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# UNIT 2 CONSTRUCTIVIST/ HERMENEUTICIST VIEW OF PERCEPTION

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## 2.0 OBJECTIVES

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Any discussion on the cognitive nature of perception would have to consider the two contrasting approaches to perception: the constructive and the ecological. Although they seem to be contradictory, attempts are made today to highlight that they in fact deal with different aspects of visual perceptions and that they can indeed co-exist. It is opined that the parallel visual systems, the dorsal and the ventral systems, with their distinctive parallelism to the constructive and ecological approaches, deal with different aspects of perception and together contribute to our pickup of visual information and our perception of reality. This presentation shows not only how these two approaches together can contribute to a better understanding of the cognitive phenomenon of perception, but also highlights how an interdisciplinary approach can give better insights into the complexity of the perceptive phenomenon.

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## 2.1 INTRODUCTION

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In comprehending the cognitive process involved in the perceptual phenomenon, a variety of views and approaches have been offered down the centuries. There are two basic types of perceptual question. One type pertains to the object of perception: How do I perceive physical objects in the world outside? Do we perceive things as they are? The second type concerns the perceiver. Human being finds itself in the midst of a world, capable of perceiving and interacting with them. But through our senses are we provided enough data required for our perception? What is the role of the perceiver in the process of perception? Is the perceptive process limited to working with the immediately available sense stimuli or does the perceiver contribute something in addition to them? These questions have evoked equal interest among psychologists and philosophers, giving rise to various psychological and epistemological theories of perception. Dominant among

them are the constructivist and ecological theories of perception. “Constructivists” claim that incoming visual data are insufficient and that the brain must supplement these data from its own memory bank to complete the perceptive process. The ecological theory, on the contrary, holds that the sensory information available suffices and thus no “mental processes” are needed to enable the pick-up of the relevant information. According to this theory perception is always in view of some animate action. In response to these contrasting positions, a third position is emerging that although the constructivist and ecological theories of perception do differ, there is certain continuity rather than dichotomy between these two approaches. It is argued that both of them are equally valid descriptions of perception, dealing with different and yet complementary aspects of perception. This paper is a brief account of these three positions.

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## 2.2 THE CONSTRUCTIVIST APPROACH TO PERCEPTION

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At the basis of constructivist approach to perception is the clear distinction made by some epistemologists and psychologists between sensation and perception, a distinction between merely having sensations and the cognitive phenomenon of perception. The important point here is that sensations are not yet perceptions. Sensation is the subjective experience, the change in the state of mind, produced by the stimulation of an organ of sense, which does not yet imply the knowledge of an external object. Perception stands for the knowledge of an object or its qualities that we obtain by means of our sensations. Included in this perceptual cognitive process is, besides the sensation, an additional cognitive act of the mind. It is this claim that is central to the constructivist approach to perception.

That we add or contribute something to our perceptual input from our own previous knowledge and experience was first proposed by the Gestalt group. For them, the perception of a whole object is more than the sensory input put together. Then there was the schema theory proposed by Bartlett, that all new perceptual input is analyzed by comparing it with items which are already in our memory store. This becomes clear when we consider how we come to recognize a pen, a former friend, etc. According to this theory, we have an “internal schema” or “template” which is compared with the incoming sensory input. Under the influence of this schema theory, Neisser further differentiated two types of input processing: top down processing and bottom-up processing. It explains two basic ways in which the external world is perceived. The top down processing involves the generation of schemas by the higher cortical structures and these schemas are sent down to the nervous system for comparing them with the incoming stimulus. Top-down processing is thus a schema-driven or conceptually-driven processing, where the perceptual process depends upon the past knowledge and experience. In the context of new experiences the pre-existing schema get modified which again facilitates further experiences. Bottom up processing, on the other hand, starts with the stimulation from the nervous system, progressing towards the higher cortical areas. This is a stimulus-driven or data-driven processing, where the perceptual process depends solely on the sensory input. Top down processing is where higher-level knowledge based information predominates and bottom up is where the information that senses gather about the world by detecting various forms of energy such as sound, light, heat and physical pressure are deemed as sufficient to enable us to perceive.

Constructivists have predominantly favored the top down processes, an affiliation that began over 100 years ago, instigated by Herman Helmholtz (1821-1894). Helmholtz argued that human perception is the product of experience. Let us explain this with an example. How do we see a dog? In perceiving a dog, our previous experience of what a dog looks like, i.e. four legs, tail, specific shape of the body, head, etc. aids our perception. Helmholtz named this process of perceiving a dog in terms of our previous experience an “unconscious interpretation.” Thus, for him the basic perceptual processes is a fundamentally unconscious process. Helmholtz was also the first theorist to introduce the concept of ‘size constancy’. Size constancy is the ability to perceive the true size of an object despite variations in the size of its retinal image. Helmholtz claims several elements of knowledge facilitate this ability, including prior experience. Taking this argument further, Irvin Rock and Richard Gregory propose that perception is a kind of hypothesis testing. Signals are received by the sensory receptors like eyes, ears, etc. These then trigger neural events where appropriate knowledge, such as previous experience interacts with the sensory input to create mental data. Thus, for example, even when we see only the tip of a branch of a tree showing itself through a window, we can and do interpret these data as part of a tree. Thus we supplement the information presented to the senses.

The assumption here is that humans are unable to understand new information, without the inherent help of their previous knowledge. When objects are viewed without understanding, the mind will try to reach for something that it already recognizes, in order to process what it is viewing. That which most closely relates to the unfamiliar from our past experiences, makes up what we see when we look at things that we don’t comprehend. Thus the perceptive process involves the construction of the object of perception. The data received is interpreted in terms of a subjective framework, consisting of past experiences, subjective make-up, etc.

We can identify three significant features of the constructivist approach to perception. Firstly, this approach assumes that there is a poverty of stimulus. The data reaching our senses are as inherently insufficient, that, by themselves, they are unable to provide a true description of the world. Two reasons as to why our sensory input is limited: 1) our cognitive resources can cope only with a certain amount of incoming information, so that part of it filtered out. 2) the senses may not provide a complete picture. Much of the visual information coming in, especially when the distance is more, or due to other adverse circumstances, could actually be of poor quality. Here we need prior knowledge for interpreting the available sensory input. Sensations thus require ‘enriching’ in terms of an active and intelligent perceptual system. Such a system takes recourse to interpretative, inferential, and constructive types of mechanisms to overcome this inherent insufficiency of stimulation. The essentially inadequate information available to the senses is used as the basis for making inferences or forming hypotheses in order to make sense of the information presented to the senses. Thus, according to the constructivist approach, sensory stimulation by itself is inadequate to produce perception. Brain’s interpretative activity is a critical component. The brain is not just processing what is received, but falls back on the stored knowledge from the previous perceptual activity. This naturally implies the formation of incorrect hypotheses as well resulting in perceptual illusion. But, if the stored knowledge does impact negatively what we perceive, why do we make so much use of it. The theory would say that we

have no other option since our sensory input is highly impoverished. We need to fall back to such a perceptual system in order to recognize things and people we already know. We need to construct our perception with the help of the stored knowledge.

Secondly, the constructivists see perception as a multistage indirect process. The perceived object is not directly presented by the sensation. There are a number of dimensions mediating the passage from stimulation to the formation of the percept. The constructivist position emphasizes the cognitional dimension inherent in every perceptual process. A stimuli or sensory input, as we have mentioned earlier, does not in itself amount to cognition. It really becomes informative only after the central nervous system has added its own input and interpreted the sensory input. For example, what is actually involved in “seeing” a cat in the corner of the room. The retina of the eye can only receive the visual stimuli, but it does not know anything about cats. The sensory input has to be categorized into a cat. Thus the cat is not perceived directly, but the perception of a cat is a construction of the brain with the help of the received stimuli, an indirect perception.

Thirdly, in constructing such a percept, memory, stored schemata, and past experience play an important role. What we know affects what we perceive, could even overrule the apparent sensory information. It is said that we see things not as they are but as we are. Thus there is a strong interaction between sensory information moving ‘bottom-up’ and knowledge moving ‘top-down’. This interaction determines what is perceived. In recent time, Boring explains this process through a distinction between “core” and “context” of perception. The basic sensory data that connects us most directly to the object is called “core” data of perception. The “context” data of perception, on the other hand, consists of all the other sensory data that modify or correct the data of the core as it forms the perception. This includes everything from the past experience, certain acquired properties of the brain, various expectations triggered by the core data, etc. It is in terms of the context data, the core data is interpreted into a specific percept.

To sum up: the constructivist approach to perception holds the view that perception is an active and constructive process. This position presupposes that perception is not directly given by the stimulus input. It is rather an end-product of an interactive process between the available, but essentially inadequate sensory stimulus and internal hypotheses, expectations, and stored knowledge. This obviously implies that since perception is influenced by subjective schemas, hypotheses and expectations, the constructed percept will sometimes be incorrect, that perception is essentially prone to error. In short, perceptions are constructions out of fragmentary and inadequate sensory data in terms of mental schemas, previous experiences and present expectations.

### 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 are the types of Perceptual questions?

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2) What is the main contention of the Constructivist approach?

## 2.3 ECOLOGICAL APPROACH TO PERCEPTION

Diametrically opposed to the constructivist approach to perception is the perceptual ecology approach of James J. Gibson. In his book, *The Ecological Approach to Visual Perception*, Gibson presented an exciting new approach to the study of visual perception that included many new concepts and new ways of looking at perception. Gibson rejected the constructivist claim of a poverty of stimulus and the consequent need to fall back on existing schemas in constructing the percepts. He does this by rejecting the basic assumption that perception is based in sensations. Gibson finds the classical approach of describing the stimuli for perception in terms of stimulus energies impinging upon the receptors completely unsatisfactory. Instead, he investigated what information is actually presented to the perceptual systems. He and the psychologists who work within this paradigm detailed how the world could be specified to a mobile, exploring organism via the lawful projection of information about the world into energy arrays. He points to the differences between these energies and the optical information available in the ambient optic array. That information is *picked up* by a stationary or moving observer. Gibson calls attention to the fact that perception consists of perceiving events; i.e., perceiving changes over time and space in the optic array. No enrichment is required and perception is direct perception. For him, the perception of the environment is direct in the sense that it is not mediated by retinal, neural or mental pictures. This direct perception consists in the activity of getting information from the ambient array of light, i.e. a process of “information pickup” though the exploratory activities of looking at things by looking around and moving around.

In answering the question as to what sort of information is picked up in direct perception, Gibson speaks of some higher-order invariants in the optic array that serve to supply the observer with unequivocal information. To illustrate this, he presents a study of size perception he performed during World War II. Aviation cadets were given the task of matching the height of stakes planted at various distances in a very large plowed field with a set of stakes of varying size nearby. The finding of the experiment was that size perception remained invariant no matter how far away the stake was planted. Gibson is suggesting that size constancy results from the direct pickup of invariant ratios in the ambient array. It is also noteworthy that he claims that these invariant ratios are picked up “unawares”. For him, both size and distance are perceived directly.

Gibson’s conception is one of an active perceiver exploring his environment. Eye-, head-, and body-movements are part and parcel of the perceptual process.

Perception transpires continuously over both time and space. “Space” here refers not to an empty space but to the many surfaces that make up the environment, the most important being the terrain that at times reaches the horizon.

Thus the ecological approach understands perception as a single-stage process. No mediating process is implied. Perception is direct and immediate. Further, this approach foresees no role for memory, past experience, and related phenomena like expectation in perception. While the constructivist approach is concerned with analyzing the processes and mechanisms underlying perception, the ecological approach deals with the analysis of the stimulation reaching the observer. Another important feature of ecological approach is the manner in which perception is associated with action. According to it, perception is a prerequisite for animate action in the sense that without perception action would not be guided and without action perception would be pointless. Perception and movement are the two sides of the same coin, action

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## 2.4 CONVERGENCE: THE DUAL-PROCESS APPROACH

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There is an emerging trend today, advocated mainly by Joel Norman, that the two above mentioned approaches to perception, the ecological and the constructivist, are valid descriptions of perception, but the difference is that they treat different aspects of perception. He, in turn, advocates what is known as “the dual-process approach.” It is based on the assertion that perception consists of two visual systems functioning more or less in parallel. The two visual systems or rather streams, known as the dorsal and the ventral, deal with different aspects of perception and hence can be seen as co-dimensions of a broader theory of perception. The dorsal system deals mainly with the utilization of visual information for the guidance of behavior in one’s environment. The ventral system deals mainly with the utilization of visual information for “knowing” one’s environment, i.e., identifying and recognizing items previously encountered and storing new visual information for later encounters. But it should be stressed that both systems overlap in the functions they perform. Understood in this manner, it is easy to see how the ecological approach broadly parallels the functions of the dorsal system, and the constructivist approach broadly parallels that of the ventral system. Thus, properly understood, the two approaches to perception are just accounts of two pathways of the cognitive process of perception. Let us consider this aspect a little deeper.

This idea of two visual systems or streams itself has a history of its own. Initial distinction was between a cortical (around the brain) system answering the question ‘What is it?’, and a sub-cortical system answering the question ‘Where is it?’. The former came to be known later as the “focal” and the latter as the “ambient” systems. A radical change in this understanding was brought about in 1982 by Ungerleider and Mishkin, who identified rather two separate pathways and called them the “ventral stream” and the “dorsal stream.” According to them, the ventral pathway dealt with object identification, and the dorsal pathway dealt with object location. Somewhat similar to the earlier understanding, they called the ventral pathway a “what” system and the dorsal pathway a “where” system, but unlike the earlier understanding, both of these pathways were cortical.

Further advancement to this understanding was provided more recently by Goodale and Milner with a rather different interpretation of the dichotomy between the two streams. They traced the way how the ventral stream transforms visual information into an exocentric (also called “allocentric”) framework that facilitates the perception of an object as it relates to the visual world. The dorsal system, on the other hand, transforms visual information into an egocentric framework which facilitates someone either to grasp or physically manipulate an object. As far as the functions of the ventral stream are concerned, their interpretation was similar in the sense that it is mainly involved in the processes of recognition and identification. But in highlighting the functions of the dorsal stream, they provided new insights. The main function of dorsal stream was not just mapping the location of objects, but rather to exercise visual control and guidance of motor behavior. The focus of their study was to highlight how the dorsal stream is capable of utilizing visual information for the control of movement, and how it is dissociated from the ventral stream. Thus, as mentioned above, the major difference between the two streams consists not in the visual information they process, but in the transformations they perform on the available visual information. While the ventral stream transforms visual information into an exocentric or allocentric framework allowing the perception of the object as it relates to the visual world, the dorsal stream transforms visual information into an egocentric framework that facilitates the grasping of an object and its further physical manipulation.

Let us thus compare the two visual streams and highlight their differences. First difference is, while both systems analyze the visual input, this analysis is carried out for different purposes. The primary function of the ventral stream is the recognition and identification of the visual input. And this recognition and identification takes place through a process of comparison with some stored representation. But, the primary function of the dorsal system is analysis of the visual input in order to facilitate visually guided behavior towards the environment and the objects in it (e.g., pointing, reaching, grasping, walking towards, climbing, manipulating, etc.). These are only the primary functions and no absolute exclusivity need to be attached to it as each of the system may also participate in those functions carried out normally by the other stream. Second difference concerns sensitivity. The two visual systems differ with respect to their sensitivities in the spatial and the temporal domains. The ventral system is more sensitive to high spatial frequencies while the dorsal system is sensitive to high temporal frequencies. In other words, the ventral system is superior at seeing fine details, while the dorsal system is better at seeing motion. The third difference concerns memory. The ventral system is the memory-based system, utilizing stored representations to recognize and identify objects and events. In contrast, the dorsal system appears not to have a long-term storage of information, but only very short-term storage allowing the execution of the motor behavior in question. Fourth difference pertains to consciousness. In their normal everyday functioning, we are much more conscious of ventral system functioning and hardly conscious of dorsal system functioning. The final difference consists in the difference of purposes for which both systems process information about objects in our environment. The information processing of the ventral system aims at recognizing and identifying the object and for this purpose all that is needed is object-centered information. In other words, the ventral system utilizes an allocentric frame of reference. In contrast, the dorsal system must perform some action on, or in relation to, the object, such as grasping it. For this purpose it needs to know the dimensions of the object in body-

centered terms. For example, it needs to specify, how large should the gap between the thumb and forefinger be in order to pick up that block. Thus, the dorsal system must utilize egocentric frame of reference.

The points above have all pointed to differences between the two systems but it should also be mentioned that the two systems appear to perform many similar functions, may be for quite different purposes and using quite different mechanisms. Thus, for example, both systems deal with object shapes, sizes, and distances. While the two systems have different functions it should be emphasized that there is a great deal of complementarity between them and they normally function in synergy. Thus, when one picks up a hammer, the control and monitoring of the actual movements is by the dorsal system but there also occurs intervention of the ventral system that recognizes the hammer as such and directs the movement towards picking up the hammer by the handle and not by the head. At times dorsal system processing can enter consciousness via the ventral system after the event. Further, the ventral system often is involved in what appear to be dorsal functions. Let two examples be listed to illustrate this point: 1) when the dorsal system is faced with difficulties in picking up the necessary information, due to, say, insufficient information or conflicting information, the ventral system can be turned to for help. 2) When there is some time delay between the visual input and the required motor output, the ventral system is called upon to temporarily store the visual information as the dorsal system is incapable of bridging that delay.

It is now easy to see the parallelism between the two visual systems and the two approaches we have described above. The dorsal system is similar in function to the ecological approach, which speaks of direct perception. The indirect perception of constructivism parallels the ventral system. The dorsal system, as we saw, picks up visual information mainly to facilitate our life in our environment. It does this more quickly than the ventral system. It does this as a rule without much involvement of conscious awareness and does not involve the cognitive system with the task of “interpreting” the sensual input. Practically all the task of picking up information for enabling the performance of actions or behaviors are carried out by the dorsal system. In contrast, the ventral system primarily serves in the recognition and identification of objects and events in one’s environment. It compares visual inputs to stored information in a quest for a meaningful interpretation of those inputs. When needed the ventral system also participates in other perceptual activities, such as different aspects of space perception like the perception of size and distance. As it is the system of which we are normally conscious it has “the last word” as to our judgmental interpretation of stimulation reaching our senses.

### 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) According to Gibson, what sort of information is picked up in direct perception?

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2) What are the similarities in the two approaches to perception?

## 2.5 LET US SUM UP

Thus we can easily see how these apparently contradictory theories do in fact complement each other as they are only looking at two different yet interrelated aspects in the perceptive process. Thus, this interdisciplinary approach to understand and integrate the process of perception can form the basis for a broader theory of perception resulting in a single theory, which is being labeled the “dual-process approach” to visual perception. According to this approach much of our day-to-day pickup of visual information is carried out by the dorsal-ecological system without involving much conscious awareness. To a great extent, the information picked up is that which allows us to function within our environment. The ventral-constructivist system, on the other hand, is a “higher” system that deals with the interface between the visual input and cognition, and we are normally conscious of its output. Only it possesses a long-term memory and therefore any type of identification or recognition must transpire within it. As the dorsal system is mainly concerned with directing our actions and behaviors in our environment it must rely on body-centered information about the environment and the objects in it. In contrast, the ventral system in its attempt to recognize objects can suffice with relative, object-centered, information.

## 2.6 KEY WORDS

<b>Perception</b>	: The process of using the senses to acquire information about the surrounding environment or situation
<b>Cognitive</b>	: Relating to the process of acquiring knowledge by the use of reasoning, intuition, or perception

## 2.7 FURTHER READINGS AND REFERENCES

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## 2.8 ANSWERS TO CHECK YOUR PROGRESS

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### Answers to Check Your Progress I

1. There are two basic types of perceptual question. One type pertains to the object of perception: How do I perceive physical objects in the world outside? Do we perceive things as they are? The second type concerns the perceiver. Human being finds itself in the midst of a world, capable of perceiving and interacting with them. But through our senses are we provided enough data required for our perception? What is the role of the perceiver in the process of perception? Is the perceptive process limited to working with the immediately available sense stimuli or does the perceiver contribute something in addition to them? These questions have evoked equal interest among psychologists and philosophers, giving rise to various psychological and epistemological theories of perception.
2. At the basis of constructivist approach to perception is the clear distinction made by some epistemologists and psychologists between sensation and perception, a distinction between merely having sensations and the cognitive phenomenon of perception. The important point here is that sensations are not yet perceptions. Sensation is the subjective experience, the change in the state of mind, produced by the stimulation of an organ of sense, which does not yet imply the knowledge of an external object. Perception stands for the knowledge of an object or its qualities that we obtain by means of our sensations. Included in this perceptual cognitive process is, besides the sensation, an additional cognitive act of the mind. It is this claim that is central to the constructivist approach to perception.

**Answers to Check Your Progress II**

- 1 Gibson speaks of some higher-order invariants in the optic array that serve to supply the observer with unequivocal information. To illustrate this, he presents a study of size perception he performed during World War II. Aviation cadets were given the task of matching the height of stakes planted at various distances in a very large plowed field with a set of stakes of varying size nearby. The finding of the experiment was that size perception remained invariant no matter how far away the stake was planted. Gibson is suggesting that size constancy results from the direct pickup of invariant ratios in the ambient array. It is also noteworthy that he claims that these invariant ratios are picked up “unawares”. For him, both size and distance are perceived directly.
2. The dorsal system is similar in function to the ecological approach, which speaks of direct perception. The indirect perception of constructivism parallels the ventral system. The dorsal system, as we saw, picks up visual information mainly to facilitate our life in our environment. It does this more quickly than the ventral system. It does this as a rule without much involvement of conscious awareness and does not involve the cognitive system with the task of “interpreting” the sensual input. Practically all the task of picking up information for enabling the performance of actions or behaviors are carried out by the dorsal system. In contrast, the ventral system primarily serves in the recognition and identification of objects and events in one’s environment. It compares visual inputs to stored information in a quest for a meaningful interpretation of those inputs. When needed the ventral system also participates in other perceptual activities, such as different aspects of space perception like the perception of size and distance. As it is the system of which we are normally conscious it has “the last word” as to our judgmental interpretation of stimulation reaching our senses.