
UNIT 4 PERCEPTION NATURALIZED

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4.0 OBJECTIVES

Having learned about the naturalised epistemology, especially the methodological continuity between sciences and epistemology, we shall try to apply the method so as to see how it works in practice. This unit has the following objectives:

- Application of method
- Demonstrate the inter-disciplinary character of the method
- Suggest an up-to-date theory of perception

4.1 INTRODUCTION

We saw that Quine's idea of naturalized epistemology as "science self-applied" is particularly significant in the background of the internal conflicts in epistemology. Although epistemology seeks to sit in judgment over disputed questions of truth, in reality it ends up engendering even more disputes and contentious claims. One such topic is perception. Philosophers, especially from the seventeenth century, have spent an extra-ordinary amount of time discussing perception. The reason for such preoccupation with perception is not far to seek. This was the time when theology lost its crown as the queen of sciences to the more empirical sciences. These new disciplines, in the final analysis, were dependent solely on sense experience for getting information about the world around us.

Such intense focus on perception gave rise to various theories ranging from George Berkeley's *esse est percipi* (to be is to be perceived) to G.E. Moore's defence of common sense. Given the variety of competing theories, perception

is an excellent candidate to which naturalised epistemology can legitimately say, “Physician, heal thyself.” It is also a fit candidate in as much as it comes at the intersection of various disciplines like philosophy, psychology and phenomenology, to mention just a few. We shall apply, therefore, the principles and procedures of naturalised epistemology to perception to see what theory of perception is adequate to the phenomena relevant to the problem of perception.

4.2 WHAT IS PERCEPTION?

Perception tends to get defined in two different ways: either in terms of the senses or in terms of immediacy. It is commonly associated with the kind of knowledge we get about our surrounding world through our senses –seeing, hearing, touching, tasting and smelling. (Although there is a tendency to think of perception solely as vision, knowledge by means of any of the five senses is understood to be perception). It is for this reason that perception is defined in terms of the senses as sense-experience or sensory knowledge.

While this definition is true for the most part, it is not perfect. What about our awareness of ourselves? What about our awareness of our own inner states, like knowing that I am angry? None of the five senses are involved in the process. Still they are considered perception. What is typical of perceptual knowledge, then, seems to be that they are immediate. They are not mediated through other knowledge, as in inference or testimony. Defining perception as “immediate knowledge” than as sense-knowledge has the added advantage that a group of phenomena that is known as extra-sensory perception (ESP) or what the Indian traditions call yogic perception also gets included as perception, since they are also immediate knowledge. (Please note that yogic perception is not necessarily be limited to yogis; yogis have merely developed an innate human capacity to a greater degree).

Although perception is best understood as immediate knowledge, practically all discussions of perception in Western philosophy are done in the context of empirical knowledge. Considered in this manner perception tends to get defined as knowledge by means of senses or introspection. We shall limit our discussion of perception to such knowledge which is immediate and ordinary, and leave out discussion of ESP. We shall further limit our discussion to visual perception, for the most part, although much of what is said in this connection will also be applicable to others.

4.3 AN OVERVIEW OF THE DIFFERENT THEORIES OF PERCEPTION

Since naturalized epistemology is suggested as a remedy for the internal conflicts in epistemology where instead of resolving cognitive disputes it tends to give birth to more disputes by producing more contentious theories, it is appropriate that we begin with a review of the different theories we have already studied in an earlier unit.

Let us begin with realism. Realism is not primarily an epistemological theory, but an ontological theory, a theory of what exists. It holds that the world exists independently of our knowledge of it. The world of objects (apples

and oranges, stones, and trees) and events (earth quakes and tsunamis, sunrise and sunset) exist irrespective of whether anyone perceives them or not. Of course there are some objects and events that would not exist if there were no human consciousness to bring them about (e.g., tables and chairs, wars and weddings). But underlying such artefacts and events there is a world that is independent of each and every human being. This is realism, as opposed to idealism which holds that the world exists only in relation to consciousness.

Our concern is with realism as a theory of perception, a mode of knowing. The first component of realism as a theory of perception is ontological realism or the view that there exists a mind-independent reality to be known. As a theory of knowing, realism must explain how we come to have knowledge of that mind-independent reality. How does the ontological reality become an epistemological reality? It becomes epistemological reality when a knower becomes aware of it or when the ontological reality somehow enters consciousness. This, then, is the second component in any knowledge: awareness or entry of an independent reality into the consciousness of the knower. Awareness, obviously, is not something material. Aristotle therefore described perception as a matter of the mind taking the form of the object without its matter. When I am aware of a cat on the mat, it is not the material cat that enters into my mind but only its immaterial form.

If what enters into consciousness is true knowledge of what is out there, then what has entered into consciousness must indeed represent what is out there. It must indeed be the cat there on mat right now, not my memory of a dead cat that used to sit there or my imagination of a kitten that may sit there in the future. In other words, my awareness or representation of the mind-independent reality must correspond to the reality. Correspondence theory of truth, therefore, is a third component of realist theories of perception.

Such correspondence between what is in consciousness and what is in the world can come about only if my awareness is somehow be causally related to the perceived reality. Such causal connection between knowledge and reality is a fourth element of the realist theory of perception. So far there seem to be no serious problems. Problems and contentious theories of perception enter the picture along with foundationalism of the modern period. It begins with the common place observation that our perception is not always reliable, that our senses do deceive us sometimes. This is a common observation known to all, but it did not have the kind of implications it came to have with the modern thinkers. From this observation they go on to doubt *all* perceptual knowledge and asks whether *any* of our perceptions is reliable. The many theories of perception that cropped up during the modern period are, therefore, attempts at securing perceptual knowledge against that imaginary danger.

One of the solutions the foundationalists proposed is called indirect realism. It says that our knowledge of the world is indeed secure; it is just that our understanding of the nature of perception is mistaken. We think that when we perceive something, we get directly connected to the world outside and therefore when we find a wrong case of perceptual knowledge, we begin to doubt all perception. Therefore, instead of thinking that perception connects

us directly to the world, we must think of it as connecting to the world only indirectly. Direct realists, on the other hand, deny that our perception is indirect. We know the objects in the world directly.

Both are realist theories as both accept all the four doctrines above: mind-independent reality, awareness of that reality, a causal connection between mind and reality and the correspondence theory of truth. The main difference is that the indirect realists deny that there is any direct causal link between the end product of perception (awareness of the cat) and the mind independent reality (cat). Reality does have a causal impact on us, but what it produces is not the awareness of the object cat. What it produces is some kind of an intermediary object. These intermediaries are given various names: idea (Locke and Berkeley), impression (Hume), sensation or sense-data and qualia (twentieth century empiricists). From these intermediaries we infer to the nature of the object. Therefore if there is a misperception it is our mistake; there is no problem with perception. Perception can be trusted to give us true knowledge of the world. Direct realists find that in their attempt to defend perceptual knowing the indirect realists go too far in saying that it is not the objects but the intermediaries that are perceived. We perceive a cat and not the sensation or idea of a cat.

Reaction against the anti-realist dangers of indirect realism came in the form of the causal theory of perception, which is an emphatic affirmation of the causal component of realism we have noted.

With the advent of computer technology realism takes on to a computational model of perception. Like other realists, they too treat perception as cognitive episodes that begin with certain sensory input and ends with a cognitive output. They differ from other realists in their attempt at theorizing about the process that happens in between the input and the output. In this matter they are somewhat similar to the indirect realists, except that they analyse the intermediary process as a computing process done in the mind to give an output in the form of a perceptual cognition.

Constructivism is another theory of perception. It differs from all the realist theories in the attention paid to the active dimension of perception. The basic idea is that the perceiver's conceptual and linguistic scheme determines, shapes, and/or constructs his or her perceptual experiences. The active contribution of the perceiver often takes the form of an unconscious interpretation in terms the conceptual and linguistic scheme available to the perceiver. The phrase "seeing-as" (seeing as a cat, as a dog etc.) is often used as short hand for this kind of interpretation. Because of this basic difference between constructivism and realism, constructivism is often called "anti-realism" (in spite of the fact that a constructivist like Hilary Putnam has explicitly repudiated that he is not anti-realist and has called his position "internal realism").

Note: Foundationalism and coherentism are theories of justification (epistemology) whereas realism and constructivism are primarily theories of reality (ontology) and only secondarily theories of knowing. But foundationalist justification goes together with realist ontology whereas coherentism goes with constructivist ontology.

Check Your Progress I

Note: Use the space provided for your answer

1) What is perception?

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2) What are the four components that make theory of perception realist?

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3) Name the prominent theories of perception.

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4.4 CLARIFYING THE PROBLEMS OF PERCEPTION

William Alston has observed that historically, philosophers “have been concerned both with the epistemology of perceptual belief and the nature of perception. Under the latter heading we can distinguish two main interrelated problems, (a) what is it to perceive an object (event, situation, state of affairs), and (b) what is the nature and structure of perceptual experience (consciousness).” This is correct. There are two different problems that philosophers of perception have been concerned with: the justification of perceptual beliefs and advancing theories about the nature of perception. The two are clearly different. One comes from the realization that any of our individual perceptions could be mistaken. From this realization, it asks the legitimate question as to how justification of individual perceptions may be done. Justification of perceptual beliefs, therefore, is justification of individual beliefs. Inquiry into the nature of perception, on the other hand, is about that whole mode of knowing called “perception” as distinct from inference, testimony, memory, and so on.

If justifying individual perceptual beliefs is like a football referee attempting to confirm that a scored goal was indeed a valid one that did not violate any of the rules of the game, examining the nature of perception is like examining the rules themselves to see whether the rules are appropriate or they need to be changed. No individual referee, of course, is allowed to do

that. There could arise a rare occasion in the course of a game where the rules are not clear or and where the referee has to make an ad-hoc decision, but if there were no rules in place, there would be no point in refereeing itself. To use the Wittgensteinian terminology we saw in one of the earlier units (Block 3, unit 2), justifying an individual perceptual belief is an activity done within a language-game whereas examining the nature of perception is to scrutinize the language-game itself. This important difference is neglected by the traditional foundationalist approach. When the foundationalists move from the finding that individual perceptual beliefs could be mistaken (and therefore, needing justification) to thinking that all perceptual beliefs may be mistaken, they are like the bird that finds strong winds an obstacle to flying to thinking that it could fly without any air at all. (This imagery is from Kant).

The difference between an individual perception and perceptual consciousness is not merely a matter of greater generality. An individual perception is a cognitive episode, something that happens to us. As episodes, they begin with the surface irritation of our senses and end with the claim to have perceived something. In computer terminology, a perceptual episode begins with an input into the processor and ends with an output. Perceptual consciousness, on the other hand, are not merely about episodes happening in consciousness; perceptions are also activities we do, not passivities inflicted on us. As activities, perception does not begin with an input, but much before; nor does it end with a propositional output. A hungry animal, for example, looks for food before it receives any sensory input. And its process of perception does not end with the awareness “There is food available”, but goes on to act on the awareness. This point of perception as an activity is typical of perceptual consciousness than perceptual episodes.

The two problems—the problem of justifying perceptual beliefs and the problem of the nature of perception—are, thus, clearly different. Once the differences are recognized there is nothing so very mysterious or profound about the justification of individual perceptual beliefs as to require too much attention from philosophers. All of us have the experience correcting perceptual errors, but that is always done by standing within the larger perceptual boat. They can be corrected as long as the reliability of perception as whole is not doubted. When any individual perception needs to be corrected we do so by looking more carefully, or getting someone else to take a look. This is the significance of accepting contextual continuity, as integral to naturalized epistemology.

One might think this to be an anti-climax to centuries of discussion on perception. But it is not. Philosophers on either side of the battle really do not have any alternative to this procedure, as far as the problem of justifying perceptual beliefs is concerned. Their conflict concerns the second problem, i.e., the nature of perception. And it is in this area that naturalized epistemology must prove its worth. But modern epistemologists, both foundationalists and coherentists, miss the point that there are two different problems involved. From the finding that some of our individual perceptions have been mistaken in the past, the foundationalists go on to distrust the whole of perception and its derivatives (which amounts to all knowledge.) and seek to secure all of them at once by looking for some infallible foundations. They give birth to the realist theories of perception, including the causal theory. In doing so, they neglect the important differences between the two problems and in the process

seek to play the incompatible roles of refereeing the game according to rules on the one hand, and not recognising any prior rules that make the game possible, on the other. The coherentists, finding the impossibility of a “God’s eye view” that does not stand on any prior beliefs, go to the other extreme and come up with constructivism, which seems to be purely a matter of coherence. If the foundationalists proceed as if there were no rules that constitute a game, the coherentists proceed as if rules alone make a game and the skill of the players is of no consequence. Conflating the two different problems, therefore, lead the rivals to engage in theorising without paying attention to the total context of the game.

Naturalized epistemology challenges both to distinguish the two problems and properly identify the problem they deal with. Both are challenged to see that although they talk in terms of justification, in as much as their concern is about perception, their points of conflict concern the nature of perception and not the justification of individual perceptual beliefs. Once this clarity is achieved, it is possible to focus on the real problem of perception, which is not that of justifying perceptual beliefs but of finding the nature of perception. This, in turn, enables us to look at the phenomena relevant to the problem. Focussing on the nature of perception, then, let us proceed to consider the phenomena relevant to it.

4.5 PHENOMENA RELEVANT TO PERCEPTUAL CONSCIOUSNESS - I

Following Alston’s lead, we can see that the nature of perception includes (a) the nature perception and (b) the nature of perceptual consciousness. The former is mostly a conceptual matter of analysing how the word “perception” is used by normal language users. For this purpose, it is enough to focus on individual perceptions as identifiable episodes in consciousness. These episodes begin with a sensory input and end with a cognitive output. The realists analyse the conceptual structures involved in the process. Perceptual consciousness, however, is not just a conceptual matter; it is also empirical and phenomenological; it begins before there is any input and does not end with the output. This is what the constructivists focus on. Thus when the problem of perception is clarified as the nature of perception, we get two different sets of phenomena that need to be taken into account.

As far as the concept of perception is concerned, we have already seen them while dealing with the definition of perception as well as in our discussion of realism. But we shall see them now, in terms of the phenomena relevant to a theory of perception.

1. *Mind-independent Reality*: Think of the distinction between seeing a cat and imagining a cat. The main distinction is that in one case, there is a cat that exists independently of my consciousness and in the other case there would be no cat if I stop imagining. Ontological realism therefore, is a constitutive phenomenon of the very idea of perception.
2. *Determinacy or Stability*: The independently existing reality is experienced by us not as “reality” or “world” in the abstract but always perceived as individual objects or events that have a determinate character. Our perceptual experience is always an experience of the determinate reality

of apples and oranges, having this shape and that colour and so on. We experience the world as having a pre-fabricated character, so to say. We do not cut up the world into apples and oranges; we find them given as such. We do not make stones hard and cotton soft; it is given to us so, and so on.

3. *Awareness*: This, too we have seen, is constitutive of the concept of perception.
4. *Immediacy of awareness*: while discussing the definition of perception we noted this. This makes the difference between my being a witness to an event and hearing about the event from somebody else. If this phenomenon were to be absent we would not call it perception. (There are some complications as to what could be considered immediate: if my watching a game on TV immediate mediate? But it is a problem as to the definition of immediacy and not questioning immediacy itself.)
5. *Causal connection*: This is another conceptual requirement that for an episode in consciousness to be considered an instance of perception, that episode must have causal links with the mind-independent reality in the sense that if reality were to be different that episode would not take place. An episode where causal connection is missing would be an instance of imagination, hallucination, etc., but not an instance of perception. Causal connection is necessary but not sufficient condition for perceptual experience.
6. *Fallibility*: It is an undeniable fact about our perceptual experiences that some of the episodes we took to be veridical might subsequently turn out to be false. The main difference between the direct and indirect realists is a matter of how to explain this phenomenon.

4.6 PHENOMENA RELEVANT TO PERCEPTUAL CONSCIOUSNESS-II

The realist theories of perception, although called *theories* of perception, remain focussed on individual perceptions than on finding the nature of perceptual consciousness as such. Therefore, they tend to neglect the wide range of phenomena that are relevant to perceptual consciousness, especially the range of phenomena that are related to perception as an activity done by the perceiver, which begins before any sensory input and does not end with the cognitive output. Such phenomena related to the activity of perception include the following:

1. *Perceptual search*: Not only do we see things that are presented to us but also look for things that interest us. I can go to a library and search for a particular book; go into a crowd and look for a particular face.
2. *Selective attention*: Our attention is selective. It is commonplace that “the information available during each moment in time...is vast and complex. We are constantly bombarded by a myriad of sights, sounds and smells. Yet most of these go unnoticed... It is only a fraction of these that comes to be noticed by the perceiver.” Therefore, “the causal sequence set off by the proximate stimulus determines what can be

perceived in any given conditions, but not necessarily what will be perceived.” Consequently, even when all objective factors, including the physical position of the perceiver, are kept constant, the resulting perception could vary. Therefore, different people could see different things in the same given environment.

3. *Perceptual polymorphy*: Like selective attention, this also points to the fact that even when there are no variations in the objective factors, the perceptual synthesis could vary. However these are two different phenomena. Selective attention refers to the fact that the perceiver has a choice in receiving the stimulus input from the environment; polymorphy points to a different fact that even the same input can lead to different perceptual output. The most common examples that illustrate this phenomenon are ambiguous pictures like the duck-rabbit or the old woman-young woman. But the phenomenon is not restricted to ambiguous cases. Consider the following example given by Alva Noë. I say “Nein.” If the person who hears me knows German and the context is right, what I said will be heard as “No”. If the hearer knows only English and the context is different the same word will be heard as nine (9).
4. *The Hidden Side*: When we see an object we receive sensations only of the side that is exposed to us. But we are also aware that it has other sides and that these will be available to us if we move around; they are available to other perceivers who are seeing it from other sides.
5. *Veridicality and Corrigibility*: The foundationalists focus on the fallibility of perception and seek security against that possibility. But fallibility is only part of the story. The amazing fact about perception is not its fallibility but the fact that most of our perception is true (veridical). Even a mistaken episode of perceiving is recognized as an instance of misperception only after having corrected it or in the process of correcting it, such that the perception as a reliable mode of cognition is never in doubt.

Check Your Progress II

Note: Use the space provided for your answer

- 1) What, according to William Alston, are the issues that philosophers have been concerned with in perception?

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- 2) Clarify, briefly, the two different problems of perception.

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- 3) Describe one phenomenon each from the two groups that are seemingly opposed to each other.

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4.7 CHOOSING A THEORY OF PERCEPTION

Having seen the different theories of perception, now is the time for epistemology to do its proper job and adjudicate between them by giving credit where it is due correcting what needs to be corrected. We have already seen the main points on which the different theories differ. The main difference is between realism and constructivism. One focuses on perceptual episodes and emphasises the receptivity of the mind for such episodes to occur. The other focuses on perceptual consciousness and the active contribution of the perceiver before, during and after the episode. Compared to this major difference, the differences between different versions of realism are more like shadow boxing. Indirect realism and the computational model agree in giving some kind of an active role to consciousness during the cognitive episode, but remain silent on any activity before or after the episode. They remain focussed on particular episodes of perception because even while proposing a “theory” of perception, they make no distinction between a perceptual episode and perceptual consciousness.

Once the problem of perception is properly identified as the nature of perceptual consciousness, it becomes clear that we cannot really choose between realism and constructivism, between receptivity and activity because both are characteristic features of perceptual consciousness. Therefore, both have to be combined in some fashion. Cognitive psychology takes both into account when it talks about two kinds of processing that goes into perception. One is called “top-down” or theory-driven processing where our prior theories and concepts influence what is perceived. The other is called “bottom-up” or data-driven processing which is controlled by what is given to the senses from outside. A philosophy of perception, then, needs to combine both processes. This could be done either by adopting realism and making appropriate adaptations to it or by adopting constructivism and adapting it. Alvin Goldman in his *Epistemology and Cognition* (1986) takes the former path and makes modifications to the correspondence theory of truth. We shall explore how a constructivist approach could be adapted to include basic realist insights.

We adopt a constructivist theory, with its active role to the perceiver because that makes it easy to explain such phenomena as perceptual search, selective attention, polymorphy and so on. The real problem for constructivism is to find an explanation for such hardcore phenomena as determinacy and immediacy. Take immediacy. If perception is immediate, something that happens to us, then it cannot be a matter of our construction or interpretation.

Moreover, in most cases of perception we are not aware of any constructing activity on our part. When the problem is spelt out in this manner, the solution suggests itself. Our lack of explicit awareness of activity is not an argument against perception being an active construction. There are other instances of activity within our bodies (such as digestion), of which we are not explicitly aware. Perceiving process could also be a similar, unconscious activity. It may still be asked: if there is a mediating process of this kind, how can it be considered immediate knowledge? The answer is that immediacy is being used here in a comparative sense: compared to other means of knowing like inference or testimony, perception is immediate.

4.8 COGNITION AND EVOLUTION

A more difficult problem is that of determinacy. Constructivists seem to say that it is we who cut up an indeterminate external reality into determinate entities like apples and oranges. This cannot really be the case. A rock is hard not because perceivers find it so; perceivers find it hard because rock is indeed hard. Humans, at the most, could have found the words for certain features exhibited by reality itself. These are features of reality to which we have given names. Constructivism can be adapted to accommodate this phenomenon by making some modifications. Constructivists can be more explicit in acknowledging that our constructions are based on the features exhibited by reality. What they need to claim is not that reality is devoid of features that are independent of the perceiver, but that it has too many features from which the perceiver picks and chooses some to the neglect of others. In other words, perceivers selectively attend to some features and not to others. Moreover, what gets selected and gets left out in most cases of routine perception is not done at the conscious level. This fits with the unconscious processing mentioned in connection with immediacy. The blind nature of such processing is found in Jerry Fodor's book, *The Modularity of the Mind*.

Such unconscious processing is explained by evolutionary theory, which speaks about the cognitive niche of different organisms. The basic idea is that each kind of organism picks up the information it needs for its survival in a given environment. In the process of evolution the cognitive mechanism of an organism has developed in a manner such that certain features of a given surrounding are picked up by it while the other features are left out. There is evidence to show that what the bats and bees pick up from the same surroundings is not exactly the same as that which is picked up by humans. The cognitive niche of the human animal is called "mesocosm". It is our evolutionary heritage that we unconsciously pay attention to some feature of the surrounding and not to others. Not all our perception is not of this kind. But this accounts for that inner core of our perceptual knowledge that is more or less common to us as a species. It is the same core that comes into play in radical translation. Here, then, we have an excellent explanation that combines the active contribution of the perceiver without denying the realist intuition that what is perceived is determinate mind-independent reality.

An additional advantage of this theory of perception is that the perennial conflict between *a priori* knowledge favoured by the rationalists and *a posteriori* knowledge favoured by the empiricists gets resolved. *A priori* knowledge is inner core that is our evolutionary heritage. But even what is ontogenetically

(in terms of the individual) *a priori* in this manner is phylogenetically (in terms of the species) *a posteriori*.

Another important conclusion follows from this manner of combining realism and constructivism. When we take all relevant phenomena into account human knowledge turns out to be not a mirror of reality at all. Rather, knowledge is like a map. Just as there could be various true maps of the same territory (political, geographical, industrial etc.), so too with human knowledge.

Check Your Progress III

Note: Use the space provided for your answer

1) A good theory of perception needs to combine realism and constructivism. Why? How does cognitive psychology take both into account?

2)1 How can a constructivist theory of perception account for the determinacy of perception?

3) How does evolutionary theory help us to resolve the conflict between a priori knowledge and a posterior knowledge?

4.9 LET US SUM UP

Naturalized epistemology sees epistemology as “science self-applied”. It means that the manner in which it attempts to settle cognitive disputes about other realms should be applied also to resolve internal disputes within epistemology. Perception is a fit candidate for this treatment as it is a field of various theories. When the method of naturalized epistemology is applied to perception not only are we able to find where the different theories have gone wrong (conflating different problems leading to the neglect of the relevant phenomena) but also acknowledge what is true in those different theories. In the process, not only does epistemology become a matrix of inter-disciplinary collaboration but human knowledge comes to be seen as maps of reality, rather than a mirror of it.

4.10 KEY WORDS

- Ontology** : is the study of what there is.
- Mesocosm** : is a term used in evolutionary epistemology. It stands for the cognitive niche of the human species, that technologically unaided world of perception that falls in between macrocosm and microcosm. It is an evolutionary heritage that bears the stamp of our struggle for survival.
- Ontogenesis or Ontogeny** : a term in biology referring to the growth and development of an individual organism.
- Phylogenesis or Phylogeny** : stands for the evolutionary history of an organ or some part of an organism. Contrasted with ontogeny, phylogeny is always in relation to a group or species and not of individual development.

4.11 FURTHER READINGS AND REFERENCES

Brewer, William F., and Bruce L. Lambert. "The Theory-Ladenness of Observation and the Theory-Ladenness of the Rest of the Scientific Process." *Philosophy of Science* 68, no. 3, September (2001): S176-S86.

David, Kelly. *The Evidence of the Senses: A Realist Theory of Perception* Baton Rouge and London: Louisiana State University Press, 1986.

Estany, Anna. "The Thesis of Theory-Laden Observation in the Light of Cognitive Psychology." *Philosophy of Science* 68, No. 2 (2001): 203-17.

Gilman, Daniel. "Observation: An Empirical Discussion." *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 1990 (1990): 355-64.

Goldman, Alvin I. *Epistemology and Cognition*. Cambridge, MA: Harvard University Press, 1986.

Grice, H. P., and Alan R. White. "Symposium: The Causal Theory of Perception." *Proceedings of the Aristotelian Society, Supplementary Volumes* 35, 1961: 121-68.

Karmiloff-Smith, Annette. "Précis of Beyond Modularity: A Developmental Perspective on Cognitive Science." *Behavioral and Brain Sciences* 17, no. 04 (1994): 693-707.

Noë, Alva. *Action in Perception*, Representation and Mind Series. Cambridge, Mass.: MIT Press, 2004.