well have been chosen. In defending Poincaré's approach to geometry, Kyburg explains that "Poincaré specifically mentioned simplicity as a ground for choosing between geometrical conventions, not excluding other nonepistemic considerations." Cf. Henry Kyburg, *Science and Reason*, (Oxford: Oxford University Press, 1990), p. 112. We may say then that in specifying testability and degree of confidence as guidesposts in choosing observation statement, Popper's conventionalism may be said to be similarly weak.

⁸⁹*Ibid.*, p. 1114.

⁹⁰*The Logic of Scientific Discovery*, op. cit., p. 109.

'somewhat arbitrary' decisions, if considered more closely, would appear more as conjectures than decisions. They are conjectures in the sense that there is a 'guess' that further tests will not lead to any deviating result."⁹¹

With all these denials and acceptance of being arbitrary, and hence, resembling a conventionalist, Popper distinguished himself from the conventionalist in the manner of making decisions. "I differ from the conventionalists in holding that statements decided by agreement are not universal but singular."⁹² Finally, what this inquiry on decision and arbitrariness teaches in that the empirical basis of objective science has nothing absolute about it. In Popper's famous line, 'science rests not on a solid rock, but on a swamp'.

Rationality and Justification in Observation

Critical attitude is claimed as the decisive point in rationality. Crucial as it is, critical attitude is even considered as a constitutive element of the dignity of man, touching both the moral and the intellectual aspects of man.⁹³ Critical attitude is essentially an argument by tests. This argument by tests involves observation statements which in themselves are tests. However, the question now is whether there is also rationality involved in observation statements. Is the element of critical attitude i.e., argument by tests, operational in the level of observation statements? To all these

⁹¹P.A. Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. 1114.

⁹²*The Logic of Scientific Discovery*, op. cit., p. 109.

⁹³P.A. Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. 1805; see also *Conjectures and Refutations*, op. cit., p. 385. The high insistence on critical attitude as an essential element of rationality seems to create a good impression of a truly rational Popperian system. Critical attitude as incorporated in the methodology of Popper appears to give the Popperian approach the birth right for what Newton - Smith calls "le pouvoir de la rationalité scientifique". The latter is obtained when the fact of showing that a proposition authorized by a scientific method, provides a reason for believing or accepting this proposition. - "La notion du pouvoir de la rationalité scientifique consiste dans l'idée que le fait de montrer qu'une proposition est autorisée par la méthode scientifique fournit une raison pour croire ou pour accepter cette proposition . . ." Cf. W.H. Newton-Smith, "Le Pouvoir de la Rationalité Scientifique", in Dominique Janicaud (ed.), *Les Pouvoirs de la Science, Un Siècle de Prise de Conscience*. (Paris: Librairie Philosophique J. Vrin, 1987), p. 48.

David Stove's *Popper and After: Four Modern Irrationalists*, (Oxford: Pergamon Press, 1984) expresses a contrary sentiment against the rational image of the Popperian proposal. Jean Largeault takes note of Stove's allegation that the Popperian philosophy of science is not less rational than that of Feyerabend, Kuhn and others. - "D. Stove attaque de front: "La philosophie popperienne des sciences n'est pas moins irrationaliste que celle de Feyerabend, Kuhn et les autres . . ." Cf. Jean Largeault, "Critique du Rationalisme Critique", in *Archives de Philosophie* 48 (1985), p. 138. This accusation, as explained by J. Largeault, has two roots" 1) the systematic confusion between questions on the logic of language used in theories and of the historical or sociological data, 2) the postulate that the correct arguments are analyzed in the form of classical logic, to the exclusion of inductive procedures, statistics, etc . . . - "L'irrationalisme de Popper aurait deux racines 1) la confusion systématique entre questions de logique de langage des théories et données historiques ou sociologiques, 2) ce postulat que les raisonnements corrects s'analysent dans les formes de la logique classique, à l'exclusion des procédures inductives, statistiques etc . . ." Cf. *Ibid*.

questions, the answers are all affirmative. Having dealt previously on observation statements undergoing tests, it can be generally stated that the critical attitude is essentially applied to observation statements. However, Popper also described rationalism as a method of argument that seeks to solve problems by an appeal to reason instead of an appeal to emotion and passions.⁹⁴ The formulation of an observation statement is affected and must be guided by this distinction between the appeal to reason and the appeal to emotion and passions. The demand for objectivity of observation statements necessitates that the observer should bar himself from formulating statements about his personal experience, sensation or perception. Observation statements do not become objective by virtue of an appeal to emotions, convictions or passions, but by virtue of an appeal to critical reason.

In Geoff Stokes' article entitled, *From Physics to Biology: Rationality in Popper's Conception of Evolutionary Epistemology*, where he treated different shades and meanings of rationality in the development of Popper's epistemology, a so-called rationality as falsifiability was described. This 'species' of rationality consists of the logic of falsifiability criterion of demarcation between science and metaphysics.⁹⁵ What is related however to observation statement in connection with this form of rationality is the "presumed existence" of a particular form of community characterized by having the capacity for a free critical discussion.⁹⁶ The question on 'test ad infinitum' may be taken up within the context of this presumption posed by this Popperian model of rationality. The decision, if one may recall, is obtained by a common agreement. This common agreement in turn, rests

⁹⁴K. Popper, *The Open Society and its Enemies*. Vol. 2 (London: Routledge and Kegan Paul, 1966), p. 224.

⁹⁵Geoff Stokes, "From Physics to Biology: Rationality in Popper's Conception of Evolutionary Epistemology" in Kai Hahlweg and C.A. Hooker, (eds.), *Issues in Evolutionary Epistemology*, (Albany: State University of New York Press, 1989), p. 490.

⁹⁶*Ibid.* Using the 7 concepts of rationality presented by Mario Bunge, the rationality required in the popperian system may be considered as *methodological*. However, just as it has been reiterated, it has never been a popperian preoccupation to 'justify claims'. I may also say that by reason of the weak conventionalism earmarked in the system of choosing observation test statement, the popperian approach is *practical*. . . Finally, since by falsification or corroboration, the merit of two competing theories is estimated, the Popperian approach may also be considered as *evaluative* - "Selon Bunge, il y a sept concepts de rationalité, 1) conceptuelle, 2) logique, 3) méthodologique; critiquer, mettre en doute et justifier ce que l'en propose, 4) gnoséologique, 5) ontologique, 6) evaluative, 7 pratique: adopter les moyens utiles dans la recherche des objectifs fixés. Cf. M. Espinoza, *Essai Sur L'intelligibilité de la Nature*. (Toulouse: Editions Universitaires du sud, 1987), p. 143. However, M. Bunge thinks that Popper is not a rationalist par excellence because he doesn't conform to the seven concepts of rationality indicated. - "Popper est-il le rationaliste par excellence? Bunge pense que non car il ne se conforme pas aux sept concepts de rationalité indiqués . . ." Cf. *Ibid.*, p. 137. For another interesting presentation of the different general conceptions of rationality see also Richard Faley, *The Theory of Epistemic Rationality*, (Massachusetts: Harvard University Press, 1987), pp. 130-131. In this book, the author enumerates 3 conceptions - the Aristotelian (or reflective subjective or epistemic) conception, the radically subjective conception and the radically object conception. Popper's objectivist approach to theory would fall on the last category (this claim of course is based on what Popper presumes about his work).

in this so-called particular form of community which is involved in a free critical discussion. Observation statements undergo tests by falsification and the decision to stop the test at a certain point is critically discussed by a form of community. In this perspective then, we may say that observation statements bear the mark of rationality.

Observation statement however, is not rational if rationality means 'certain knowledge' - an equation which Popper has not assumed but remained as the major preoccupation for most of the empiricists and the conventionalists. Observation statement cannot be rational in the sense of being 'certain' since owing to its theoretical nature, it transcends sense-experience and therefore cannot be verified strictly speaking. On the contrary, observation statement is always seen as uncertain and conjectural and this fallible. Therefore, no matter how numerous and how severe the tests that observation statements have undergone, they remain uncertain and conjectural.

Sergio Fernandes, in his book entitled *The Foundations of Objective Knowledge*, has dealt with a distinction between a practical sense of rational and theoretical sense of rational. S. Fernandes recounted,

"In some *practical sense* of 'rational,' it is rational for Popper to prefer the best tested theory as a *guide for action*. This is simply because the reasonableness of a belief consists on its being arguable, and having withstand critical argument (see RS 59-60, OK 22, Replies 1026 etc . . .). In some sense of 'rely' we do rely according to Popper, on the best tested theories as a basis for action (OK 22, Replies 1026). However, from a *purely theoretical rational* point of view, we should not 'rely' on any theory (OK 21)."⁹⁷

There appears to be no problem if the distinction between the practical sense of rational and the theoretical sense of rational, respectively translated into 'practically rely' and 'theoretically rely', be applied to observation statement. In the practical sense, best tested observation statement can be a guide for action. For instance, the decision to accept observation statements is a practical job. A scientific community relies, in a practical sense, on the best tested observation, for otherwise, testing will proceed 'ad infinitum'. On the other hand, going to the theoretical sense of rational, it may be

⁹⁷Sergio Fernandes, *The Foundations Objective Knowledge*, *op. cit.*, p. 113. Briefly then, one may say that, using the distinction presented by Sergio Fernandes, one may *rely* and *not rely* on any theory. This portrait of rationality is likewise captured by Jean Largeault's presentation of at least three different concepts of rationality. The first one is exemplified by Carnap. For him, what is rational is expressed in the logical formalisms, deductive or inductive. Then there is L. Brunschvicg who sees reason as an activity, and consequently, with a nominalist conception of logic, he thinks that rationality resides in the synthesis of experience and of mathematical structures. Finally, there is Popper who decides that rationality resides in the "tension" that joins permanence to change. (One may then make the following correspondence; rely-permanence and not rely- change) "Popper décide que la rationalité réside dans la controverse, qui joint la permanence au changement." Cf. Jean Largeault, "Critique do Rationalisme Critique", in *Archives de Philosophie*, 48 (1985), p. 129.

advised also that one should not rely on any observation statement. 'Not to rely on any observation statement' would mean, 'not to treat them as final.' Again, this non-final nature of observation statements has been explained as a consequence of the theoretical nature of observations.

After dealing with the rationality of observation statement, a presentation which may enforce the claim for rationality of the over-all methodology of Popper, one may now proceed to the question on justification of observation statement which is close to the hearts of many. It is true that Popper refused any possibility for scientific theories to be justified or verified,⁸⁸ "our awareness, our knowledge cannot justify or establish the truth of any statement."⁸⁹ However, amidst these refusals to give leeway to justification, Popper saw only one kind of justification which he believed possible, that is, "the logical justification of the preference for one theory over another."¹⁰⁰ It would appear that this kind of justification is applicable also to observation statements. The said justification speaks of "logical" and "giving preference to one theory over another" - in the present case, giving preference to one observation statement over another. It was said previously that an observation statement can be basic if it is 'easily testable'. It is easily testable if the observation statement is less theoretical and to be less or greatly theoretical is a question related to the logical formulation of the observation statements particularly involving theoretical terms. Therefore, if ever one observable statement is preferred over another, it is because it is less theoretical (the logical basis of preference) and so, easier to test. Therefore, it goes without saying that logical justification may be applied to observation statements.

The application of 'logical justification' to observation statement may also be put simply in the following manner. The preference for one observation statement over another is based on the greater testability and greater degree of tests (in terms of severity and also in number) it has undergone. It could be stated then that it is logically justified to prefer an observation statement which has greater testability and has undergone greater degree of tests instead of another which is less testable and has undergone lesser degree of tests.

Observation - Theory

As indicated earlier, observations provide tests for theories. However, many members of the scientific community would like also to say that theories do something to observations too; that theories may serve as guides to observations. The close affinity and mutual service rendered by theories and observations are most likely not to be denied by the majority. However, there are some philosophers and scientists who would rather

⁸⁸*Objective Knowledge*, op. cit., p. 67.

⁸⁹*The Logic of Scientific Discovery*, op. cit., p. 98.

¹⁰⁰*Objective Knowledge*, op. cit., p. 67.

look at theories and observations as truly distinct, while the rest remain convinced that there is a bit of theory in every observation. A short background about the issue will be of help.

Distinction between Theory and Observation

Ian Hacking strongly denies that all reports of observation must carry a load of scientific theory or that they assert theoretical assumptions.¹⁰¹ The assertion is simply dismissed by him as hardly worth debating, if not trivial. Awareness of scientific observations without theoretical assumptions all the more makes him convinced of his position. He refers back to the noteworthy observations of Bartholin (1625-1698) on Iceland Spar or Calcite, Grimalde (1613-1663) on the illumination in the shadow of an opaque body, Newton (1624-1727) on the dispersion of light. Hacking stresses that "... these people saw because they were curious, inquisitive, reflective. They were attempting to form theories. But in all these cases, it is clear that the observations preceded any formulation of theory."¹⁰²

Hacking indeed, admits that the development of optics mostly depended on noticing phenomenon. But 'to notice' for him does not imply having a theoretical framework previous to the observation. He enforces some more his position by citing that, "... in Hershel's case, it was lack of theory that made him set up and take notice."¹⁰³ He contends that an assistant, though without formal education can be trained to be skillful in handling apparatus and be sensitive in *noticing oddities*. But this noticing need not obviously imply theoretical background as to assert a theory-loaded noticing.¹⁰⁴

Hearing much about the predicament that all observations are theory-loaded, W.V. Quine suggested to stop the talk on observation and talk instead of observation sentences, the sentences that are said to report

¹⁰¹Ian Hacking, *Representing and Intervening*, (Cambridge: Cambridge University Press, 1984), pp. 171-175.

¹⁰²*Ibid.*, p. 156.

¹⁰³*Ibid.*, pp. 178-179. The case is about the phenomenon of a differential heating by colored light.

¹⁰⁴Van Fraassen may explain differently this "noticing oddities" of an assistant by using his distinction between "observing simply" and "observing that". An example is given to illustrate the distinction. If a tennis ball is presented to the recently discovered tribe still living in the stone age in an island in the Philippines, certainly the tribe will observe something, i.e., moving, bouncing; but it will not "observe that" it is a tennis ball because it doesn't possess the corresponding concepts. But scientific activity doesn't proceed in this way. It is insisted that in science, one doesn't purely observe but rather one "observes that". This example is taken from B. Van Fraassen, *The Scientific Image*, (Oxford: Oxford University Press, 1980), p. 91. This same example also appears in the book of J. Echeverría, *Introducción a la Metodología de la Ciencia*, op. cit., p. 202. Van Fraassen's distinction between "to observe purely" and "to observe that" is more or less similar to Dretske's "non-epistemic seeing" and "epistemic seeing" which will be discussed further in the following pages face en face to Ian Hacking's "noticing oddities" of an assistant.

observations. He further asserts that there is a perfectly distinguishable class of observation sentences, because "observations are what witnesses will agree about on the spot."¹⁰⁵ The distinguishable class of observation sentences may imply a constructed wall of distinction between these observational sentences and the other non-observational sentences which many not be agreed upon on the spot.

On the reversed side of the distinction, Laudan isolated theories from observations. He refurbished the 'distinction' by differentiating empirical problems from conceptual problems, this time, in order to insist that scientific theories face problems that are not generated by observation.¹⁰⁶

Finally, while accepting the distinction between theory and observation, Carl Hempel admitted arbitrariness as far as the dividing line between theory and observation is concerned.¹⁰⁷

The Distinction and Instruments

One may anticipate novel discoveries by analyzing which new methods for observation will be introduced in the near future.¹⁰⁸ Hag this in mind, Gerald Feinberg aptly accorded key role to instruments which, by continuous upgrading, may make measurements more and more accurate, thereby making observations more precise too. But to measure with accuracy and to observe with more precision, instruments are developed in such a way as they can assure maximum detachment from personal influences, i.e., to be able to maintain separation between observations and our beliefs.

Ensuring objectivity and precision may have been one of the reasons why even in the use of instruments, the 'distinction' has to be applied. But whatever the reason is, the predicament has been made that between the instrument and the observation, no theory is involved, or better, no theory is imposed by the observer to the observation when he uses an instrument. Ernst Nagel presented an example about photographic equipment attached to telescopes which is commonly employed in testing Newtonian Gravitational Theory.¹⁰⁹ To construct the apparatus and to interpret the observations collated through the use of the same apparatus, the observer may resort to laws and theories of optics and chemistry. Being in the realm of mechanism, the purpose of testing is obviously not the same with the laws

¹⁰⁵W.V. Quine, "The Roots of Reference" in Ian Hacking, *Representing and Intervening*, op. cit., pp. 36-39.

¹⁰⁶Harold Brown, *Observation and Objectivity*, (Oxford: Oxford University Press, 1987), p. 7.

¹⁰⁷Carl Hempel, *Philosophy of Natural Science*, (New Jersey: Prentice-Hall Inc., 1966) p. 82.

¹⁰⁸Gerald Feinberg, *Solid Clues*, (New York: Simon and Schuster, 1985), p. 137.

¹⁰⁹Ernst Nagel, *The Structure of Science*, (London: Hardcourt, Brace and World Inc., 1979), pp. 348-349.

that govern the interpretation of the observations. The laws governing the apparatus belong more to the science of optics and therefore, the laws cannot be implicitly contained nor traced in the object of observation which in this case, is in the realm of mechanics. This example of Nagel would explain that indeed, the use of an instrument may involve laws about the instrument. But such laws may not fall in the realm of the laws that pertain to what is observed. Hence, an observation may not be theory-loaded in the context of the use of an instrument.

The position favoring the distinction between observation and theory recalls one of the major preoccupations of both the verificationists and operationalists, that is, "to free knowledge from the taint of 'speculation' by securing it in something that can be known for certain."¹¹⁰ Since observational terms were thought to be directly applicable to experience,¹¹¹ which is not the case when it comes to theoretical terms, consequently, observational terms are also perceived to foster the acquisition of certainty. It was also considered that whole theory-change meant change in the meaning of theoretical terms, the meaning of observational terms is invariant under theory-change.¹¹² Therefore, observations are said to be theory-neutral or that, one is able to have experience without theoretical preconceptions.

Observation as Theory-loaded

In N.R. Hanson's terminology, to insist on the distinction between theory and observation is a logical butchery. He declared that "observation and interpretation (theory) are never apart, so they need not be joined. They are related symbiotically so that each conceptually sustains the other while separation kills both."¹¹³ Hanson reasoned out that two people may be looking at the same thing e.g., a quare box (see fig. 5). But when you ask them respectively on what they see, one may say that it is a box viewed from below, and the other, that it is a box viewed from above. They see the same box but the accounts they give are different. Hanson's investigation is therefore a refutation of the contention that "2 normal observers seeing the same object or the same scene from the same place, see the same thing." Instead, what is proposed is that "2 normal observers

¹¹⁰Jonathan Powers, *Philosophy and the New Physics*, (London: Methuen and Co., 1982), pp. 11-12.

¹¹¹W.H. Newton-Smith, *The Rationality of Science*, (London: Riutledge and Kegan Paul, 1981), pp. 11-12.

¹¹²*Ibid.* Robert Nola contends that although the metaphor 'theory-ladenness or theory-loaded' was popularized by N.R. Hanson (*Patterns of Discovery*, Cambridge: Cambridge University Press, 1958, p. 19), it was from G. Ryle (*Dilemma*, Cambridge: Cambridge University Press, 1954, p. 90) that the metaphor was coined. See Robert Nola, "Some Problems Concerning the Theory-ladenness of Observations", in *Dialectica*, 41 (1987) pp. 274-275.

¹¹³Sidney Morgenbesser, (ed.), *Philosophy of Science Today*, (New York: Basic Books Inc., 1967), p. 99.

seeing the same object from the same place in the same physical conditions, don't see necessarily visual experiences, even in the images of their respective retinas are virtually identical."¹¹⁴

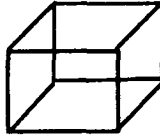


Figure 5

Kuhn also cited a similar case when for instance a chemist and a physicist are asked whether a single atom of Helium was or was not a molecule. For the chemist, it was a molecule based on kinetic theory of gases, while the physicist would say that it was not for it displayed no molecular spectrum. In both cases presented, the 'square box' of Hanson and the 'Helium' of Kuhn, retinal reaction and visual-sense data are identical, and so the difference must lie in the interpretations. This difference in interpretation strengthens the position of the 'theory-loaded observation.'

In his book *The Structure of Scientific Revolution*, Kuhn pointed out that paradigm procedures and applications are equally necessary to science as the paradigm laws and theories are.¹¹⁵ The restricting influence of the paradigm as a whole would then seem to put its muscle on observations. Anthony O'Hear recounted this restricting capacity when he raised up the assumption of Kuhn that "... in a mature science, the observational level is totally determined by classificatory schemes which are themselves part of scientific paradigm."¹¹⁶ Meanwhile, having the semblance of the paradigm's influence on observation, Cornelius Benjamin's set of our mind is held responsible for the transformation of stimulus before entering

¹¹⁴"... Deux observateurs normaux regardant le même objet ou la même scène à partir du même lieu «verront» la même chose." The other position preferred is, "... deux observateurs normaux voyant le même objet du même endroit dans les mêmes conditions physique ne vivront pas nécessairement des expériences visuelles identiques, même si les images de leurs rétines respectives sont virtuellement identiques." Cf. Pierre Jacob, *L'âge de la Science*, (Paris: Editions Odile Jacob, 1989), pp. 44-45.

Consequential to the two positions above, namely "2 observers seeing the same object see the same thing" and "2 observers seeing the same object don't necessarily see the same thing", are 2 descriptions of observation in general, i.e., "observation as a purely passive attention, or a pure receptive study", and "observation as referring to a certain organization of vision". - "L'observation n'est pas purement passive; il s'agit plutôt d'une certaine organisation de la vision." Cf. Gérard Fouriez, *La Construction des Sciences*, (Bruxelles: De Boeck- Weesmael S.A., 1988), pp. 30-31.

¹¹⁵Thomas Kuhn, *The Structure of Scientific Revolution*, (Chicago: The University of Chicago Press, 1970), p. 60.

¹¹⁶Anthony O'Hear, *What Philosophy Is: Introduction to Contemporary Philosophy*, (England, Penguin Books Ltd., 1985), p. 130.

the consciousness.¹¹⁷ Fritjof Capra, for his part, translated this mind 'set' simply as the **frame of the mind**.

"The patterns scientists observe in nature are intimately connected with the patterns of their minds, with their concepts, thoughts and values. Thus the scientific results they obtain and the technological appreciation they investigate will be conditioned by their frame of mind."¹¹⁸

Theory-loaded Observation and Instrument

It is more surprising however, that even Auguste Comte seemed to favor the 'theory-loaded observation'. He wrote,

"... without a theory of some sort by which to link phenomena to some principles, it would not only be impossible to combine the isolated observations and draw any useful conclusions. We would not even be able to remember them, and for the most part, the fact would not be noticed by our eyes."¹¹⁹

Without a theory of some sort to link phenomena observed through an instrument with some principles, isolated observations would simply be hanging in mid-air. This statement and its equivalents would most likely be the manner of stretching the remark of Auguste Comte when it comes to instruments. For supposedly, what is missing or to explain what has gone wrong requires that one knows with precision what he should expect,¹²⁰ which for its part presupposes a relevant body of background knowledge. Harold Brown went further by saying that the development of instrument requires theories that indicate what sort of item exist in our environment and how we should seek to observe them.¹²¹ It is suggested then that the theory behind the invention is likewise the necessary influencing theory that governs its use as one observes through this same instrument.¹²²

¹¹⁷A. Cornelius Benjamin, *Science Technology and Human Values*, (Columbia: University of Missouri Press, 1965), p. 30.

¹¹⁸Fritjof Capra, *The Turning Point*, (London: Fontana Paperback, 1983), p. 77.

¹¹⁹Gerald Holton, *The Advancement of Science and its Burdens*, (Cambridge: Cambridge University Press, 1986), p. 32.

¹²⁰Thomas Kuhn, *op. cit.*, p. 65.

¹²¹Harold Brown, *op. cit.*, pp. 75-76.

¹²²Roberto Torretti distinguishes personal from impersonal observation. "In personal observation the receiver is always the observer's body - or part of it - but in impersonal observation it can be a wide variety of things - a photographic camera, a voltmeter, etc . . ." In other words, impersonal observation formally involves the use of instruments or observational devices. He continues, "It (impersonal observation) is expressly designed to register the interesting effects of the intended object of observation which has been previously singled out by some human research project . . . digital and pointer readings get their distinctive interpretation from the theory of the respective instruments and without it, they all look quite insignificant and very much the same." Cf. Roberto Torretti, "Observation" in *British Journal for Philosophy of Science*, 37 (1986), p. 2, 17, 19. What we are up to is that with Roberto Torretti, the use of observational devices or

Finally, Fred Dretske introduced and made the distinction between 'non-epistemic seeing' and 'epistemic seeing'. The 'non-epistemic seeing' is a primitive visual ability without the influence of education, past experience, linguistic sophistication and conceptualization, and is common to many sentient beings. It is likened to a stripping operation that comes up with the sensory core or the directly given purified residue. Harold Brown gave an example of this.

"If the item before me is in fact a photograph of an interaction in a bubble chamber, then that is what I am seeing, even if I know nothing about bubble chambers, or photographs."¹²³

On the otherhand, the epistemic seeing has an essential feature, namely,

"... Nothing can be seen in these ways without acquiring some true belief about what is seen which in turn suggests that what we see in an epistemic way, can be influenced by all those variable that are capable of influencing what we believe."¹²⁴

With the distinction between epistemic and non-epistemic seeing, one can now refer back to what Ian Hacking cited about the English assistant trained to become expert in noticing impression in the apparatus but without formal education. One may say that the English assistant may see the impressions in a non-epistemic way, whereas the real scientist sees the same impression in the epistemic sense. The advocates of 'theory-loaded observation' may judge that the non-epistemic seeing is not the sense that one is said to have observed, and that observation is properly an epistemic seeing. Others may even go further by saying that even the non-epistemic seeing presupposes a background knowledge no matter how primitive it is and so observation in that context is still theory-loaded.

What has transpired in the last few pages portrays a crystallization of two opposing views regarding the close affinity between theory and observation.¹²⁵ These are two views that certainly recognize the paramount

instruments has come to be equated with impersonal observation; that a "human research project" is said to specify the teleology of observational devices thereby involving theories in the design of these same devices; and finally, just like Harold Brown's contention, R. Torretti insisted that a reading from an instrument presupposes a theory.

¹²³Harold Brown, *op. cit.*, p. 80.

¹²⁴Fred Dretske, *Seeing and Knowing*, (Chicago: The University of Chicago Press, 1969), p. 76.

¹²⁵The question whether there is "theory-neutral observation" is still at table for discussion and debate. Recently, the opposing views are represented in the works of Jerry Fodor and Paul M. Churchland. P. Churchland's position in his book *Scientific Realism and the Plasticity of Mind* was summarized by Jerry Fodor in his article "Observation Reconsidered". Churchland contended that "an observation sentence might mean anything depending upon the theoretical context. Fodor emphasized that this contention is equivalent to the claim that anything might be an observation sentence depending upon the theoretical context; . . . or that anything might be observed depending upon the theoretical context. After taking a close note on the modularity of

value of observation in relation to theory. Moreover, it was also seen that the opposing views carried their influence not only in the more direct manner of observation but even in the use of instruments for observation. Having presented what the question on observation-theory relationship is all about, the investigation will now proceed to find out what Popper has to say regarding this subject matter.

Popper on Theory and Observation

In the previous section dealing with the study of observation, Popper has been quoted to have asserted that "all terms are theoretical to some degree,"¹²⁶ (this citation was used in to secure a position from Popper regarding the question of the distinction between the observables and the non-observables) or that "observation statements are theoretical,"¹²⁷ (this quotation was used in dealing with the fallible nature of observation statements). These two citations among others are ultimately based on the fundamental assertion of Popper that "theory comes first before observation." This fundamental assertion has been expressed quite oftenly (though not the only manner of expressing it) as "every observation is already an interpretation in the light of our theories."¹²⁸ Actually, the term theory as used in the previous statement carries with it the whole load of the framework with which observation is worked out. Within this framework

our perceptual system, Fodor opposed Churchland's position with a conclusion, "... Part of the story about scientific consensus turns crucially on the theory-neutrality of observation. It is perfectly obviously true that scientific observations often turn up unexpected and unwelcome facts, that experiments often fail and are often seen to do so, in short, that what scientists observe is not determined solely, or even largely by the theories that they endorse, still less by the hopes that they cherish." Cf. Jerry Fodor, "Observation Reconsidered", in *Philosophy of Science*, 51 (1984), p. 28, 42.

What followed was an article written by P. Churchland which was meant to answer Fodor and to specifically claim that Fodor's contentions about the psychology of human perception are mostly irrelevant to the epistemological issue at stake. He likewise pushed the issue that Fodor's modularity/encapsulation thesis is neither correct nor has any significance to the epistemological problems. Cf. Paul Churchland, "Perceptual Plasticity and Theoretical Neutrality: A Reply to Jerry Fodor", in *Philosophy of Science*, 55 (1988), pp. 167-187.

Daniel Gilman, for his part, wanted to clarify that the argument presented by Churchland from the point of view of neurology was inadequate as an evidence against Fodor's Modularity/Encapsulation thesis. Cf. Daniel Gilman, "Discussion: The Neurobiology of Observation", in *Philosophy of Science*, 58 (1991) pp. 496-502.

¹²⁶Conjectures and Refutations, op. cit., p. 119.

¹²⁷Objective Knowledge, op. cit., p. 30.

¹²⁸P. Arthur Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. 222; *The Self and its Brain*, op. cit., p. 425; *The Logic of Scientific Discovery*, op. cit., p. 107, n. 3. On the contrary, Gary Jones explains that there are observations, i.e., previously established regularities or repetitions of observed events which must precede the theory and serve as the explanandum of the theory. Cf. Gary Jones, "Popper, Theories and Observations," in *Erkenntnis*, 18 (1982), p. 340. Meanwhile, Robert Nola would rather say that observation temporarily precedes theory and that earlier theories may also guide us towards later observations. He insists that "any attempt to argue that one must always precede the other is clearly false." Cf. Robert Nola, "Some Problems Concerning the Theory-ladenness of Observations", in *Dialectica*, 41 (1987), pp. 279-280.

are the observer's theoretical interests, the special problem under investigation, his conjectures and anticipations and the theories which he accepted as a kind of background - his horizon of expectations.¹²⁹

Alongside the positive assertion that 'every observation is already an interpretation in the light of our theories' is the corresponding negative assertions that "there are never any uninterpreted data experienced by us,"¹³⁰ "sense-data, untheoretical items of information, simply do not exist",¹³¹ "even pure observation is never neutral."¹³² As recounted by O'Hear, for Popper, the presuppositionless observation is in practice and in principle unattainable.¹³³ It is unattainable in practice because of the infinity of features surrounding even one phenomenon and our corresponding inability to observe all of them. In principle, it is unattainable because one is led to nowhere by a mere command like "observe!".

Furthermore, as a result of the assertion that every observation is already an interpretation in the light of our theories, observations are considered as selective. Observation is tailored from an inborn or acquired predisposition or expectation to classify things. Popper gave the example about a hungry animal. Just as a hungry animal divides the environment into edible and inedible things, so it is with a scientist who may classify objects as either relevant or irrelevant, similar or dissimilar (and therefore selective) relative to his needs and interests.¹³⁴ A hungry animal searches

¹²⁹*Conjectures and Refutations*, op. cit., p. 47. A. O'Hear does not agree with this predicament. He argues that "the fact that there are interests and schemes of classifications behind any observation of the world does not amount to an elevated sense of theory." Cf. Anthony O'Hear, *Introduction to the Philosophy of Science*, op. cit., p. 83.

¹³⁰*Ibid.*, p. 387.

¹³¹Karl Popper, "Is there an epistemological problem of perception?" in I. Lakatos and A. Musgrave (eds.), *Problems in the Philosophy of Science*, (North Holland Amsterdam, 1968), p. 163.

¹³²P.A. Schilpp (ed.), *The Philosophy of Karl Popper*, op. cit., p. 164. A good example can be given. Each stage in the series of attempts to establish the validity of the observation statement - "Here is a piece of chalk." - has a great number of theoretical generalizations. For instance, a chalk is constituted by calcium carbonate and therefore it must produce carbon dioxide when one soaks it in acid, etc. . . . This in turn shows that the gas which escapes is carbon dioxide because it agitates lime water etc. . . . - "Chimiquement parlant, la craie est constituée essentiellement de carbonate de calcium, plaide-t-il, elle doit donc produire du dioxyde de carbone quand on la trempe dans un acide. Il effectue l'expérience et montre que le gaz qui s'échappe est du dioxyde de carbone parce qu'il trouble l'eau de chaux. . . . Chaque étape dans cette série d'essais pour établir la validité de l'énoncé d'observation "voici un morceau de craie", à un nombre de plus en plus grand de généralisations théoriques. . . ." Cf. Alan Chalmers, *Qu'est-ce que la Science?* op. cit., p. 53.

¹³³A. O'Hear, *What Philosophy is: An Introduction to Contemporary Philosophy*, op. cit., p. 12. However, O'Hear contends, "... that all observation involves presuppositions and assumptions is undoubtedly true, but this does not imply that there is no point in drawing distinctions between more or less theoretical levels of observation. Cf. A. O'Hear, *Introduction to the Philosophy of Science*, (Oxford: Clarendon Press, 1990), p. 89.

¹³⁴*Conjectures and Refutations*, op. cit., p. 46, 47; *Objective Knowledge*, op. cit., p. 342, 343; P.A. Schilpp, *The Philosophy of Karl Popper*, op. cit., p. 59.

(observes) what is relevant to his hunger. A scientist searches (observes) what is relevant to his most pressing problem and most preoccupying interest.

Another consequence of the 'fundamental assertion' is the formulation of what is called the **systematic** and the **real** observations. Systematic observation is described as "an observation undertaken with the intention of probing into the truth of the theory or the myth".¹³⁵ Such kind of observation arises from critical discussion, that is, from a problem that one tries to solve and the conjectures which one attempts to refute. In fact, it is because of the critical discussion that this observation is called 'systematic'. Meanwhile, Popper made the 'fundamental assertion' a must for any observation to be 'real'. He proposed that "each observation is preceded by expectations or hypotheses; by those expectations, more especially which make up the horizon of expectations that lends those observations their significance; *only in this way do they attain the status of real observations.*"¹³⁶ As it appears, this citation is not so different from the previous ones presented. The only notable but fairly important consideration here is that Popper has formally made his 'fundamental assertion' as a rule for every observation. Even the so-called **chance observation** is not at all accidental if investigated closely. Just like the other forms of observation presented, chance-observation does not escape the influence of expectation. Though unexpected, a chance observation is still based on an expectation. Popper explained how it is so.

"A chance observation is like an unexpected stone in our path; we stumble over it just because we did not expect it - or more precisely because we did expect, though unconsciously, that the path would be smooth. Thus, the so-called 'chance observation' or 'accidental discoveries' are not as accidental as one might think at a glance."¹³⁷

The case of chance observation is a case of a happy thwarted expectation, that is, something unexpected in what we have been expecting. This case of chance observation explains why the discovery of *penicillin* by Alexander Fleming was not really accidental. Fleming, together with other researches have been hoping and expecting that there could be such a substance like penicillin, an expectation that motivated researchers to continue testing their conjectures. What appears similar to the 'unexpected stone in our path' is the appearance of the mold whose antibiotic properties are non-toxic.

By dealing with observation statements containing theoretical terms, and with the theoretical disposition and interpretation from which observation statements are formulated and in a sense derived, one gets

¹³⁵*Ibid.*, p. 127.

¹³⁶*Objective Knowledge*, *op. cit.*, p. 346. Underline is mine.

¹³⁷P. A. Schilpp (ed.), *The Philosophy of Karl Popper*, *op. cit.*, p. 40-41.

the impression of working simply within the parameters of logical and to a certain degree, linguistic questions. On the contrary however, the question on theory-observation relationship extends and is applied to an individual organism, that is, "whatever is true for logical reasons is actually true for the organism - both for its nervous system and for its psychology."¹³⁸ Popper therefore, moved from logic to biology.

First of all, Popper gave a general assumption that "at every stage of the evolution of life and of the development of organism, we have to assume the existence of some knowledge in the form of dispositions and expectations, . . . which are the most important aspect of the **organization of an organism**."¹³⁹ 'Organization' is a general term which would mean, the growth, the manner of responding to stimuli in the ecological system, and the process of continuing to live. Popper then cited some examples to support his general assumption. For instance, he traced back our more dogmatic way of thinking to the inborn need for the so called discoverable structural invariants or in short the basic regularities. A particular case is the infantile dogmatism observed by Jane Austen. It was about Henry and John who have passed the stage of early childhood and who were still asking everyday for the same story of Harriet and the Gipsies. They 'tenaciously' set up the reader just to find out if she will deviate from the usual recitation.¹⁴⁰ From this example, the observation of Henry and John concerning the daily recital of the story is framed on their expectation for constancy or invariance.

Popper also talked about **the eye of a cat**. He went further in his general assumption by giving the impression that the very innate structures are imbedded in the very sense organs of the individual organism-in this case, in the eye of cat.

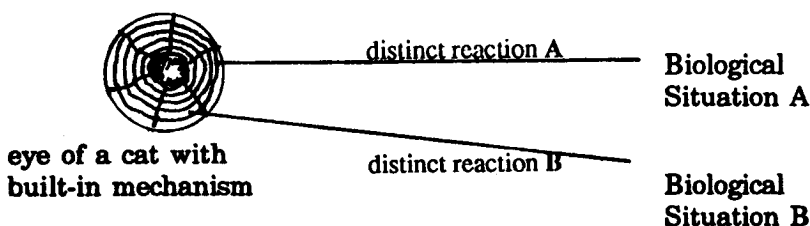


Figure 6

What has been recounted is that, the eye of a cat reacted distinctly when biological situation A was presented, a reaction different from another one when presented biological situation B. The point of Popper

¹³⁸*The Self and its Brain*, op. cit., p. 435; *Conjectures and Refutations*, op. cit., p. 48.

¹³⁹*Objective Knowledge*, op. cit., p. 71.

¹⁴⁰*The Unended Quest*, op. cit., p. 48.

was that, "the disposition to distinguish between biological situation A and biological situation B is built into the sense organ, and with it, the theory that these and only these, are the relevant situations for whose distinction the eye is to be used."¹⁴¹

Popper also made a more graphic explanation about the 'relativity' of situations or stimulus to our built-in or inborn system of expectations. He spoke about an observation as being the result of a stimulus that **rings the bell**. Meaning to say, the stimulus must be significant, relative to our system of expectations in order to be able to ring a bell and thus to be observed.¹⁴²

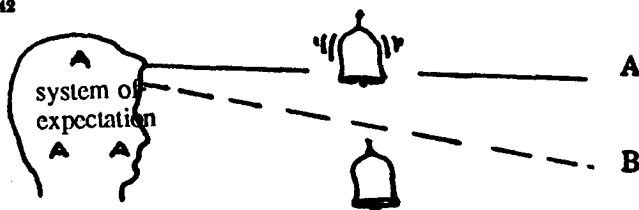


Figure 7

Stimulus A fitted perfectly to the system of expectation of Mr. X (which happened to be full of A's). Hence the bell rang and observation went on its way. In contrast, there was simply nothing in the system of expectation of Mr. X that could be stimulated by stimulus B. Hence, the bell did not ring. Incidentally, this illustration may explain the idiom - "She rings my bell."

Another interesting example which Popper has in order to support the hypothesis about the inborn expectation, is the work of Konrad Lorenz on 'the theory of imprinting'. The controlled experiment was about a newly hatched gosling. It was observed that a newly hatched gosling adopts as its 'mother' the first moving thing it sets eyes on.¹⁴³ The overall conclusion taken from this experiment was that, young animals have an inborn mechanism (genetically conditioned) for jumping to unshakeable conclusion.

Speaking now about instruments as to whether they are or they are not theory impregnated, Popper appeared to have espoused the position that instruments are likewise, soaked in theory. Most explicit among Popper's idea about the instruments as theoretical is his description of an observing experimentalist. The experimentalist may be looking intently through a telescope or a microscope and very attentive to what he is observing. But he should not forget that "it is a telescope or a microscope through which he is looking, and that he takes the whole theory of these

¹⁴¹*Objective Knowledge*, op. cit., p. 72. Popper quoted the experiment of T.N. Wiesel and D.H. Hubel, "Single Cell Responses in Striate Cortex of Kittens Deprived of Vision in One Eye," *Journal of Neurophysiology* 26, pp. 1003-1017.

¹⁴²P.A. Schilpp, *The Philosophy of Karl Popper*, op. cit., p. 99.

¹⁴³*The Unended Quest*, op. cit., p. 44.

instruments for granted (they form part of his background knowledge).¹⁴⁴ The way how the instruments work, the principles involved and the objectives which the instruments are capable of achieving are all counted as built in theories and mechanisms of the instruments. Hence, conscious or unconscious of this, the observer using an instrument is, right there and then, carrying the dispositions or inherent theoretical structures which direct the process of observation. To recap the issue, Popper made an analogical comparison. "Just as our observational instruments are based upon theories, so are our sense organs, without which we cannot observe."¹⁴⁵

From what has been presented as an exposition on the precedence of theory over observation, a valuable consideration can be briefly expounded. It is the assertion that "the observer actively explores experience", an assertion that is reinforced by Popper's declaration that "all observation is an activity with an aim (to find, or to check some regularity which is at least vaguely conjectured) . . . for there is no such thing as passive experience . . . experience is the result of active exploration by the organism."¹⁴⁶ The hungry animal classifies what is edible (what is relevant) and what is not (what is not relevant) in relation to his pressing problem, namely, hunger. The hungry animal does not wait for things to be classified for him. Otherwise, the animal will not live long to finally have a bite. Because of this active dimension of the observer, it can be said that "we do not have an observation, but we make observation."¹⁴⁷

The position of Popper is in fact in the middle of two extreme positions on the role of observer. On the left is represented by Russell who argued that "the observer when he seems to himself to be observing a stone, is really observing the effects of the stone upon him."¹⁴⁸ The extreme position on the right is represented by the Copenhagen interpretation which put more emphasis on the observer's physical interference on the object of observation. Hence for instance, quantum mechanics is thought as not representing particle but rather our knowledge, our observations, or our consciousness of particles.¹⁴⁹

Against the leftist position, Popper simply denied that the observer is observing the effect of the stone upon himself and dismissed the question as not worth pursuing. Against the rightist position, he likewise

¹⁴⁴P. A. Schilpp, *The Philosophy of Karl Popper*, op. cit., p. 1122.

¹⁴⁵*The Self and its Brain*, op. cit., p. 134.

¹⁴⁶*The Unended Quest*, op. cit., p. 51.

¹⁴⁷*Objective Knowledge*, op. cit., p. 342.

¹⁴⁸*Ibid.*, p. 65.

¹⁴⁹*Quantum Theory*, op. cit., p. 35. The Copenhagen interpretation is considered as phenomenalist, and as a consequence, the indeterminations of Heisenberg are reduced to perturbations which in themselves are attributed to the observer. Popper's approach on the contrary is ontological with two principal theses: realism and indeterminism. - "Généralement, l'interprétation phénoménaliste de "Copenhague" était présumée, en conséquence les indéterminations de Heisenberg étaient réduites à des perturbations, elle-mêmes attribuées à

denied any support for such assertion and explained the reason why the Copenhagen interpretation was formulated. The reason proposed was the overwhelming effect of technological advancement applied to observation instruments. The indirectness of observation has simply been reduced more and more. But nevertheless, Popper stayed firm with this position that even in quantum theory, the observer plays exactly the same role as in classical physics, i.e., "his task is to test the theory".¹⁵⁰

Popper remarked that, "it is through our theories that we learn to observe, that is to say, to ask questions which lead to observations and to their interpretations."¹⁵¹ It may not be a mistake to say that it is also through our theories that we learn how to make instruments, to ask questions which lead to the making of the observation instruments. If one would follow the Popperian position that there is no accidental observation, it can be said that in the case of instruments, both Jansen and Lippershey were guided by questions which led them to observations and finally to the invention of the microscope and the telescope respectively. 'Is it possible to see objects so tiny to be clearly seen by the naked eye?' - Jansen could have asked. 'Is it possible to see objects so far to be clearly seen by the naked eye?' - Lippershey could have questioned. Their inventions certainly led to the improvement of the then existing instruments for observation. However, people having the same persuasion as Jansen and Lippershey brought the questions to a more extended degree. Therefore, ultra-microscopes and high-powered telescopes were invented.

Finally, the growth of observation knowledge goes with the advancement of theories. "Crucial questions which may lead to answers (to observations) may decide between competing theories."¹⁵² If one theory is preferred over another, the status of the 'elevated' theory carries with it the whole system, including questions posed and the test observation. Now, as the previously preferred theory is repalced by another 'more powerful' theory, the questions posed and the test observations that went with it are presumed to be improvements of the previous ones.

The Ontological World and the Place of Observation

The following is a presentation of the three ontological sub-worlds proposed by Popper.¹⁵³

l'observateur. L'approche de Popper, au contraire, est foncièrement ontologique, avec deux thèses principales, la réalisme . . . et l'indéterminisme . . ." Cf. Jean Claude Dumoncel, "L'anti-Reductionnisme Popperien Face aux Tendances Dominantes de la Philosophie Analytique," in Renée Bouveresse et Hervé Barreau, *Karl Popper, Science et Philosophie*, (Paris: Librairie Philosophique J. Vrin, 1191). p. 110.

¹⁵⁰*Ibid.*

¹⁵¹*Conjectures and Refutations, op. cit.*, p. 248.

¹⁵²*Ibid.*

¹⁵³*The Self and its Brain, op. cit.*, p. 359.

World 1	World 2	World 3
Physical Objects & States	States of Consciousness	Knowledge in Objective sense
1. Inorganic Matter & Energy of Cosmos	Subjective Knowledge	Cultural heritage coded on matrl. substrates
2. Biology - Structure & Actions of all living Beings	Experience of: Perception	Philosophical
3. Artefacts	Thinking	Theological
Matrl. Substrates of Human Creativity, Books, Tools, Machines, Music . . .	Emotions	Scientific
	Memories	Historical
	Dreams	Literary, Artistic
	Creative	Technological
	Imaginations . . .	Theoretical Systems
		Scientific Problems
		Critical Arguments

With this structure, let us now try to fit items forming the integral elements of observation. First, let us enumerate the elements. 1) There is the observer with his system of expectations and the problems or interests or aims that have become his pressing preoccupations. 2) There is also the observation process - a perceptual experience involving the senses. 3) Then, there is the 'observable' which is a macro-physical object situated in time and place. 4) There is the instrument for observation, a microscope or a photometer. 5) Finally, there is the observation statement or report which is theory-impregnated.

The observer is a microcosm of the ontological worlds for he represents the three worlds - his body, brain and senses belong to the first world, his consciousness, to the second world; his system of expectations, theories and interests and problems all belong to the third world. Observation as a process involves the three world too. The object which is observable and the body reactions are in the first world, observation as a perception is in the second world, while theories and aims which allow the observer to make observation and not simply to have it, are in world three. The observable is a macrophysical object belonging to the first world (however, a sculpture which is man-made is a material artifact, it belongs to both world 1 and 3.¹⁵⁴ A mountain or the sea however, simply belong to world 1). Since an observation instrument is a material artifact, it belongs both to World 1 - the encoding material and World 3 - the mechanics of using the photometer or microscope and the theories behind their use. Finally, observation statements in itself, is a sole property of World three after it has been formulated in descriptive language.

Among the five elements described above as to what world they belong, observation statements are of special interest since they are the "foundations" of science.¹⁵⁵ By themselves, (after the development of the

¹⁵⁴*Ibid.*, p. 41.

¹⁵⁵P. A. Schilpp, *The Philosophy of Karl Popper*, op. cit., p. 1123.

higher functions of language, namely, descriptive and argumentative functions) observation statements are detached from ourselves and belong to world three.¹⁵⁶ When observation statements are collected in files or record books, in themselves they are both part of world one and world three. Their material composition belongs to world one but the ideas or conjectures expressed in observation statements are inmates of world three. One may say then that world 3 has been encoded in world one. Meanwhile, consciousness mediates between the two worlds in some ways. Consciousness may remember the observation statements made during 'day-8' of the experiment and here, the liaison is only between world 2 and world 3. World 2 - consciousness may also perceive in the record book, observation statements written during 'day-8' of the experiment, the liaison in this case is between world 1 and world 2. However, since perceiving in this instances does not only involve the perception of the material composition of the record book but also the 'grasping' of what the observation statements mean, therefore, the liaison is also between world 2 and world 3.

In his book *The Self and its Brain*, Popper admitted that the complete understanding of the mind-body problem is unlikely to be achieved.¹⁵⁷ But dealing on the 'ontological worlds' necessarily means touching the question on the mind-body relationship. Popper believed that with his 'tripartite division' he could hope to make the understanding of the issue clearer. With the application of the '3 world model' to observation, it is hoped that the work would have served as an instance of Popper's intention, if not, even just a source for further questions. For as Popper himself noted, "Seeing or perceiving or observing is a reaction not simply to visual

¹⁵⁶*Ibid.* Popper's proposal of World 3's (W3) objective existence has met varying philosophical sentiments. Bryan Magee was all praise to the concept of a man made yet autonomous 3rd World. He considers W3-hypothesis as "a most promising growth point". Cf. Bryan Magee, *Philosophy and the Real World. An Introduction to Karl Popper*, (La Salle: Open Court, 1985), p. 62. Tom Settle, following the same thread of sentiment, has a high esteem for the W3 proposal so much so that after analyzing the arguments of L.J. Cohen against Popper's W3, he concludes that even if Cohen is right, Popper's W3 hypothesis is not damaged nor undermined. Cf. Tom Settle, "Comments on Farr's Paper III. Is Popper's World 3 an ontological extravagance?" in *Philosophy of Social Science*, 13 (1983), p. 199. See also L. J. Cohen, "Some Comments on Third World Epistemology," in *The British Journal for Philosophy of Science* 31, (1980) pp. 175-180. However, W3 proposal is not all sweet appraisal. Gregory Currie estimates the proposal as less abstract than the traditional Platonism but also less coherent. Cf. Gregory Currie, "Popper's Evolutionary Epistemology: a Critique," in *Synthese* 37 (1978), p. 428. Meanwhile, John Gilroy Jr., aligns himself with critics like Susan Haack who calls the W3 theory a serious ontological extravagance (cf. S. Haack, "Epistemology with a Knowing Subject", in *Review of Metaphysics* 33 (1979) p. 325 and Paul Feyerabend who brands the W3 theory as nothing but a "chimera" (cf. Paul Feyerabend, "Review of Popper's Objective Knowledge," in *Inquiry* 17 (1975), p. 475. Cf. also John Gilroy Jr., "A Critique of Karl Popper's World 3 Theory", in *The Modern Schoolman* 62 (1985), p. 185. Finally, for M. Bunge, the W3 of Popper does not exist just as an immaterial spirit does not exist either. - "Selon M. Bunge, l'esprit immatériel n'existe pas. Le Monde 3 de Popper non plus." Cf. M. Espinoza, *Essai Sur L'intelligibilité de la Nature*, op. cit., p. 137. From these citations, it is evident that just like Popper's theory of verisimilitude, his World 3 theory is also very controversial and can easily become a subject for debate.

¹⁵⁷*The Self and its Brain*, op. cit., p. 37.

stimuli, but to certain complex situations . . ."¹⁵⁸ If an organism can react to certain complex situations, it must be made up of complex mechanisms. Thus, with everything still, as it were, complex, one may just have to continue searching for more creative questions, proposing more ingenious solutions.

Summary and Conclusion

It is true that Popper never gave a definition for observation but nonetheless, he gave a good number of descriptions. Functionally, observation fits into the system of rational criticism as tests i.e., observations test theories. Also, since the maturity of a theory follows an evolutionary Darwinian pattern, observations serve as stimuli and challenges. Formally, observations verbalized in an 'exosomatic descriptive language' may become basic statements but not vice-versa. Objectwise, observation involves macroscopic bodies, namely, the observable. But Popper does not disregard theoretical entities for after all, he insisted that all terms are theoretical. By its nature, observation statements are conjectural and fallible. Their objectivity is ensured by a scientific community engaged in critical discussion as to the choice and efficaciousness of observations. Subjected to criticism by tests, observations gain the character of rationality. Finally, Popper's fundamental assertion that "theory comes first before observation" makes him a proponent of the 'theory-ladenness' metaphor. From the fundamental assertion comes the requirement of being systematic and real. Finally, observation may be charted in the World 3 theory of Popper considering the observable object, the observer himself, the process of observation, the instrument used and the observation statement.

Although observation statements differ from theories, it appears that what Popper has exacted for theories, is the same requirement demanded from observation statements. Consequently, it goes without saying that Popper's theory of 'observation' may also gain the same popularity and attention his 'theory of theory' has -both praise and criticism, acceptance and rejection,¹⁵⁹ confusion¹⁶⁰ included. After all, Sir Karl Popper is a

¹⁵⁸P.A. Schilpp, (ed.), *The Philosophy of Karl Popper*, op. cit., p. 45.

¹⁵⁹In a Spanish daily *El País* dated Tuesday 29th of October 1991, a feature in the cultural section is entitled, "Popper pide a científicos, políticos y periodistas que reconozcan lo ignorantes que son." It is a title that has something to do with Karl Popper's citation of Socrates' slogan "Sólo sé que no sé nada" during his investiture as *doctor honoris causa* by the Universidad Complutense de Madrid. I heartily recounted this event to Fr. Joseph Maria Bochenski, OP, a highly respected philosopher who is now residing in Fribourg, Switzerland, and a good friend of Karl Popper too. Pausing for a moment, he afterwards remarked, "Where else has he not received the title *doctor honoris causa*?" He added, "By this time, he should be a good candidate for the Nobel Prize Award."

Though not losing the respect due to the Austrian-born philosopher, critics have unceasingly come to the open in order to show and explain that there is something wrong with Popper's ideas. David Papineau for instance summarizes Popper's influence by saying, "Sir Karl Popper is like Gladstone (A Good Man but a Bad Thing). He is a Good Philosopher of Science, but he has been a Bad Thing for the subsequent development of the subject." Cf. David Papineau, "Has Popper been a Good Thing?" in Kostas Gavroglu et al., *Imre Lakatos and Theories of Scientific*

philosopher who searches for a coherent point of view rather than for a common consensus. But on the other hand, if Popper has to remain faithful to the essence of openness and dynamism¹⁶¹ of his proposal, critiques will just have to be written, presented and studied seriously. In other words, all of us, including Sir Karl Popper, might as well pay respect to Socrates' slogan "Sólo sé que no sé nada."* □

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Change, (Dordrecht: Kluwer Academic Publishers, 1989), p. 431. Daniel Hausman, maintaining the same sentimental vibration, concludes that "Popper's philosophy of science is a mess, and that Popper is a very poor authority for economists." Cf. D.M. Hausman, "Hausman Paper" in Neil De Marchi, *The Popperian Legacy in Economics, Papers presented at a symposium in Amsterdam, December 1985*, (Cambridge: Cambridge University Press, 1988), p. 17. Moreover, J.F. Malherbe traces the origin of the grand difficulty in Popper's ideas from the dualism which separates acting from knowing, norms from acts . . . - " . . . Les grandes difficultés de la pensée de Popper, en épistémologie comme en philosophie, socio-politique, ont pour racine son dualisme, dualisme qui sépare l'agir du savoir, les normes des faits . . ." Cf. Jean-François Malherbe, *La Philosophie de Karl Popper et le Positivisme Logique*, (Paris: Presses Universitaires de France, 1976), p. 287.

¹⁶⁰'Confusion' provoked by conflicting views: confusions that cover issues with vagueness and therefore calling for more indepth investigation. The following instances may be cited as 'confusions'.

There is this issue about Popper's realism. Graham Oddie marks well the effort of Popper in strengthening the fortress of realism. Oddie recounts that "Popper was the first philosopher to stress the importance for realism of the concept of truthlikeness, and the necessity for realists to give the concept a rigorous explication." Cf. Graham Oddie, "The Poverty of the Popperian Program for Truthlikeness," in *Philosophy of Science*, 53 (1986), p. 163. However, in spite of the effort and Popper's 'truth correspondence theory' David Papineau accuses Popper of anti-realism for according to him, ". . . there is no attempt in Popper's thinking to tie up the principles for choosing between scientific theories with the professed aim of having true theories." Cf. David Papineau, "Has Popper been a Good Thing?" in Kostas Gavroglu et al., *Imre Lakatos and Theories of Scientific Change*, op. cit., p. 432.

Another example of 'confusion' is on the question of materialism. J. Van Rooijin notes that Popper (*The Self and its Brain*, 1977, p. 5) regards materialism as a mistake, for men are not machines. Cf. Jeroen Van Rooijin, "Interactionism and Evolution: A critique of Popper," in *The British Journal for Philosophy of Science*, 38 (1987), p. 90. However, there is J.L. Englander who considers Popper's theory of refutation not only realist but equally materialist "La conception poppérienne de la vérité objective, elle-même liée à sa théorie de la réfutabilité, apparaît donc non seulement réaliste . . . , mais également matérialiste . . ." Cf. Jean - Loup Englander, *Pour L'incertain. L'apport de Karl Popper à Karl Marx*, (Paris: éditions Syllepse et éditions Périscope, 1990), p. 53.

Finally, G. Reichberg presents as opposing critique of Feyerabend who reproaches Popper for his excessive empiricism and of W. Newton-Smith who estimates that the Popperian methodology is deficient in this regard. - "Si Feyerabend reproche à Popper un excès d'empirisme, Newton-Smith au contraire estime que la méthodologie poppérienne s'avère déficiente à cet égard . . ." Cf. Gregory Reichberg, "Popper en question quelques critiques sur la croissance de savoir", in *Revue Thomiste* 85, (1985), p. 455.

¹⁶¹This spirit of openness and dynamism is pinpointed by A. Verdan who describes Popper's proposal as never pessimistic but instead optimistic, dynamic and open. - ". . . Pessimiste par contre, est un terme qui ne convient nullement à Popper, et qu'il refuse d'aillerus énergiquement, en nous proposant de la science . . . une conception dynamique, ouvert . . ." Cf. André Verdan, *Karl Popper ou La Connaissance sans Certitude*, (Lausanne: Presses Polytechniques et Universitaires Romandes, 1991), p. 27.

*I only know that I know nothing = I just know that I don't know.