**Introduction to Psychology**
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# Lecture - 05

## Perception

## Sensory Mechanisms

So, welcome to this first lecture. Initially, before I take you into the details of some of the topics which might be very interesting to you from behavioral point of view.

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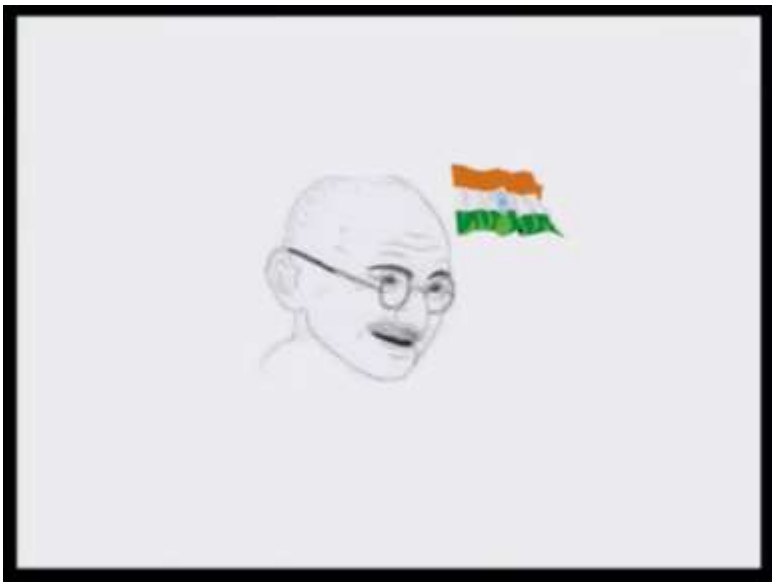

Just look at the line that you see on the screen. What do you see right now, you somehow guess that this is perhaps a curve line that someone has drawn, I extend it little more and then you realize that fine the line has now taken more sharp turn towards the right and then I further try to extend it. It is difficult to make a sense out of it and then I add these lines and you can very easily now make out who this person. This is the image that gets generated in your mind.

When this image gets generated in your mind, suddenly you recollect not only the name, but you recollect whole sequence of events attached to this very individual who is known as the father of the nation. You have derived certain type of a mental images of a certain type of representations like, freedom you derive you might even derive the political map of a country called India you might have recollection of philosophy that is now called as Gandhian philosophy whole lot of things gets recollected.

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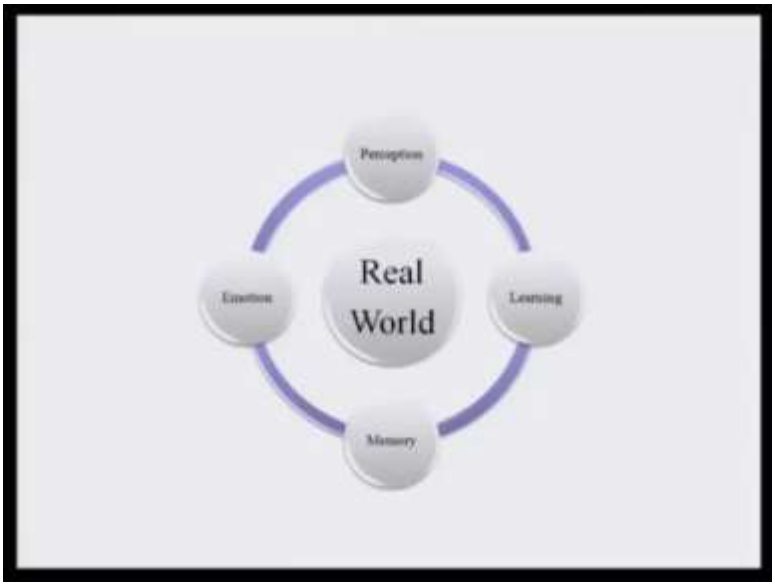


So, actually when you look at the real world we take certain inputs from the external environment. Sometimes it might be that might draw some inputs even from our internal mechanism and then we try to assign a meaning to it. In psychology this is what we call as Process of Perception. Now the fact that I fail to decipher the line even though it was being extended couple of times till I got substantial cue to identify that I am looking at the line drawing that represents the Father of the Nation. I was searching for a possible cue so that I could assign a meaning to it this process is what is called as Perception.

So, when you see these things or when you saw the line that you saw right now to derive an image of what you are looking at you have learned certain things certain things got recollected from your memory and then it did induce a sense of feeling within you. So, initially we will begin with the process of perception, then will go to learning, then will

come to memory and finally, we will be talking about emotional process the affective process.

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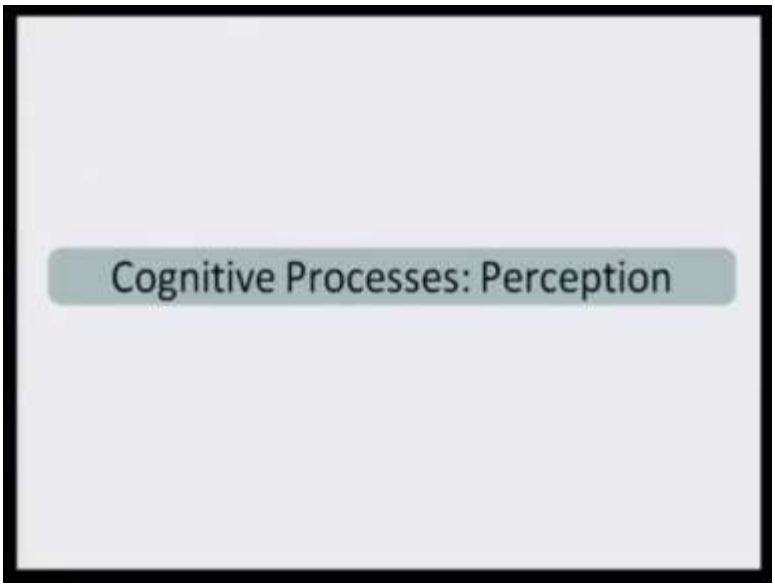


Before we come to perception let us understand one thing, that the brain before it arrives at a conclusion before it assigns a meaning to something it would require a trigger, it would require a sensation from outside.

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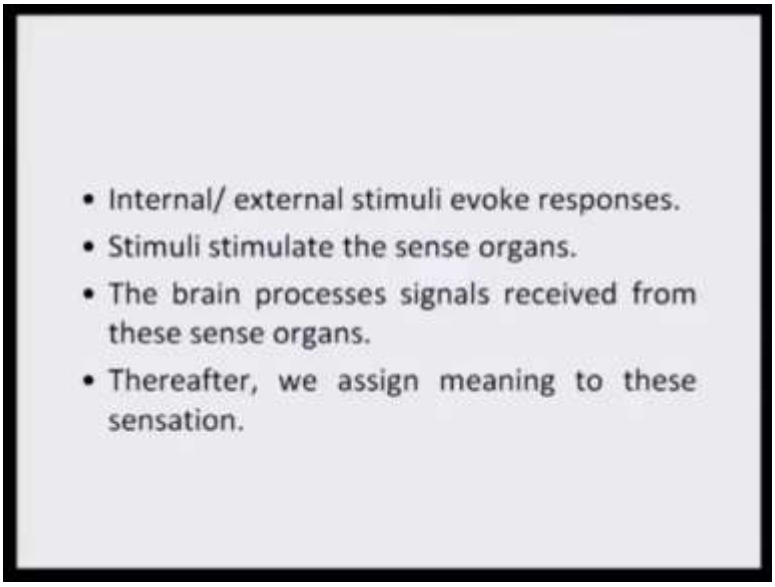


So, any information that comes to brain whether it is through the any external source or it is through the internal source this is called Sensation. And as you know that we are endowed with certain sensory organs. So, these sensory organs whether it is eyes, ears somesthetic sensors tongue all these sensors, they sends certain type of stimuli to the brain. So, the internal or the external stimuli that evoke response in us, is always important for a perceptual process to begin. So, when the brain will start processing the signals that it receives from the environment, it will then suddenly go ahead with process of assigning meaning to it.

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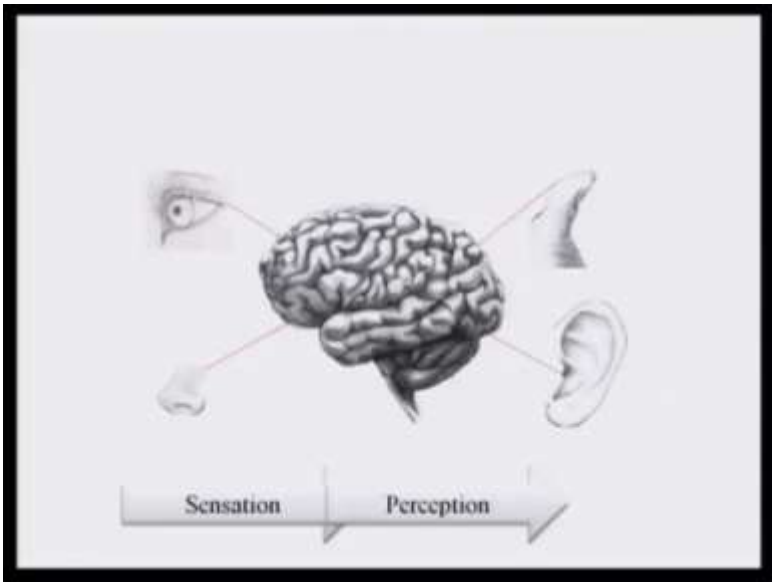


So, any perceptual process that we are looking at from the point of view of sensory input coming through sense modalities will finally, look for a possible meaning that would be considered as the most appropriate representation of what the brain is finally, decide for. And this is what is called Perception.

What we will do as part of this very course is that initially our focus would be on the process of sensation. So, we would look at the basic sensory organs, the eyes, the nose ,the ears, the somesthetic sensors, the kinesthetic sensors, the vestibular sensors, the olfactory mechanism and then we would know try to get a feel that this is how the brain gets the information and this is how we understand what is there in the real world.

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For doing this I am taking this very example, here you see boy who is primarily playing in the park. This boy is primarily trying to aim at the color disk that he is looking at. Suddenly he finds a bird there and he is starts following the bird because the chirping sound attracts him. If he is hungry, then he removes the rapper and eats a chocolate and then suddenly while eating he sees a rose in one of the corners of the park and he goes and smells it. These are the processes that all of us experienced throughout our life.

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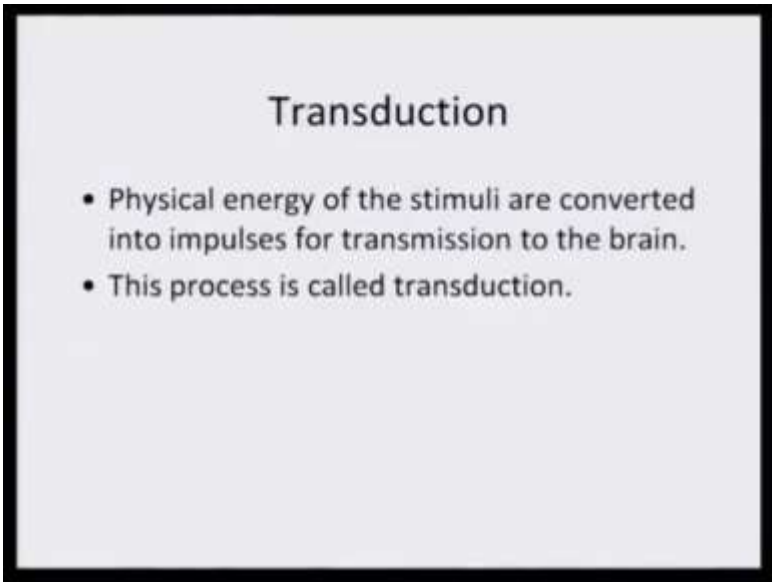


So, when the physical energy of the stimuli, when it is gets converted into the impulse and get transmitted to the brain. So, that the brain can finally, make a meaning out of it, this is called as Process of Transduction. So, the physical energy getting converted into an impulse which the brain can process is the process of transduction and this transduction is we can consider as the first step towards perceiving the external world.

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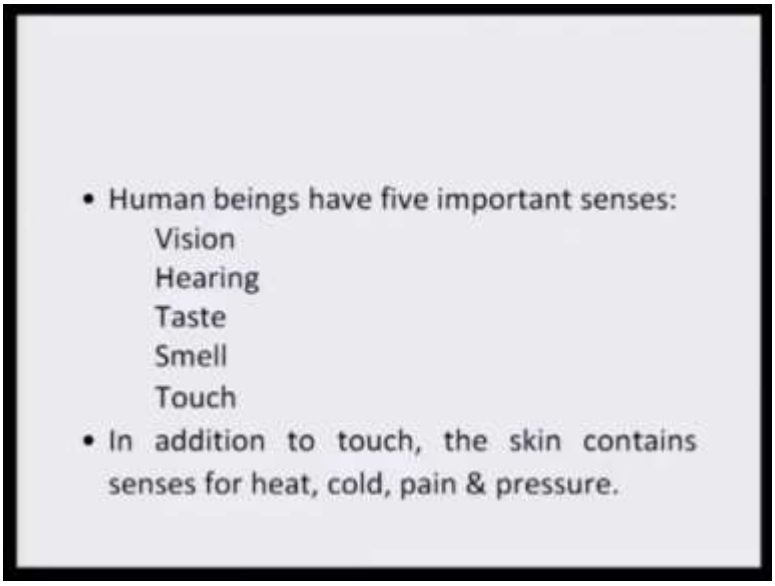

So, we have as human beings five important sense organs. A Vision, Hearing, Taste, Smell and Touch and in addition to touch the skin also now provides you with the senses of for heat cold pain and pressure.

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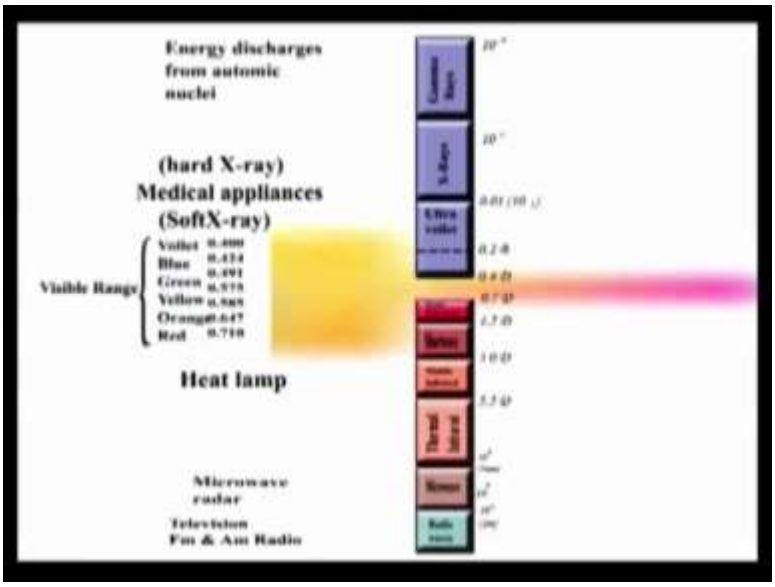


Now look at this very video. Let us now understand that fine once we know that this is what our eyes can process, how does the visual system works. To comprehend the visual mechanism clearly let us look at this video, here you see the electromagnetic variations emitted by various objects as you already know the visual spectrum extends from about 380 to 780 nanometers. The colors represent the visible spectrum.

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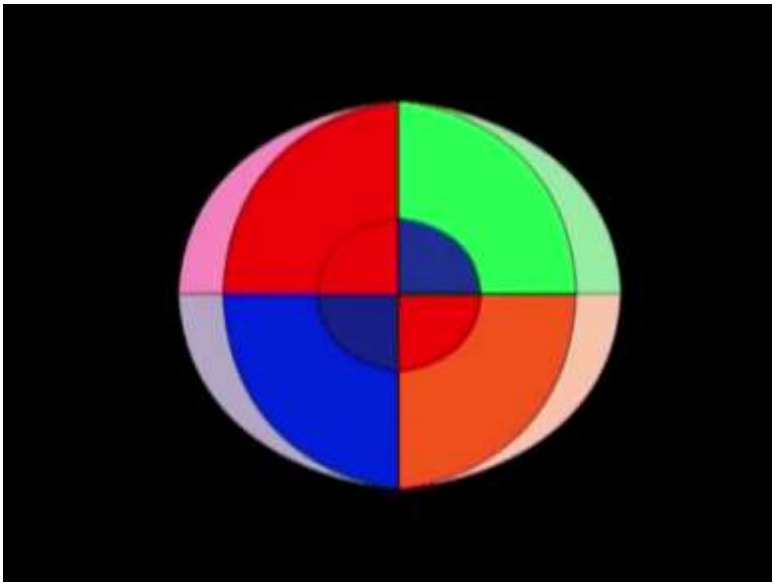

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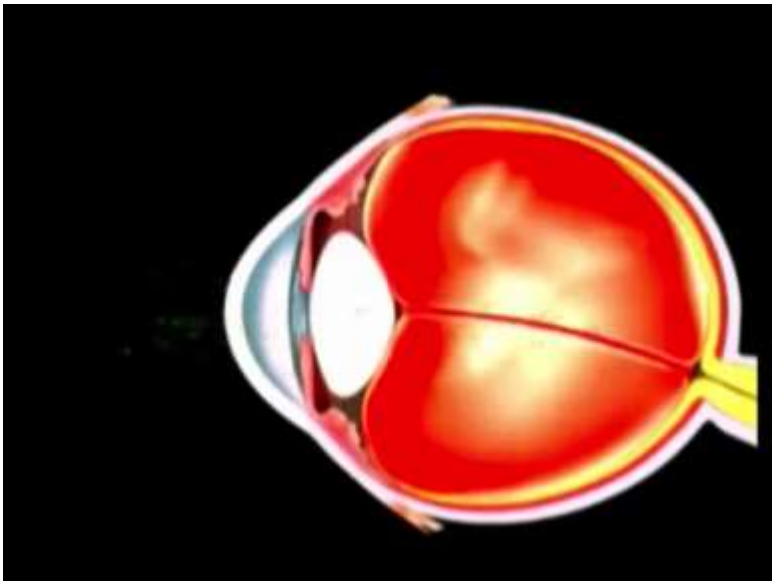

This is a colored disk and this boy is aiming at it we are trying to understand the visual mechanism. So, what did he see, to comprehend this let us look into his eyes, the light from the colored disk entered the eye through Pupil, Cornea, Lens and Interiors of eye ball it has now reached the Retina.

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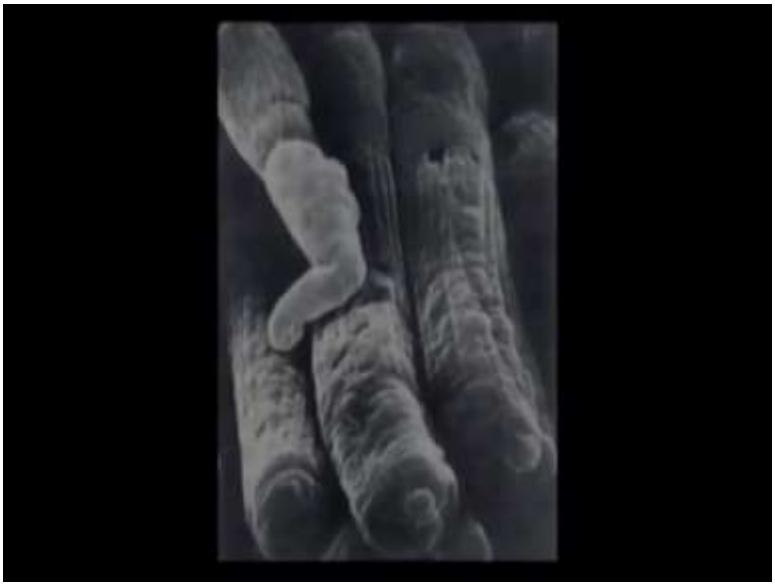

What you see now is a photo micrograph of the rod and cone sense in the eyes.

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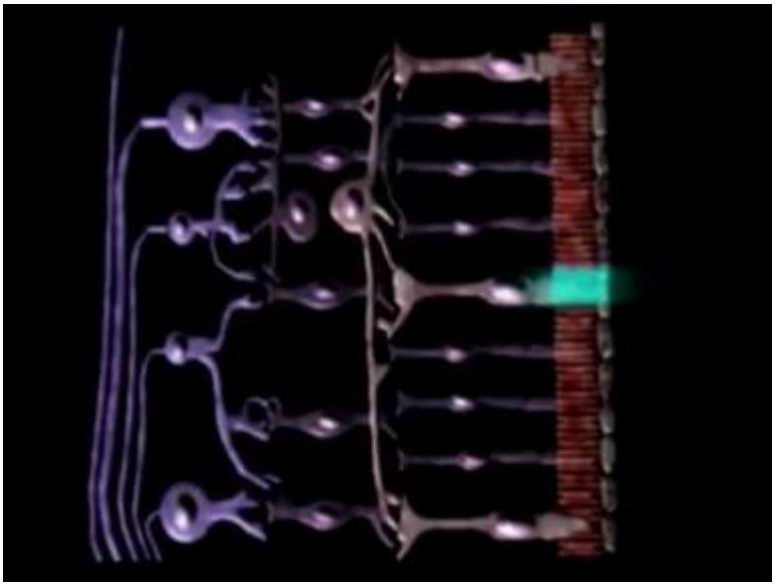

You are now looking at the ganglion cells that is M and P cells and the bipolar neurons. The light passes between the ganglion cells and the bipolar neurons. The bipolar neurons send the signal back to the ganglion cells. There after the optic nerve carries the signal to visual cortex.

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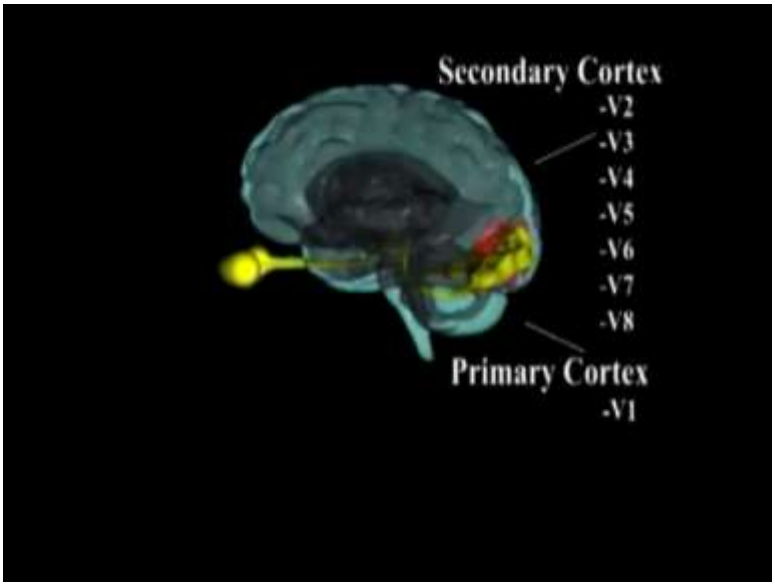

You now see the primary and the secondary visual cortex. That is visual area 1 mentioned here as V1 and areas 2, 3, 4, 5, 6, 7 and 8.

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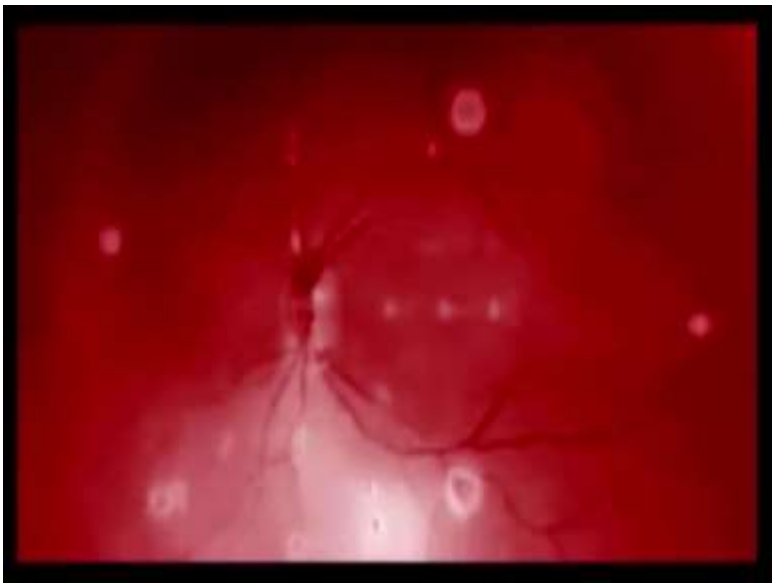

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Here you see the optic disc fovea and blood vessel. The visual sensation in this boy completed now, he was aiming at the colored disk. So, what did his brain see? The

extension of the color disk that you see with dashes shows the visual field of left and right eyes respectively. The part of the colored disk that you see next to the eye balls show the respective projections on the Retina of the left and the right eyes. The bright yellow light represents movement of signal across the brain. Some of optic nerves from both the eyes cross to other side of the brain at optic chiasm.

The neural conduction in the optic nerve reaches the lateral geniculate nuclei. The spread of colors on the left and the right sides show the inputs to the left and the right lateral geniculate nucleus respectively. Finally, the input reaches the visual cortex. Once again the colors, that you see in the part of the cortex represent the input that has reach the primary visual cortex on the middle surfaces of the left and right hemispheres of the brain. It is worth looking, that the full colored disk that the boy was looking at has been preceded differently by the two eyes and of course, two hemispheres of the brain. What is remarkable is that the parts of this information finally, combine and we perceive it as a color disk.

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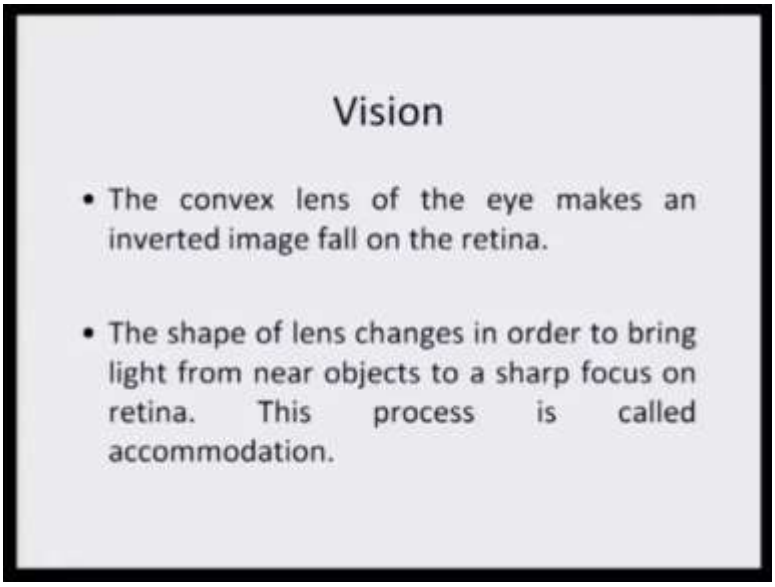


Now, primarily what is important for us to understand here is, that the convex lens of our eyes, it makes an inverted image fall on the Retina and the shape of the lens changes in order to bring light from near objects to a sharp focus on the Retina and this very process

of bringing sharp focus on the Retina is what is called as Accommodation. So, what we have done we have talked about transduction, we have right now talked about accommodation.

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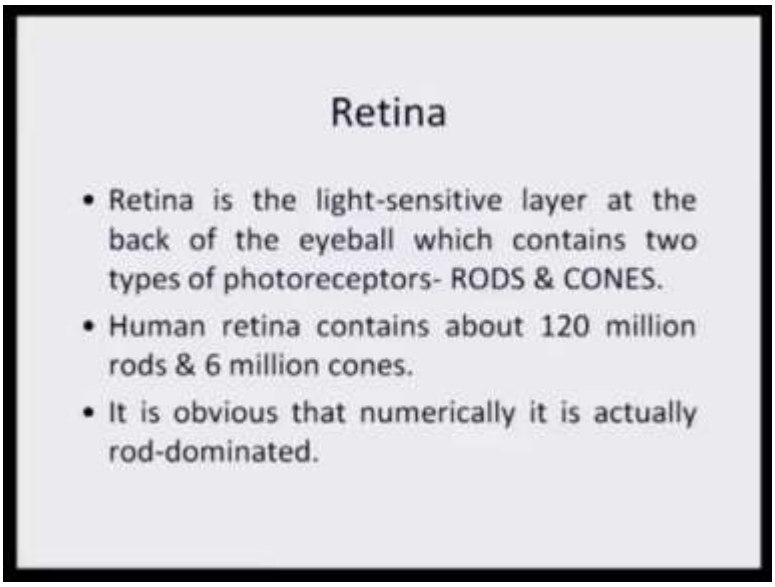


Now, the Retina is a light sensitive layer at the back of our eye balls which contains two types of photo receptors the rod cells and the cone cells. And it is very interesting to understand that numerically our Retina is rod dominated.

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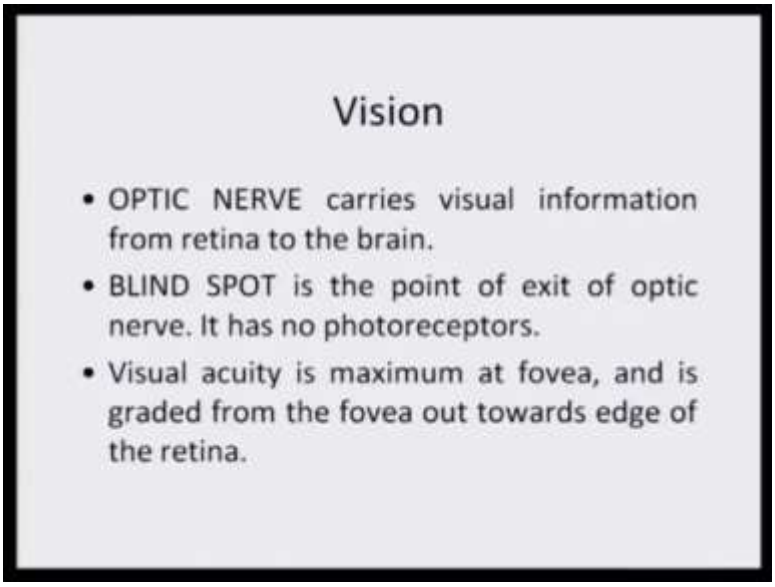


Then the primary things that you saw in the video right now over the optic nerves which carries the visual information from Retina to the brain and the point where the optic nerve makes an exit from the eye is called the Blinds Spot, because it does not have any photo receptors.

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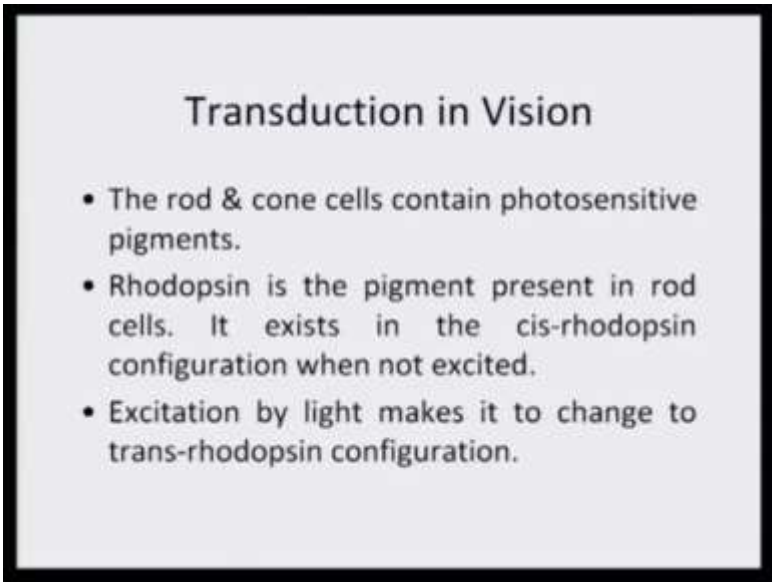

Now the rod and the cone cells they contain photosensitive pigments and very interestingly the rod cells for example, when it is not excited it is in the cis-rhodopsin configuration and when the light falls on it, it changes into the trans-rhodopsin configuration and this concept we will again carry when we come to memory and when we would be talking about iconic memory.

There we would be saying that right at the level of this sensory organ certain amount of time, very brief period of time, some amount of information is retained and at that time we would be referring to iconic memory, but right now we are not going to memory, but I would just request you to remember this fact. That the chemical configuration changes and to have a second round of excitation this trans-rhodopsin configuration will have to return back to it is a cis-configuration state.

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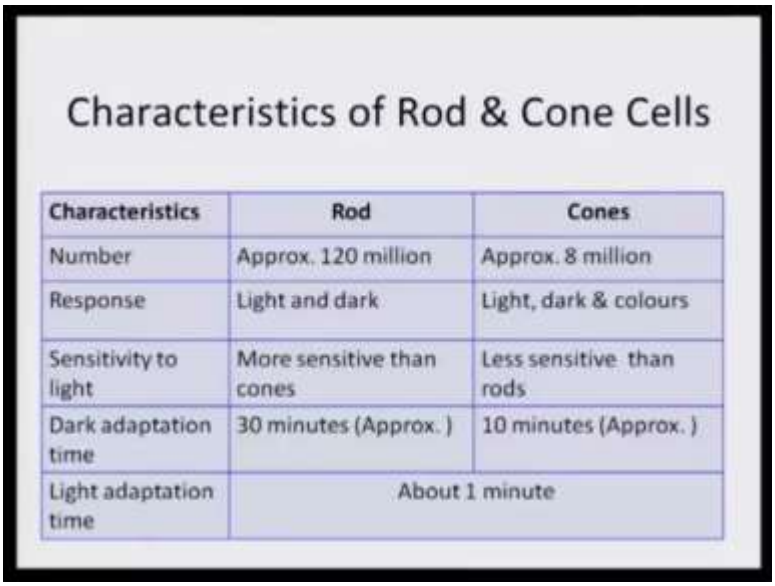


Now, let us just compare the characteristics of the rod and the cone cells in terms of number of course, as I said that our Retina is rod dominated. So, we have a approximately 120 million rod cells compare to just 8 million of cone cells, in terms of response rod cells are of course suppose to process the light in the dark condition whereas, cone cells also have the responsibility of identifying the colors. They are sensitive to colors. In terms of sensitivity to light rod cells of course, are more sensitive

compared to the cone cells. If you experience a dark situation, in terms of dark adaptation time the rod cell it takes approximately 30 minutes to adapt whereas, the cone cells they take approximately 10 minutes to adopt, where is in the light condition both these cells they take a approximately 1 minute for adaptation.

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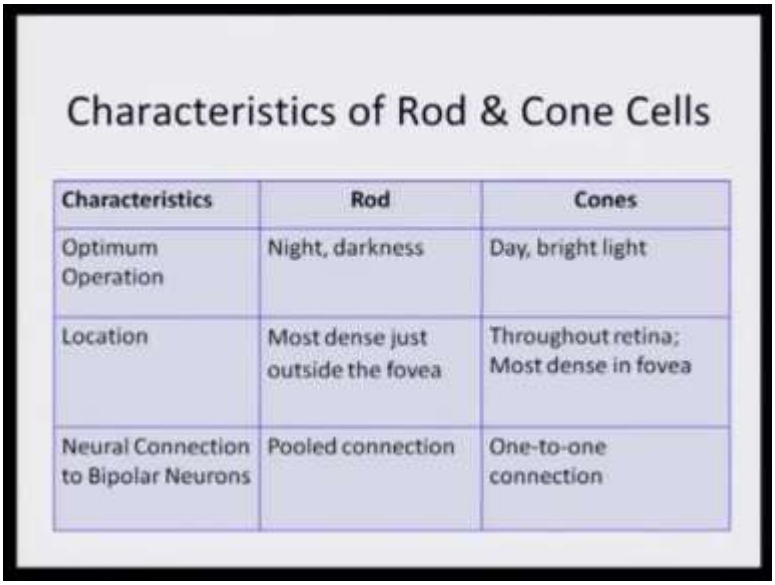


And again now the optimum operation of the rods cells can be seen during darkness whereas, cone cells maximum operations can be seen during bright light. And in terms of its location on the Retina the rod cells are more dense just outside the fovea whereas, cone cells are you know distributed throughout the Retina and it is more dense on the fovea, and in terms of neural connection to the bipolar neurons that you saw in the video, the rod cells are they are into pooled connected form format whereas, the cone cells they are one to one connected.

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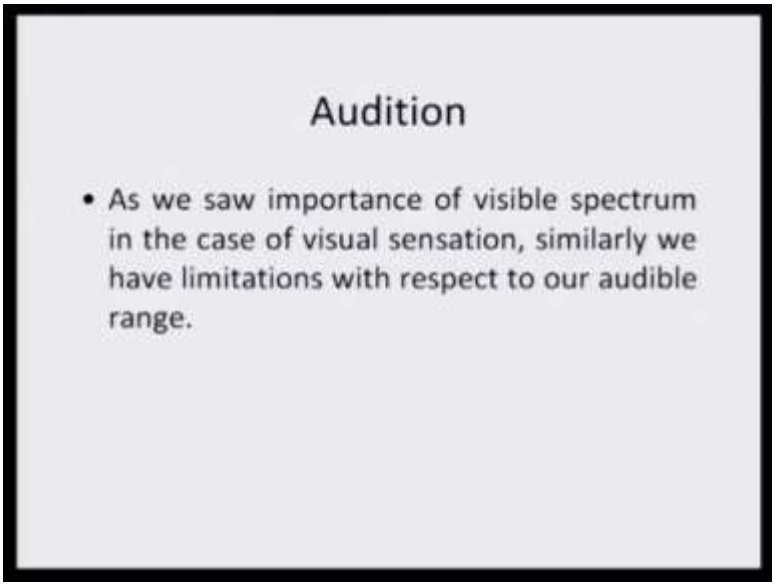


Now, in the video that you saw for the visual mechanism; you realized that we have a limitation in terms of our visible spectrum, it's not that entire range of light can be seen by us. So is the limitation even with our auditory mechanism.

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Look at this very video, to comprehend the auditory mechanism let us look at this video. This young boy is fascinated to the chirping sound of the little bird; he is scrolling and approaching the bird. How does he here this sound.

Look at his pinna, his pinna collects the sound energy that is generated by the bird. This sound travels through the ear canal and strikes his tympanic membrane. That is his ear drum. Here sound energy is transformed into mechanical energy, the oscillation of the ear drum makes the malleus ,incus, and stapes move. Besides transmitting the energy, these bones also amplify the sound. You can see the oscillation of stapes in the middle ear.

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This now presses the oval window and the vibration enter cochlea. You now see the organ of corti. The wave in the cochlea has reached there; the organ of corti has numerous hair cells, which act as receptors. The pressure on the waves stimulates these hair cells which in turn generates receptor potential. This neural firing travels to the brain through auditory pathway and the child senses that he is listening to this melodious sound of the bird.

Having seen how this child was actually listening to the chirping sound of the bird. Let us now come to the mechanism of Olfaction. This boy now after chasing the bird goes to a corner of the park looks at the flower. Look at this very video.

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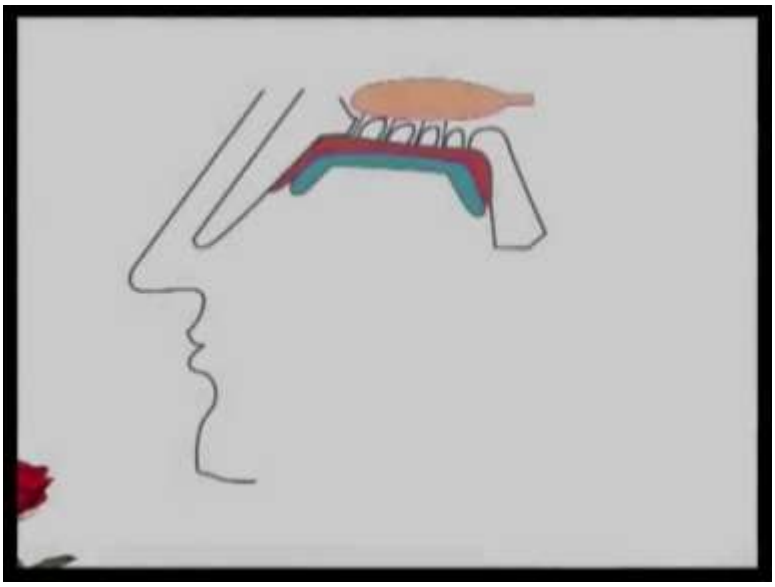

Let us look at this video to understand the olfactory mechanism. This young little boy is too fond of roses, he goes and sniffs the rose in his garden. How does he identify the smell of the rose? As you see here, the vigorous intake of air by this boy has made the OBP release in his nose. The receptors at the olfactory epithelium specialize in a particular smell, this unique odour reaches his olfactory bulb.

You see the olfactory bulb olfactory nerve and the mitral cells. You now see the olfactory receptor neurons that are blue, green and red in color here. You can see the OBP released and the conduction of odour signal in the olfactory receptor neurons. These odour signals are now transmitted from olfactory neuron to the mitral cells and finally, the olfactory track carries the message to the brain. This is how this young boy got this smell of the rose.

Now, after having had the smell of the flower now the boy feels hungry and he thinks of eating chocolate, look at this very video which would explain the mechanism of taste.

This young boy is enjoying a chocolate, how does he get the taste of it, look at his tongue.

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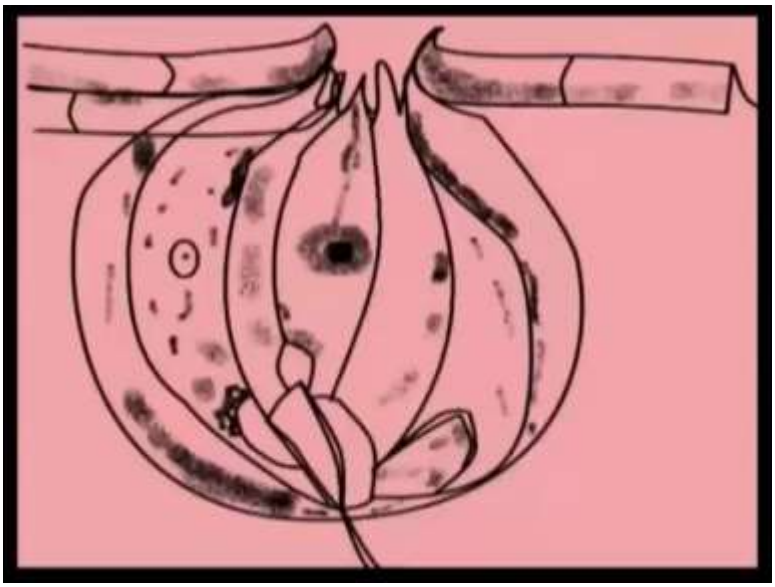

The tip of the tongue sensitive to sweet and salty taste; side to sour and the back to bitterness you can see small bumps that contain the taste buds, these bumps are called Papillae. You can see a taste bud. The chemical components of chocolate dissolve in the saliva and goes down to the services between the papillae. This chemical interaction triggers adjacent neurons and these impulses travel to the parietal lobe and limbic system of the brain of this boy. This is how he got the taste of the chocolate.

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Now, if you combine all the video that you seen, you saw the video for the visual mechanism, you saw the video for auditory mechanism, you saw the video for the olfactory mechanism and finally, the taste mechanism. So, if you combine all these now video that you saw right now.

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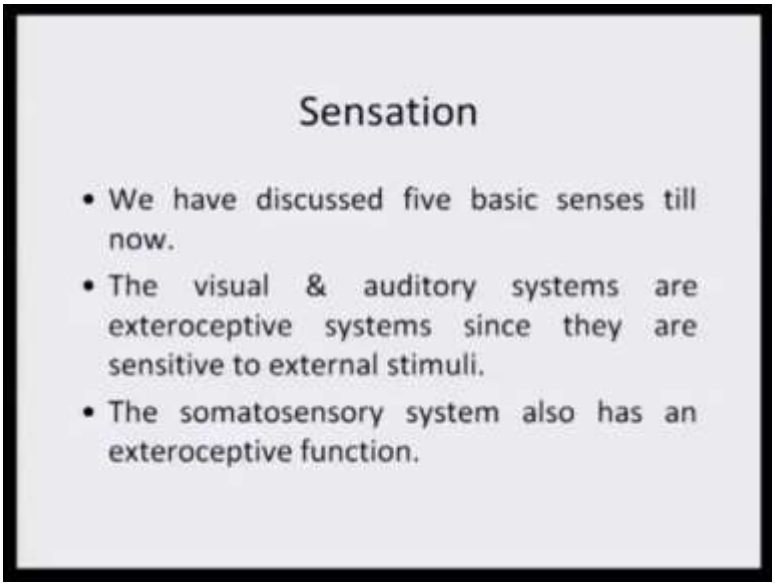

You can very easily sense that fine this is how we make a sense of world. So, till now we have discussed the five basic sense modalities. The visual and auditory systems are exteroceptive systems. Since, they are sensitive to our external stimuli, whereas somatosensory system also has an exteroceptive function to perform.

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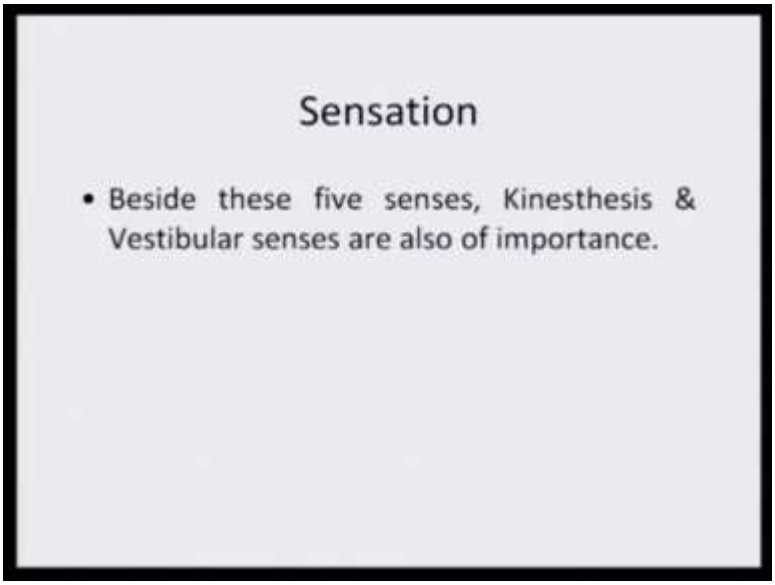


So, beside these five senses, we have two important sensations one is the kinesthesis senses another is the vestibular senses and both of them help us like anything in terms of living in this very world.

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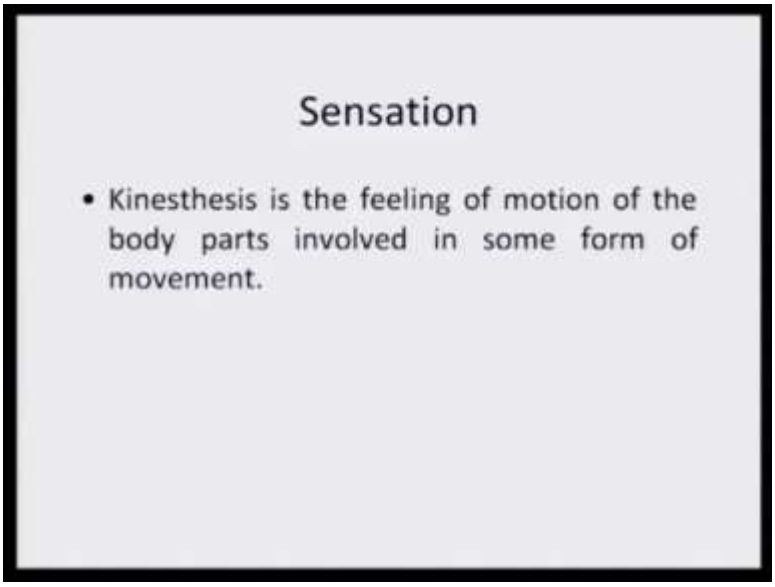


Now, Kinesthesis is the feeling of motion of the body parts involved in some form of movement. Imagine the situation say for instance, you are traveling you are walking, you are running. Now basically what you are doing is that you have perception of your body parts, how it moves and that gives you a constant feed back in terms of synchronizing your movement, so that you can perform the act that you are performing. Whether it is say walking running whatever it is. It is this very kinesthesis sense which gives you a complete feedback as to how your body parts are moving and this helps you a perform the task meticulously.

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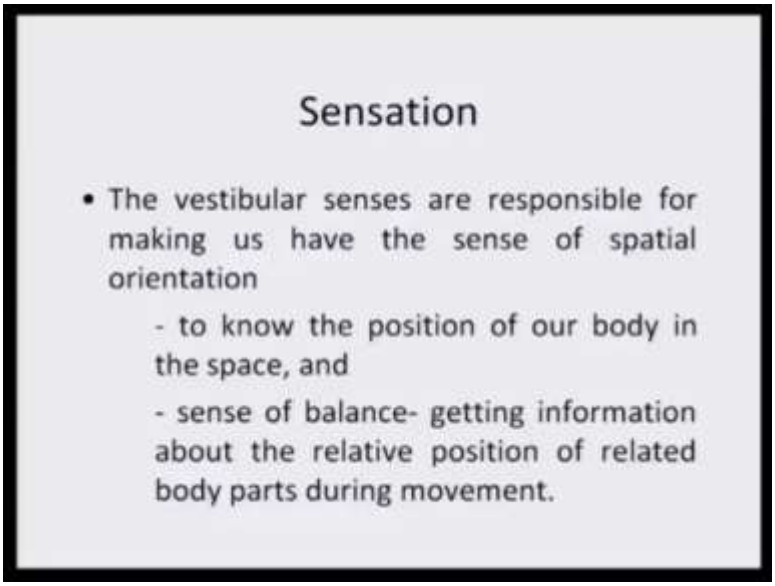


The other sense that we are now coming to is the sense what is called as the Vestibular senses and these are senses which are responsible for making us have the sense of spatial orientation. spatial orientation would mean that it helps us know, the position of our body in this space. Say for example, if you are say - trying to jump for instance. You have to understand very well the relative position of your body in the space.

So, the sense of balance during movement all types of movement is basically dependent on the vestibular senses.

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Let us now see these small video clips from the Beijing Olympics. These are some of the finest movements, that human beings are capable of performing. All this require extreme degree of coordination. Now that the video footage that you saw, you had a gymnast who was moving without looking at object that hand was resting the body weight upon. In the other case you saw an athlete performing on the surface of the ice and it was a perfectly synchronized movement even though the body weight was rested on 1 foot, 2 foot both the feets and then even while the whole body was you know swinging very fast.

Now these are the processes for which you require sound vestibular mechanism. So, with this we come an end to our discussion on the first topic, where we focused exclusively on the sensory mechanism. Just to recapitulate we have discussed about the visual mechanism, we have talked about the auditory mechanism, we talked about olfactory mechanism, we also talked about the taste mechanism, these four mechanisms and then we additionally we took into account the kinesthetic and vestibular senses. So, this is how the input comes to the brain. Once this following the process of transduction the information comes to the brain, our brain then tries to assign an appropriate meaning to this. If we succeed a assigning an appropriate meaning to what we have sensed this is what is called as Perception.

Key words - perception, transduction, vision ,audition, taste , sensory mechanisms