

## QUINE ON OBSERVATION SENTENCES

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### I

Quine has based many of his philosophical theses on observation sentences ascribing seven distinctive roles. First, they were probably the origin of language. Man must have used them like the call of the birds and cries of animals. Second, they are the infant's entry to language. As a new born baby, one has to depend on the observation sentences for acquiring the basic rules of language. The child learns first the one word sentence "Mama", "Milk" etc. and learns other sentences later. Third, they are the basis of translator's entry to a jungle language. A translator is different from the child in one important sense that he knows a language already. If the knowledge of the working of his own language is an advantage for an adult, then interference of his linguistic habits would be a hindrance to his learning a second language. The only way he can make contact with the alien language is by basing his hypotheses on the basis of observation sentences the way a child would do in learning a language. Fourth, they are the vehicles of evidence for our knowledge of the external world. We do speak of the objects of the world and we base our knowledge of these objects on our sense perception and the sentences that we form on their basis. Fifth, they are the shared reference-points for two theories. When we have to compare or relate sentences belonging to two different theories, the only common reference points would be the observation sentences. We will not be in a position to know whether the disagreement arising out of the difference in the perspective or the theory is about one and the same thing if we do not have objective reference points. Sixth, they are the primitive source of the idioms of belief and other propositional attitudes. Without the aid of the observation sentences, it is not possible to make statements about the beliefs and values. We behave in a certain way which is the proof of our belief and attitudes and

therefore observation sentences are to be considered primitive source of these attitudes. Seventh, their holophrastic role bears significantly on the epistemology of ontology. These observation sentences help us to identify the ontological commitments of our epistemological theses.<sup>1</sup>

Going by the list of roles that are identified with observation sentences, it is beyond doubt that observation sentences occupy central position in Quinian philosophy. Observation sentences help him to avoid two extreme and unrealistic philosophical positions: scepticism and solipsism. Apart from linking observation sentences to ontology, translation, theory, hypothesis, verification, to name a few, he relates the observation sentences to vital human abilities such as spacious present, innate ability to perceive similarity, and our ability to modify the perceptual similarity to make room for language based theoretical kinds in the process of naturalizing epistemology.

Observation sentences are contrasted with other types of sentences: occasion sentences, observation categoricals, standing sentences, eternal sentences and so on. Not all the sentences are mutually exclusive. An observation sentence "It is cold" is also an occasion. It is a sentence which is sometimes true and sometimes false. For instance, "It is raining" is true on some occasions and false on some other occasions and hence this sentence also is an occasion sentence. Thus, Quine defines an observation sentence as "an occasion sentence on which speakers of the language can agree outright on witnessing the occasion".<sup>2</sup> An example of observation categorical is "When the sun comes up the birds sing".<sup>3</sup> An observation categorical has normally two components. They are normally derived from the theory and hypothesis taken together. Moreover, some observation categoricals are also considered to be standing sentences. For example, "When a willow grows at the water's edge, it leans over the water" is a standing sentence.<sup>4</sup> Furthermore, a standing sentence can also be eternal sentence. There are also other eternal sentences. Any observation sentence by mentioning space and time can be converted into an eternal sentence. It rained on such-and-such a day at such-and-such a place can be an eternal sentence in this sense.<sup>5</sup>

On reflection, we notice that all the sentences can be clearly put into two basic groups: one, eternal sentences which include some standing universal sentences and occasion sentences with their space and time co-ordinates; second,

observation categoricals, occasion sentences which have no truth values. Strawson has drawn our attention to the distinction between a sentence and the use of a sentence. A sentence like "I am hungry" is neither true nor false unless it is uttered by someone in a context to make a statement. The same sentence is uttered by several people at different occasions for making different statements some are true and some are false. Thus, the use of a sentence, Strawson preferred to call it a statement. That is to say, the sentence in question here acts as a variable. When it is used in a context, it behaves like a constant having a definite truth value.<sup>6</sup>

Quine too makes this distinction between a sentence and the use of a sentence, but prefers to retain the term "sentence" in his discussions rather than statement for simplicity.<sup>7</sup> He also does not want to use the term "proposition" as having truth value for the same reason.<sup>8</sup>

## II

In *Word and Object* Quine had thought that there is similarity in the sense-data which results in the similarity of perception which becomes the base of objective knowledge. But this 1963 version is replaced by 1981 version of observational statements. In this version, Quine adopts the mechanism of defining objectivity for only one individual if the perceptual response is the same irrespective of the difference in the sense stimuli.<sup>9</sup> This is comparable to something that is called 'specious present'. Using this notion one can define the identity of the perceptual object. This is the same object which I had perceived earlier. Then Quine speaks of bilingual, who knows the identity of meaning of a sentence uttered in two languages.<sup>10</sup> Having achieved objectivity at the individual level, he moves to the intersubjectivity. Even here, he says that the individual differences drop out. This is because, he is no more speaking of the stimulus meaning. The notion of stimulus meaning is replaced by the notion of linguistic meaning. Here, he invokes the concept of speech community where people belonging to one community have the same language and use their language in an intersubjective manner despite there being some differences at the individual level of perception.<sup>11</sup>

In order to fully appreciate the issue at hand, we need to map the road through which Quine takes us to his grand programme of naturalizing

epistemology starting with neural intake and returning to it via backlog theory. Though he has made minor changes in certain pockets of his theory, the general outline of the theory remains the same. He is not interested in going into the actual firing of neural and other physiological processes even though he had located the base of our experience of similarity in stimulus. We do not need to go into details of the physical properties of firing of the nerve endings since we are interested in perception and knowledge, not the physical processes involved. Rightly, Quine has emphasized this point and stops his analysis at this level.<sup>12</sup> He confines his enquiry to the level where an epistemologist has a role to play. Thus, the starting point is the acknowledging the fact that we are born with some instinctive ability to recognize similarities. Recognizing similarity can be across time and across space. The ability to re-identify the object would be to recognize the similarity across time, and the ability to see similarity among several objects would be the ability to acquire a natural kind term. For instance, we have the ability to identify or re-identify the lost bag of ours. We have the ability to perceive motion when discreet resembling pictures with slight variations are screened at the rate of eighteen per second. Quine has recognized this ability which is normally identified as "specious present". The span of perception is minimum 1/16th of a second, the psychologists have measured and told us. We retain any perception for this period even if the object hits our nerve endings is less than this. This human ability is the one which is able to give us continuity of perception of objects eventually resulting in identity of the objects.

Since learning depends on perceptual similarity, perceptual similarity itself cannot be learned by using something else. Nothing this, Quine grants this basic learning of similarity to be innate. But he believes that the standards of perceptual similarity change when we advance in learning.<sup>13</sup> He ascribes the innate standards of perceptual similarity to natural selection in evolution.<sup>14</sup> Whether one accepts the theory of evolution or not, the point that Quine makes is not controversial. We have ability to recognize natural kinds is well accepted. All of us have the ability to distinguish between plants and animals; we have the ability to distinguish between palatable things from non-palatable ones; dangerous from non-dangerous ones without which the species of *Homo sapiens* would not have survived.

The epistemological significance of observation sentences lies in their ability to link our sensory stimulation with that of our theories about the world<sup>15</sup>.

Quine opines that observation sentences are not reports of sense data but they are reports of external circumstances.<sup>16</sup> Early stage in language learning involves association of words with a range of stimulation and conditioning. Observation sentences consisting of these terms are theory free. These very observation sentences can be viewed from the point of view of a theory as well. Thus, the observation sentences logically connect observation on the one hand, and theory on the other. Now the observation sentences have become theory-laden indeed. An observation sentence containing an ordinary word like 'water' can join theoretical sentences containing terms as technical as 'H<sub>2</sub>O'. Quine writes: "Seen holophrastically, as conditioned to stimulatory situations, the sentence is theory-free; seen analytically, word by word, it is theory-laden."<sup>17</sup> What this means is that the terms embedded in observation sentences recur in the theory formulations. What makes a sentences as observational is not a lack of such terms, claims Quine. He invokes the notion of global sensory stimulation to overcome the difficulty: "What qualifies a sentence as observational is not a lack of such terms, but just that the sentence taken as an undivided whole commands assent consistently or dissent consistently when the same global sensory stimulation is repeated".<sup>18</sup> What related the observation sentence to theory is the sharing of embedded terms, claims Quine.

Always we have something that is given as the established backlog theory constituted of sentences having logical connections among them.<sup>19</sup> We consider a hypothesis for possible incorporation into it. We derive observation categorical from the backlog theory and the hypothesis making use of other statements which are not controversial ones. The theory tells us that if the hypothesis under consideration is true, whenever, a certain observable situation arises, a certain effect could be observed. A theory is tested on the basis of synthetic observation categoricals. So we set up the situation in question. Thus it solves the problem of linking theory to observation, as well as epitomizing the experimental situation, says Quine.<sup>20</sup>

The theory and the hypothesis put together are said to imply an observation categorical. The derived observation sentence is called observation categorical compounded of two or more occasion sentences. It is itself an independent sentence though implied by the scientific theory and the hypothesis put together. But we do not know how to go about verifying such an observation sentence without making further distinction between *free* observation categorical

and the *focal* observation categorical.<sup>21</sup> Focal observation categorical would have the form 'Whenever ... it ...'. Quine considers the pronoun 'it' to be a vital new link between the two components of the observation categorical. In the free observation categorical, the link between the two components would not be specific. For instance 'Whenever there is a raven, a raven is black' will not help us since it shows only weak link between being raven and being black. For instance whenever there is a raven, a raven is black' is compatible with white raven.<sup>22</sup> 'All ravens are black' requires the focal categorical, for instance, 'Whenever there is a raven it is black' where 'it' is essential pronoun, and hence reification.

Observation categoricals can be observed independent of the theory; in fact, this itself is a miniature theory. Sometimes progress in science takes place without prior planning even; a scientist having no hypothesis may happen to note an anomalous phenomenon. The scientist may happen to chance on a counter-instance of an observation categorical which ought to have been true on the current theory as a whole, points out Quine.<sup>23</sup>

And if the occasion sentence turns out false, it does not prove that the theory is false.<sup>24</sup> Quine believes that different possibilities are open here. The falsity of the observation categorical refutes sometimes only the conjunction of sentences that was needed to imply the observation categorical. In order to withdraw that conjunction, one need not always withdraw the hypothesis itself.<sup>25</sup> By making appropriate modifications in the auxiliary sentences, we can save the hypothesis. Sometimes, we may make changes in both the hypothesis and the auxiliary sentences to save the accepted theory if the prediction fails. Only in the event of having no option, do we recommend the modification of the theory. Quine is of the opinion that this is the way work in science progresses.

The sharp distinction between language and theory is not possible at the level of theory, holds Quine. He is of the firm opinion that the distinction between language and theory fades away once we go beyond observational sentences.<sup>26</sup> This is the reason why he believes that certain changes are easily permitted and certain other changes are not so easily permitted by the society. When it is the case of the belief in the occasion sentences, Quine is of the opinion that we are willing to readily change our opinions, but when it is a matter of more serious kind, for instance, the change in the vocabulary, we resist

such change.

When we verify an occasion sentence, it turns out to be an eternal sentence. Quine is of the opinion that time and place are enough to identify the occasions in order to find whether an occasion sentence is true or false. The occasion sentence "It is raining" can be verified on 15th June 1997 at Mumbai. If it is known to be true that on this day it rained in Mumbai, then the sentence would be true for ever. The sentence enters the web of beliefs as an eternal sentence. An eternal sentence is one which has unchanging truth value. Even after two decades, the sentence would be true of Mumbai that it had rained on 15th June 1997. Thus, Quine remarks: 'What enter the web of the beliefs as protocol are their records, as dated eternal sentences. These depend for their credibility on whatever theory attests to the fixity of records or memory'.<sup>27</sup>

An occasion sentence is capable of producing several such eternal sentences. A simple sentence like "It is raining" can produce uncountable eternal sentences whenever and wherever it is uttered to make correct statements. Like this, other occasion sentences also would have their corresponding eternal sentences listed in our web of beliefs. Similarly, "I am hungry" also would have entered our web of beliefs with appropriate proper name replacing "I" in the sentence with appropriate co-ordinates of space and time. That is to say, for every event and every distinguishable feature of the world which can be observed, there could be corresponding eternal sentence<sup>28</sup> in our web of beliefs. All the standing sentences also do figure in our web of beliefs since they are also eternal sentences.

### III

Having acquainted with the basic terminologies that are related to observation sentences, we are in a position to appreciate philosophical issues arising out of them. Of the most striking ones, we shall begin asking some simple but important question about natural kinds. Next, we shall discuss some difficulties regarding the nature of occasion sentences, followed by the nature and status of observation categoricals.

Quine bases his argument in favour of naturalizing epistemology heavily on the innate notion of similarity. He finds it essential to have two types of

similarities: one at the level of phonetics, i.e., language and the other at the level of perception<sup>29</sup> in order to have scientific knowledge. Similarity at the basic level is provided by our innate notion of natural kind which helps us to have primitive induction. Without involving the notion of inductive generalization by simple enumeration, we can learn the notion of one crow, two crows, three crows, he claims.<sup>30</sup> But when we go beyond observation, our notion of similarity depends on language, i.e., the notion of theoretical kinds. We need to modify our notion of natural kind to make progress in science. Thus, the notion of similarity at this level is theory-laden. We have backlog theories which have several notions of theoretical kinds. As noted earlier, we derive observation categoricals from the backlog theory and the hypothesis put together. We can imagine several of such cases where the observation categorical involves the theoretical kinds, but not the natural kinds. For instance, grouping of whales with mammals; grouping of kangaroos with marsupial mice;<sup>31</sup> the scientist's account of wooden table in terms of arrangement of molecules;<sup>32</sup> describing water as  $H_2O$  are all of this type. However, the difficulty would arise when we are to verify observation categoricals involving theoretical kinds. In order to pave way to theoretical kinds, we had to modify our natural kinds. When we verify an observation sentence, we verify only that observation sentence which involves natural kinds and not theoretical kinds. Since theoretical kinds modify the natural kinds, the verification of observation sentences in terms of natural kinds is of no relevance to science. We cannot help but to use the natural kinds to perceive the world since our theoretical kind cannot modify our mechanism of sense perception at that level. We are incapable of using the specialized language of scientist at the observational level since the scientists' language involves several theoretical kinds which are theory-laden. However, Quine believes that what relates the observation sentence to theory is the sharing of embedded terms. Unfortunately, if the theoretical kinds are modified version of natural kinds, then verifying of observation categorical using sense perception is not possible.

The nature of observation categorical itself poses a different problem. Let us analyse observation categoricals to have better clarity on them. Observation categoricals are derived from backlog theory as well as arrived at in the form of primitive induction. For instance Quine writes "An observation categorical is a miniature scientific theory that we can test experimentally by waiting for



an occasion where the first component of the categorical is fulfilled, or even by bringing about its fulfilment, and then watching for fulfilment of the second component.”<sup>33</sup> There are singular observation categoricals, for instance “Sugar is sweet” and there are complex observation categoricals having two components, for instance “When the sun comes up the birds sing”. The question is about the nature of these observation categoricals. Should we take an observation categorical to be a singular sentence or a compound sentence having several conjuncts as its implicit parts? It is possible to view “Sugar is sweet” to be a singular sentence in the sense that it takes either of the values true or false; and speaking of degree of truth value would not make sense here. It is also possible to treat this sentence to be a compound sentence constituted of all the several observation sentences. For instance, “This sugar is sweet” and “That sugar is sweet” .... and so on without missing a single occasion where the sentence could be used. Thus, the components of this sentence would consist of all the possible situations where we could use the sentence “Sugar is sweet”. Of course, a compound sentence is said to be false even if one of the components is found to be false. One could prove that the observation categorical “Sugar is sweet” is false with one observation if this analysis is correct. However, to verify fully and establish the truth of this observation categorical would never be possible since there would always be the cases which are unobserved since time would have never come to an end. Moreover, if the observation categorical is derived from the theory, the theory cannot give us *a priori* the number of applications that the observation categorical would eventually have.

The other possibility is that the observation categoricals are complex but singular sentences in the sense that they take only one truth value either of the values true or false. If this is the correct analysis of observation categoricals, then even one predicted observation sentence is verified, the theory is justified since the sentence does not permit us to ascribe the degrees of truth. This further implies, contrary to what Quine believes, that there is no need to continue the process of confirmation if the theory is once verified. Moreover, the thesis that observation categoricals are not compound sentences but are individual sentences with binary values goes well with the feeling that science consists of eternal sentences, i.e., sentences which is true once and for all. It was quite soothing to believe that scientific theories are consistent and dependable.

A theory in science is a web of standing sentences which are said to be true once and for all.<sup>34</sup> The set of all the standing sentences include all those observation categoricals which are incorporated into the theory after verification. Of the two eternal sentences, i.e., the true observation sentences with their spatio-temporal co-ordinates and the standing sentences which constitute the backlog theory, the latter are dubious eternal sentences. The observation categoricals, which are standing sentences by virtue of their being part of the backlog theory are said to be eternal sentences even though they are synthetic. Their truth value does not depend on the meaning of the constituent words, nor in their sentential structure. Paradoxically, such eternally true synthetic sentences are considered to be true till they are proven to be false. When they are proven to be false, we do not say that those sentences were true but became false. "We say that to our surprise it was not true after all".<sup>35</sup> We never accept that standing sentences change their truth value since they are eternal sentences.

The thesis that a single observation sentence can falsify the observation categorical, is dubious. Some facts of scientific practice are to the contrary. We have several cases of natural laws having exceptions. For example, when the temperature increases, the density of the material decreases is a law. But, the behaviour of ice is an exception. Density of ice is maximum at 40°C and it has less density at the lower temperature. We also know that electrical resistance of a metal or alloy is a function of temperature decreasing as the temperature falls and tending to zero at -273° C. But it is found that for certain metals and alloys, e.g., lead, tin and vanadium, the resistance changes abruptly becoming vanishingly small at a temperature close to a few degrees above -273° C. This phenomenon is called superconductivity. The law of conservation of mass states that mass can neither be created nor destroyed. However, exception to this law is found in the case of nuclear fission where the new particle called neutrino gets created. Ohm's law states that  $V = RI$  where  $V$  is voltage,  $R$  is resistance and  $I$  is electric current. Exceptions are found to this law in the case of semiconductors. Given this law, if the temperature is kept constant the resistance should not increase, but we find that in the case of some semiconductors that increase in current results in the increase in the resistivity. What these examples indicate is that since certain laws of nature have exceptions an observation categorical or a standing sentence cannot be falsified with one example. A counter instance, would make us modify our hypothesis such that the exception

is not found or accept the hypothesis as a part of the theory with stated exceptions.

Quine links *free* observation categorical to *focal* observation categorical so that one can verify the observation categorical without much difficulty. For instance the focal categorical "Whenever there is a raven, it is black" is different from the free observation categorical "All ravens are black". The two occasion sentences "It is a raven" and "It is black" are linked with essential pronoun "it" in the focal categorical. Quine is of the opinion that we cannot go and verify free observation categoricals since they have the generalized form. However, what the pronoun 'it' does in the focal observation categorical is to link the subject of the one component of the sentence with that of the second component of the same sentence. The pronoun 'it' does not work as a demonstrative pronoun and hence does not link the observation categorical with that of observation sentence. For example, if one does not know which bird is called 'raven' 'Whenever there is a raven, it is black' is of no help for verification. Neither the word 'raven' nor would the pronoun 'it' would help us to identify the ravens if we do not know what it is to be a raven as a natural kind.

To overcome the difficulty of linking observation sentence with that of observation categorical, we need to invoke the notion of occasion sentences. "An observation sentence is an occasion sentence that the speaker will consistently assent to when his sensory receptors are stimulated in certain ways, and consistently dissent from when they are stimulated in certain other ways".<sup>36</sup> Thus, it looks as though Quine links observation sentence to the sensory receptors. However, the occasion sentences have different truth values in different contexts. The two values of assenting to and dissenting from do not seem to serve the purpose without selecting and rejecting firing of sensory receptors. Noting this Quine says "many of the receptors will be irrelevant to any particular sentence; but this excess is harmless, concealing out. Only the relevant receptors will be triggered on *all* the occasions appropriate to the sentence in question".<sup>37</sup> Given this account of what is the link between an occasion sentence and the sensory receptors, it would be possible to link *focal* observation categorical with that of occasion sentence. One has to observe what the responses are. When the first component is assented to whether the second component of the *focal* observation categorical is also assented or not. If there is consistency in their assent or dissent from in different contexts, then

accordingly the observation categorical is verified or falsified.

Quine shows how perspectives can alter our notion of similarity. For instance, we perceive three dimensional objects in two dimensional space. We perceive slanted figure as rectangle. "Still they will be perpetually similar, for we have a learned or instinctive propensity to associate perspective".<sup>38</sup> Our ability to perceive modified similarity is very limited. Despite the change in perspective, we will not be able to change our perceptual similarity beyond a point. Moreover, perceiving similarity within a perspective does not give us the objective ground which we are searching for verification. The observation sentence which would verify the observation categorical if it involves perspectivised similarity, then the theory would be valid only to those who adopt this perspective. It would be like Kant's spectacles. If we look at hills and valleys through red glasses, all objects would look red. Thus, the occasion sentences meant to verify the observation categorical cannot be theory free.

The above account is quite satisfactory if the observation categorical uses terms which are natural kinds and not the modified natural kinds. However, when we reach the advanced level of development in science, we do not use natural kinds and we use modified natural kinds. The similarity notion is no more dependent on the sensory receptors, but on the language or theory. If anything that guides the perception, it has to be these theoretical kinds. In such a situation, if one looks for consistency in assenting to or dissenting from to an occasion sentence, one is only looking for regularity in human behaviour. Quine had made the problem of induction redundant when he spoke of primitive induction and the innateness of natural kinds. However, by modifying the natural kinds and replacing them with global sensory receptors he has invited the problem of induction again. The strength of the evidence would depend on the number of occasions where we have tested the occasion sentence. It is now the same as induction through simple enumeration.

#### IV

We would be quite happy to go with Quine that the statements in science are to be considered as eternal sentences. And the data that verifies these eternal sentences themselves are observational sentences with their time and space co-ordinates and thus are to be presented as eternal sentences. Thus, the theory

and observations have the eternal relationship as long as none of them are rejected either on the basis of logical inconsistency in the theory or error in perception due to some psycho-physical factors or due to systematic distortions. If one notices counter example to the theory, one need not reject the theory in many contexts. In fact it becomes a new challenge for the scientists having the following issues to be settled: how to account for previous observations, what aspect of the theory to be modified, whether counter instance has to be accepted as valid or declare the result as some distortion or whether to treat it as an exception. Quine is better in this respect in comparison to Grunbaum in holding a better version of his holistic theory. Of course, what Quine points out is a logical point that if conclusion is false, that does not imply that all the premises are false. It is possible that the hypothesis which figures as one of the premises is false as it stands and is in need of modification and the backlog theory can be retained as it is, opines Quine. We would like to make an entirely different point. When a counter instance is found, the scientist is made to reconsider everything: backlog theory, hypothesis, the present counter instance and the past evidences. As an observation sentence, the present counter instance has as much evidential validity as that of the previous ones which had justified the theory. To acknowledge the present observation sentence as counter evidence to the theory is equally a challenge about the previous observation sentences which have supported the theory. The scientist has the obligation to show not only why he considers the theory to be false but also the status of those observation sentences which have supported the theory. Obviously, if several observation sentences have supported the theory, how can a few counter instances have higher epistemic status that they are able to falsify the theory? would be a legitimate question. That is to say, the scientist has to show how the past and present observations are consistent granting some backlog theory. If he rejects the theory on present observations, then the past observations which supported the theory might serve as counter instances. If both observations past and the present are considered together, they do lead to anomalous situation till we are able to invoke new hypothesis which can explain both : past and present observations.

What the counter instance does is to show an anomalous situation. Even one evidence is enough to show the limitation of the theory, Certainly, the counter evidence does this, but it does not necessarily falsify the theory. It only indicates that the scientific community cannot claim that it is rational and yet

maintain that all the three hold, namely, the backlog theory, the evidences that have supported it in the past and the counter evidence that is observed now. The counter evidence forces a decision. A decision has to be taken by the scientific community. What decisions they would take cannot be predicted. It could be that they find the law not a strict law. For instance, Ohm's law is not taken as a fundamental law of nature, since it applies to certain substances under certain conditions. Or the decision could be in favour of a new theory which is wider in scope, capable of accounting for both earlier evidential statements as well as the counter instances. Einstein's theory of relativity is said to be one of this kind which explains all the observations that are made in Newton's theory as well as the anomalous observations made regarding fast moving celestial bodies. Or one might declare certain phenomena as only apparent. For instance all the errors occurring in visual perceptions due to the change in the behaviour of light while changing the medium. The observation is normally dubbed as optical illusion, and thus not to be trusted. Sometimes, certain errors are taken to be errors in measurements. For instance, Heisenberg's uncertainty principle states that the velocity and the position of an electron cannot be measured simultaneously and precisely.

### NOTES

1. Quine, W. V., "In Praise of Observation Sentences" *The Journal of Philosophy* Vol. 90, 1993, pp. 110-112. In "The Nature of Natural Knowledge" in S. Guttenplan (ed.) *Mind and Language*, Oxford : Clarendon Press, 1975 p. 72 Quine speaks of three important features of an observation sentence : First, its truth value varies with the circumstances prevailing at the time of the utterance. Second, its truth must depend on intersubjectively observable circumstance. Third, the witness must in general be able to appreciate that the observation which they are sharing is one that verifies the sentence.
2. Quine, W. V., *Pursuit of Truth (PT)* revised edition, Harvard University Press, Cambridge, 1992, p. 3.
3. *PT* p. 12.
4. *PT* p. 10. Quine also makes the distinction between standing sentences and eternal sentences.

5. *PT* pp. 78-79.
6. Strawson, P. F., "On referring" in *The Philosophy of Language*, edited by A. P. Martinich, OUP, 1985, p. 223.
7. Quine, W. V., *Theories and Things (TT)*, Harvard University Press, Cambridge, 1981, pp. 31-34.
8. Quine, W. V., *From Stimulus to Science (FSS)*, Harvard University Press, Cambridge, Mass., 1995, pp. 77-78.
9. Quine, W. V., "Three Indeterminacies" in *Perspectives on Quine* Edited by Robert Barrett and Roger Gibson, Basil Blackwell, 1990, pp. 3-4.
10. *FSS* pp. 78-81.
11. *Three Indeterminacies*, p. 3.
12. *Three Indeterminacies*, p. 3.
13. *FSS* p. 19. What is to be noted is that the change in perceptual similarity is not because of the change in the innate abilities of ours, but because of the change that is brought about by our new perspectives and their concepts.
14. *In Praise of Observation Sentences*, p. 113.
15. *Three Indeterminacies*, p. 2.
16. *Three Indeterminacies*, p. 2.
17. *PT* p. 7. For detailed discussion on Observation Sentences, also see, *FSS*, pp. 22-24.
18. *TT* p. 26
19. *TT* pp. 2-3.
20. *Three Indeterminacies*, p. 8. Also see *PT* pp. 4-5. Also see *FSS*, pp. 43-45.
21. *FSS* pp. 27-28.
22. *FSS* p. 28.
23. *Three Indeterminacies*, pp. 10-11.
24. Quine says that verification is a difficult process, but falsification can be decisive: "refutation of an observation categorical by an observed counter-instance. This is how some of our false inductions get weeded out, and how science keeps a grip of reality. In principle, a hypothesis can be tested, if at all, by deducting an observational categorical from it in conjunction with auxiliary laws and then testing the categorical". W. V. Quine, "Responses", *Inquiry*, 37, 1994, p. 503.

25. *Three Indeterminacies*, p. 10.
26. *Responses*, p. 501.
27. *Responses*, p. 502.
28. *TT* p. 26.
29. *Natural Kinds*, p. 32.
30. *FSS* p. 28, *TT* p. 27
31. *Natural Kinds*, p. 40.
32. *TT* pp. 28-29.
33. *FSS* p. 26.
34. *TT* p. 26.
35. *FSS* p. 67.
36. *TT* p. 25.
37. *TT* p. 25.
38. *FSS* p. 19.