UNIT 2 EPISTEMIC HOLISM AND THEORY LADEN OBSERVATIONS

Contents

2.0 OBJECTIVES

Richard Rorty's claim about the demise of epistemology (seen in the last unit) is based on incommensurability or the impossibility of a neutral framework within which cognitive disputes can be resolved. And the main reason cited for incommensurability is the hermeneutic circle. Hermeneutic circle, having at once a component of understanding and a component of knowledge, involves semantic holism as well as epistemic holism. Of these, we examined the semantic holism in the last unit and found that it does not have kind of lethal quality that would make understanding an alien language impossible. What remains to be examined is epistemic holism to see if it leads to incommensurability. We shall do that in this unit. Its basic purpose is to introduce the students to the question whether claims to incommensurability and the impossibility of epistemology follow from epistemic holism. In the process we shall examine various versions of epistemic holism and claims to theory laden observations –from the confirmation holism of the Quine-Duhem thesis to Rorty's claim that epistemic justification is a matter of social convention.

2.1. INTRODUCTION

Ordinarily we take direct experience (in the form of observation and perception) as the ultimate test of something being true, and hence basic to epistemology. The assumption is that such experience, also called empirical evidence, provides the neutral grounds on which we can decide the truth of contested truth claims. But it has become common place in contemporary philosophy to say that observations are not neutral, that they are theory laden. If so, epistemology would seem to be impossible as there are no neutral grounds on which to determine the truth of statements. This is epistemic incommensurability. Does this conclusion really follow? In order to answer this question we need to examine epistemic holism, i.e., holism regarding justification of beliefs which comes in various hues and colours. We shall begin with confirmation holism, one version of epistemic holism, and move on to the different versions of theory laden observations that supposedly make epistemology impossible.

2.2 CONFIRMATION HOLISM

Confirmation holism is also called Quine-Duhem thesis after its proponents. Pierre Duhem suggested that the truth of individual statements cannot be determined apart from the theory of which they are parts. W.V. Quine (whose theory of radical translation we studied in the last unit) extended the idea and argued that not only single statements, but even single theories cannot be tested in isolation from other theories, and even from the whole of science. Taking Duhem and Quine together, confirmation holism is the view that individual statements or theories cannot tested for truth in isolation from other sentences and theories in the background. A sentence or a theory or hypothesis is always a part of a larger whole and can be tested only within that larger whole. In the words of Quine, "our statements about the external world face the tribunal of sense experience not individually but only as a corporate body." This has the consequence that no individual observation can fully determine the truth or falsity of any given theory. Because of this consequence, confirmation holism is also known as the underdetermination thesis, the idea that a theory or hypothesis, taken in isolation from other theories or hypotheses cannot be tested by observation to determine its truth. It is another way of saying that "rival theories of the world can be equally warranted by observations": the same observational evidence can support rival theories of the world.

Consider an example. Astronomers of the 19th century observed that the planet Uranus did not follow the path predicted by Newton. If observations were to determine the truth of a theory, then, this observation should have been taken as indicating the falsity of Newton's theory. But this could not be taken as a straightforward evidence for the falsity of Newton's laws because there were other possible explanations: there could be some as yet unknown factor that makes Uranus behave the way it did; it may also be the case that God was making nature behave in this peculiar fashion to expose the hubris of modern science. The point is that observation is not directly keyed on to any one theory; there could be alternative theories that explain the evidence. Eventually not rejecting Newton's theory turned out to be wise. The observed deviant behaviour of Uranus was indeed caused by an unknown planet affecting the path of Uranus; and that planet (Neptune) was discovered in 1846.

2.3 IMPLICATION: COHERENTIST JUSTIFICATION

Implication of not being able to test any single theory in isolation is that an unfavourable test result cannot be taken as the refutation of one's favourite theory; it can always be argued that the unfavourable result is due to the falsity of another theory. To quote Quine again, "the total field [of science] is so underdetermined by its boundary conditions, experience, that there is much latitude of choice as to what statements to reevaluate in the light of any single contrary experience." This questioning of any *direct* link between theory and observation is significant because it undermines foundationalist metaphor of knowledge as an edifice that is built brick by brick on the firm and unshakeable foundation of observations. Confirmation holism tells us that our beliefs and our theories are not individual stand-alone items but always in relation to other beliefs and theories. The foundationalist metaphor now comes to be replaced with the boat metaphor, given by Otto Neurath.

We are like sailors who on the open sea must reconstruct their ship but are never able to start afresh from the bottom. Where a beam is taken away a new one must at once be put there, and for this the rest of the ship is used as support. In this way, by using the old beams and driftwood the ship can be shaped entirely anew, but only by gradual reconstruction.

This mode of justification is called coherentist justification. This metaphor and coherentist justification could be understood in different ways, some more problematic than others. There is one form of coherentism that leads to extreme relativistic conclusions. Relativism also comes in various forms. Epistemological relativism denies that there could be any universal agreement on matters of truth. Denying the possibility of universal agreement, it holds that truth or falsity of a statement is relative to a social group or individual. Our interest is in finding out whether coherentist justification necessarily leads to this kind of relativism, and if it does, what form of coherentism leads to it.

First, Neurath's boat metaphor could be taken to mean that at no point are we without any beliefs, standing on a cosmic Archimedean point to survey the different theories and evaluate them from the outside. Once we are in the middle of the sea, we cannot get to the shore to build a new ship; we do not have "God's eye view" as Hilary Putnam called it. Let us call it the "no-zero point" thesis. It is hard to dispute this thesis and has come to have general acceptance among scholars. But does it lead to the extreme form of relativism we are concerned with? It is often thought that adopting coherentism leads to this conclusion. But it need not. To see that we must realise the two different things that the modern foundationalists attempted to do. One was doing epistemology from "God's eye view", looking at all our beliefs from the outer space, as it were, without presupposing any beliefs. The second is privileging certain beliefs as neutral, in terms of which other beliefs were accepted or rejected. (In empirical epistemology, the privileged beliefs are observational ones). Privileging some beliefs over the others is quite different from saying that we do not begin on a *tabula rasa* (blank slate) standing outside all beliefs. Therefore, the acceptance of the "no-zero point" thesis does not mean that no beliefs –whether observational or otherwise— have a privileged status. In other words, even after rejecting the traditional foundationalist attempts to build an epistemology from "God's eye view", one can still privilege some beliefs. This would be a moderate kind of foundationalism where we are always within a "web of beliefs", to use an imagery of Quine. But the web of beliefs he talks about is not a free floating balloon that moves in whichever direction the wind blows. Our web of beliefs is usually dynamic and in that sense, surely floating in the air; but it is also firmly tethered to the earth at certain points so that the balloon is not blown away by the winds. It is this tethering to reality that makes it possible to correct errors and acquire better ways of understanding reality. And this tethering is done with the help of observation sentences in Quine's philosophy. But this moderate foundationalism is also a form of moderate coherentism because it accepts the "no zero point" thesis.

Key to differentiating this kind of moderate coherentism from the more extreme forms is that the extreme forms do not privilege any beliefs, including perceptual beliefs. And the reason for withdrawing all privileges is the alleged theory laden nature of observations; there are no "pure" observations. This is the claim that we need to examine in further detail because a version of this claim leads to unacceptable forms of relativism.

In short, confirmation holism with its implied coherentism of justification, does not lead to drastic conclusions about the impossibility of epistemology. Coherentist justification is a mode of justification, after all. All that confirmation holism, on its own, does is to make us aware that the task of justifying our beliefs does not start on a zero point, in the manner in which Descartes and other modern epistemologists tried to do. It does not do away with epistemology; it undermines one particular manner of doing epistemology, epistemology that begins with "God's eye view".

Check Your Progress I

Note: a) Use the space provided for your answer
b) Check your answers with those provided at the end of the unit

1. What is confirmation holism? Why is it called the underdetermination thesis?

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2. A moderate foundationalism is also a moderate coherentism. Explain.

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3. Confirmation holism, on its own, does not undermine epistemology. Explain.

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2.4 THEORY-LADENNESS OF OBSERVATIONS

Although confirmation holism, on its own, does not undermine epistemology, the "no zero-point" thesis of confirmation holism often goes together with a rejection of the privileging of any beliefs. It withdraws all the privileges accorded to observation. The reason for this rejection of privileges is the alleged theory laden nature of observations, that is, the view that our observations are influenced by the beliefs we already hold. One could also say that what we perceive of the world is heavily dependent on the prior theories we already believe. This is a common theme that runs through much contemporary philosophical literature. This is found in the philosophy of science of N.R. Hanson, Thomas Kuhn, Paul Feyerabend, Nelson Goodman, and others. This can be seen as the hermeneutic turn in the philosophy of science. Richard Rorty's stand on epistemology can be seen as a culmination of this trend. This is not surprising because in epistemology, at least in empirical epistemology, observational evidence is taken to be the final arbiter between competing claims to truth. So too, in science: observation is supposed to be the basis on which the truth of rival theories is adjudicated. Now if theory-ladenness of observations is true, if it is really the case that our observations are not neutral between *competing* or rival theories, but those very theories determine what we perceive, then, observation reports cannot adjudicate between rival claimants to truth. Therefore we need to examine this claim very closely.

Hanson drew our attention to the theory laden nature of observations in a very dramatic fashion. He asked us to imagine Johannes Kepler with his heliocentric view and Tycho Brahe with his geocentric view standing together on a hill watching the dawn. When they see the sunrise, do they see the same thing? According to Hanson, when they say, 'I see the sun' each mean something different. This is an excellent illustration of Neurath's boat metaphor in action. He seems to be saying not only that we cannot get off the ship (the "no-zero point" of confirmation holism) but also that all the beams of the boat are on par. Observational beliefs have no privileges because observations belong to the larger gestalt; they are not neutral. Hanson's position can be understood in this manner when he says that Kepler and Brahe do not see the

same thing. And this is the way he has been understood. Taken in this manner, not only would it make epistemology impossible, it would also rule out the possibility of radical interpretation we saw in the last unit. However, Hanson also admits that when Kepler and Brahe stand watching the dawn, "something about their visual experiences at dawn that is the same for both" so much so that "sketches of what they both see could be identical". This only goes to show the basic ambiguity surrounding theory ladenness. There are different ways of understanding theory-ladenness.

The least controversial thesis of theory ladenness is that our observations –at least the observations that can be reported and talked about— involve concepts. Sometimes when Hanson talks about theory laden observations, he seems to mean this. According to him, when we say that Tycho Brahe and Kepler "see the same thing at dawn just because their eyes are similarly affected is an elementary mistake" because being in a physical state is not the same thing as having a visual experience. He goes on to say that one of the influences on observation is "in the language or notation used to express what we know, and without which there would be little we could recognize as knowledge." This unavoidable role of "language or notation" rules out the possibility of any "pure given" in observation that can be separated from all linguistic and conceptual elements. Although the logical positivists tried to do it at one time, their own very rigorous attempts to identify such pure cases led to the realization that such "pure" observation is a chimera. If we mean by "observation" something that can be identified and articulated, then what is observed is not unilaterally determined by what is received by the senses; they are co-determined, so to say, by our existing conceptual apparatus. If we understand "theory ladenness" in this broad sense of being influenced by our conceptual apparatus, such theory ladenness would not rule out there being some observations that are neutral between *rival* scientific theories, because at least a part of our conceptual apparatus that goes into perceptual experience may be common to our species, as is the case with Quine's observation sentences we saw in the last unit.

A second way of understanding theory laden observations is to say that observations are enriched by our cumulative experience. We already saw (in the last unit) Quine giving excellent examples to show how the experienced eyes of a chemist can observe copper in a solution or an expert physician can observe hyperthyroid. One's learning obviously enters into observation in this sense. Hanson's contention about Brahe and Kepler could be understood in this fashion. He says, "the layman must learn physics before he can see what the physicist sees." Let us call it the experiential thesis. This thesis too does not rule out relatively theory neutral observations shared by the specialist and the layperson, the expert and the beginner. It is these relatively neutral observations that enter into radical translation as well as the adjudication of rival claimants to truth. Therefore, the experiential thesis too, does not affect the objectivity of knowledge and science.

A third way of construing theory ladenness is in terms of new discoveries. It says that up-to-date knowledge (learning) in a field is a pre-condition for making new scientific discoveries and breakthroughs. Let us call it the discovery thesis. The very title of Hanson's book (*Patterns of Scientific Discovery*) indicates his concern in that book, which was to comprehend and formulate a logic of scientific discovery. Does the discovery thesis affect the objectivity knowledge? In order to answer that question properly we need to take into account the distinction between discovery and justification, a distinction originally made by Hans Reichenbach. The distinction is best understood with an example.

2.5 A CASE STUDY

Our example is a landmark case in the history of medical science: Ignaz Semmelweis, working as a medical doctor in Vienna General Hospital in the 19th century, noticed the large number of women who delivered their babies in one of the Maternity Divisions of the hospital died of "childbed fever" (Puerperal Fever). A number of factors about these deaths puzzled Semmelweis, including the fact that the death rate was far higher in the First Maternity Division where medical students worked than in the Second Division where ordinary midwives took care of the women. The contrast was as follows:

Year	First Division	Second Division
1844	8.2%	2.3%
1845	6.8%	2.0%
1846	11.4%	2.7%

In order to resolve this puzzling happening Semmelweis began by considering various tentative solutions (called "hypotheses") to the problem. These were some of the possibilities he considered for explaining these excessive number of deaths in the First Division.

1. The deaths are due to an epidemic
2. The deaths are due to overcrowding in the First Division
3. The deaths are caused by the rough handling of the patients by the medical students in the course their examination.
4. The deaths are caused by fear generated by the appearance of priests ministering to the dying patients!
5. The deaths due to the position in which the women in the First Division gave birth. (Women in the first Division delivered babies lying on their backs whereas in the Second division the women delivered lying on their sides).

Now that there are many possibilities for explaining these excessive deaths in the First Division (only 5 of which are mentioned here), the question to consider is which one can be considered true. How is one to rationally accept any of these 5 beliefs or any other that is not mentioned? This is the epistemological task that confronted Semmelweis. He sets about patiently examining each hypothesis. Let us examine how he did it.

Consider the first hypothesis that the deaths were due to an epidemic. If this were true, he reasoned, how could an epidemic selectively affect the First Division and not the Second? That is not likely! Moreover, the newspapers carried no reports of an epidemic in the city. To compound matters, there were some women who delivered their babies on the way to the hospital and were brought into the First division only for postnatal care. Even among them the death rate was comparatively lower than those who delivered in the First Division. All of these militated against the first hypothesis. Therefore, Semmelweis abandoned that as a plausible explanation. The second hypothesis is also easy to check for its truth. Semmelweis noticed that the Second Division was even more crowded than the First (partly because of the bad reputation of the First Division!). Faced with this data, the second hypothesis was also given up. In a similar fashion, each of these hypotheses had to be abandoned. Semmelweis was completely at a loss.

It is then that a colleague of his began to develop symptoms similar to those of the women suffering from childbed fever and in a few days he died. The major difference was that while the women developed the symptoms after childbirth, his colleague developed the symptoms after getting a small wound in the process of performing an autopsy. This leads Semmelweis to suspect that the death of his colleague was caused by blood poisoning or what he considered as the introduction of "cadaveric matter" into the blood stream while performing the autopsy. This prompts Semmelweis to make a brilliant guess that the cause of childbed fever was the same.

Since the medical students who attended to the women in the First Division, unlike the midwives in the Second Division, often came to their maternity duty after performing autopsy on dead bodies without cleaning their hands properly, they were the carriers of infection. Semmelweis tests out this hypothesis by instructing the medical students to properly disinfect their hands prior to their examination of the women. The results were dramatic: a drastic drop in the death rate, even below that of the other Division. This leads Semmelweis to accept the last hypothesis as true. Not only did it explain the high mortality rates in the First Division, it also explained why the mortality rate among the women who gave birth on the road was lower. Although their hygienic conditions were not good, they managed to escape being infected by the medical students!

There are a number of things an epistemologist can learn from cases like this. Our primary concern is with the distinction between discovery and justification. The discovery of the real cause of the unexplained deaths originated in the accidental death of the colleague of Semmelweis and the similarity of the symptoms shown by his colleague and the women who suffered from childbed fever. Because the problem of deaths from childbed fever was weighing on him, Semmelweis noticed the similarities and suddenly the insight dawns of him that the women were dying due to infection caused by the medical students. Similarly when Archimedes cried out "Eureka!" it was because he saw something new. And in coming to that new insight, the problem that was weighing on his mind had an important role to play. Thus we can readily acknowledge that the genesis of a new discovery involves a new kind of seeing, a change of gestalt that Hanson insisted upon.

Then comes the justification. Just because a brilliant idea occurred to him, Semmelweis does not accept it as true; it is accepted only when evidence confirms it. This process can be said of epistemic justification in general. The concern of justification is not so much with how one comes to entertain a belief or hypothesis, but with examining if it is true. Origins of a belief may be as lowly as a lucky guess (as in the case of Semmelweis), a sudden insight (as in the case of Galileo or Archimedes) or the result of a long drawn out empirical study. But what matters to epistemology is not how an idea originates, but how it is justified.

It is not that discovery and justification can be separated. The point is that that discovery always contains an element of irrationality, a moment of creative intuition, as Karl Popper observed in his *Logic of Scientific Discovery*. But this intuition comes to be accepted as true only on the basis of justification which "operates as a kind of controlling device, a sort of feed-back" on the original intuition. This feedback, the evidence on the basis of which a hypothesis comes to be accepted as true, is based on logic and observations that are neutral between rival theories. We shall explore the role of logic in the process in the next unit. What is important for now is that the kind of observation that plays the role of evidence in justification is not the highly ramified type where we can say that Kepler and Brahe are seeing different things, but of the kind that Hanson acknowledges as the same for both. It is similar to the kind of observation (if not the same) that we noted in the context of radical translation, the kind that is more or less common to us as a species. Thus we are led to conclude that our observations are indeed theory laden in three different ways, but none of them undermine the possibility of objective knowledge.

Check Your Progress II

Note: a) Use the space provided for your answer

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

1. What is the argument from theory ladenness of observations to the impossibility of epistemology?

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2. What are the three different ways of construing theory-laden observations that do not undermine epistemology?

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3. Explain the distinction between discovery and justification.

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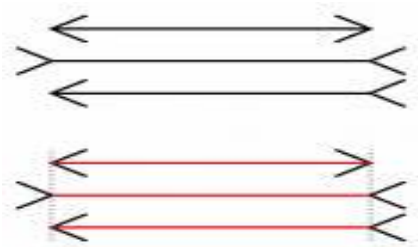
2.6 THEORY-LADENNESS AND JUSTIFICATION

The only kind of theory ladenness of observations that undermines epistemology is the one that rules out the possibility observations that are neutral with regard to *competing* theories in the context of justification. Hanson, Kuhn, Feyerabend and Rorty are often considered to be saying that there are no neutral grounds on which to decide between rival scientific theories. We saw Rorty's claim (in the last unit) that epistemology is impossible because it requires a neutral framework and no such framework is available; different discourses are incommensurable. Rorty takes over the thesis of incommnensurability from Thomas Kuhn's *Structure of Scientific Revolutions*. But whether Kuhn's thesis of incommensurability rules out rational choice of theories is a matter of dispute, to the extent that Kuhn once said, "I am not a Kuhnian"!

But Rorty draws together the contentions of coherentism and incommensurability in a specific manner to argue for the impossibility of epistemic justification. His argument regarding justification comes in two forms. One is a negative thesis and the other positive. The negative thesis is that "nothing counts as justification unless by reference to what we already accept, and that there is no way to get outside our beliefs and our language so as to find some test other than coherence." We have seen that coherentism, on its own, need not lead to conclusions about the impossibility of epistemology. But since he combines it with incommensurability, it would mean that different groups of people and people in culturally different societies have different antecedent beliefs that are incommensurable. Since justification is done in terms of these incommensurable beliefs, it is not a neutral process. There are no neutral grounds on which rationality of incommensurable beliefs can be examined. This form of coherentism, therefore, leads to relativism. If so, not only are we like sailors in the sea, but we are like sailors making different voyages in different ships. This is a fourth way of construing the theory laden observations. His more positive thesis claims that justification is a matter of social conventions and not a matter of allowing reality a say in determining the truth of our beliefs.

How warranted is his negative claim? Given his rhetorical style, it is not easy to discern if Rorty is really doing away with truth and justification or merely dramatizing the impossibility of old



engineering journal suggested that this collapse could have been avoided, had the engineer taken into account the documented series of wind failures in similar bridges. But the engineering fraternity was furious with the author of the article and he was made to recant because they saw it as a slur of their professional behaviour. Allen concludes that such examples should "disabuse philosophers of the notion that knowledge is nothing but the consensus of professional peers… What experts agree is well done need not be so, nor need what they call knowledge be the real thing." Reality has the final say in matters of truth; it can trump even the agreement of the best of experts.

Check Your Progress III

Note: a) Use the space provided for your answer

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

1. What are the two versions of Rorty's claim about justification?

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2. Indicate the evidence to show that the claim about the impossibility of theory neutral observation relevant to epistemology is false.

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3. Give an example to show that social conventions do not determine truth.

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2.7. LET US SUM UP

In this unit we considered different forms of epistemic holism to see if they undermine objective knowledge and lead to relativism. Confirmation holism is seen to undermine the form of epistemology that begins on a zero point, but does no serious harm to objective knowledge. Examining five different versions of the claim regarding theory laden observations we saw that three of them do not really rule out theory neutral observations and do not lead to relativism. Two versions, if they were true, could have been lethal to objective knowledge and led to relativism. But both these versions are seen to be untenable. Thus we can conclude that the argument from epistemic holism to the death of epistemology is exaggerated. Observations are indeed theory laden in various ways. But none of them rule out there being a class of observations that are relatively theory neutral.

2.8. KEY WORDS

Epistemological Relativism is the denial that there could be any universal agreement on matters of truth. More positively, it is the view that truth or falsity of a statement is relative to a social group or individual.

"God's eye view" is the name given to the view that claims to have knowledge that only God would have. Hilary Putnam used it describe the foundationalist ambition seeking to get away from the human limitations and have knowledge of the world from the outside, as it were, without any prior beliefs to begin with.

2.9. FURTHER READINGS AND REFERENCES

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2.10. Answers to Check your Progress

Answers to Check Your Progress I

1. Confirmation holism is the view that individual statements or theories cannot tested in isolation from other sentences and theories in the background. A sentence or a theory or a hypothesis is always a part of a larger whole and can be tested only within that larger whole. It is also called underdetermination of theory by observation because confirmation holism has the consequence that no theory or hypothesis, taken in isolation from other theories or hypotheses cannot be tested by observation to determine its truth.

2. Traditional foundationalists attempted to do two things. One was to do epistemology from "God's eye view", looking at all our beliefs from the outer space, as it were, without presupposing any beliefs. The second is privileging certain beliefs as neutral, in terms of which other beliefs were accepted or rejected. A moderate foundationalism reject the "God's eye view" but still considers some beliefs as privileged. But this moderate foundationalism is also a form of moderate coherentism because it accepts all justification is done within a web of beliefs, without giving all the beliefs in the web the same status.

3. Confirmation holism is the view that individual statements or theories cannot tested for truth in isolation from other sentences and theories, of which they are a part. It leads to coherentist justification, which is still a mode of justification of beliefs. All that confirmation holism does, on its own, is to make us aware that the task of justifying our beliefs does not start on a zero point, taking single beliefs in isolation from other. It does not do away with epistemology; it undermines one particular manner of doing epistemology, epistemology that begins with "God's eye view".

Answers to Check Your Progress II

1. Epistemology, especially empirical epistemology and philosophy of science hold that observational evidence is the final arbiter between competing theories and claims to knowledge. This would be possible only if our observations are neutral between the competing theories. If theories determine what we perceive, then, observation reports cannot adjudicate between rival theories. This way theory ladenness of observations undermine epistemology and the possibility of objective knowledge.

2. There are versions of the doctrine of theory ladenness that do not undermine epistemology. One version merely says that our observations and what we report about them, requires concepts. In this version "theory" means concepts. This kind of theory ladenness is generally accepted by all in contemporary philosophy. But it does not undermine the neutrality of observations. A second version that does not undermine epistemology is the experiential thesis. It says that observations are enriched by our experience; "the layman must, learn physics before he can see what the physicist sees." This too, does not undermine epistemology since it does not rule out there being other observations that are more neutral. A third version says that learning in a field is a pre-condition for making new discoveries and breakthroughs in that field. This discovery thesis too does not undermine epistemology as long as the alleged discovery can be substantiated or justified by means of more neutral means.

3. Discovery is about the genesis of a new idea or theory or hypothesis. The concern of justification is not so much with how one comes to entertain a belief or hypothesis, but with examining if it is true. Origins of a belief may be as lowly as a lucky guess, a sudden insight (as in the case of Galileo or Archimedes) or the result of a long drawn out empirical study. But what matters to epistemology is not how an idea originates, but how it is justified.

Answers to Check Your Progress III

1. Rorty's claims regarding justification comes in two forms. One is a negative thesis and the other positive. The negative thesis is that "nothing counts as justification unless by reference to what we already accept, and that there is no way to get outside our beliefs and our language so as to find some test other than coherence." When this is combined with incommensurability, it implies that there are no neutral grounds on which rationality of incommensurable beliefs can be examined. His more positive claim is that justification is a matter of social conventions and not a matter of allowing reality a say in determining the truth of our beliefs. It is a matter of "cultural politics" "than a transaction between 'the knowing subject' and 'reality'".

2. There are at least three factors that show that the claim about the impossibility of theory neutral observations is false: the possibility of radical interpretation, Muller-Lyer illusion, and actual scientific practice. All the three show that there are comparatively pure cases of observation that are not penetrated by competing theories.

3. When Tacoma Narrows Bridge was built in 1940, the American structural engineers would have readily agreed that it was twentieth century engineering at its best. But bridge collapsed within months of its opening because the engineers had neglected to take into account the known effects of wind. It shows that reality has the final say in matters of truth; it can trump even the agreement of the best of experts.