Indian Institute of Technology Kanpur
National Programme on Technology Enhanced Learning (NPTEL)
Course Title
A Brief Introduction of Psychology

Lecture – 01
Perception

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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 a behavioral point of view just look at the line that you see on this screen.

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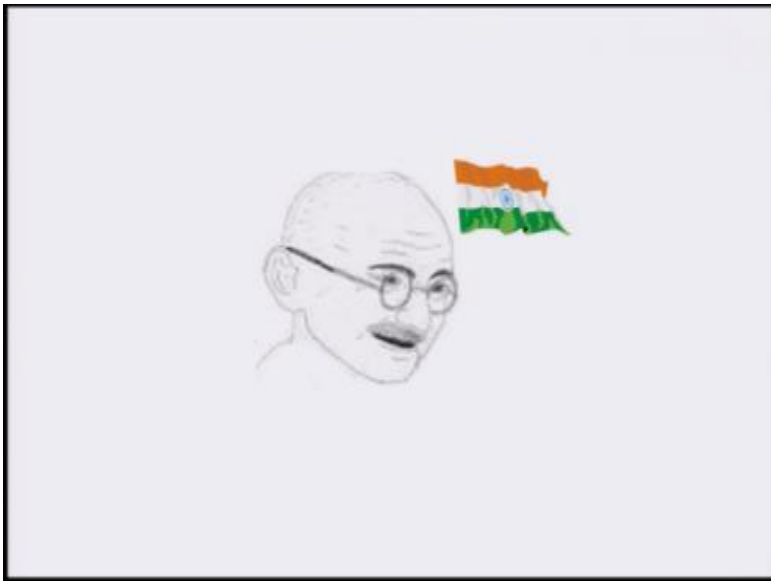

What do you see right now, you can somehow guess that this is perhaps a curve line that someone has drawn, I extend it little more and then you realize that fine the line has now taken a more sharp turn towards the right and then I further now try to extend it, it is difficult to make a sense out of it and then I add these lines and you can very easily now make out who this person

is okay. 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 okay. You derive certain type of mental images of a certain type of representations like freedom, you derive you might even derive them a political map of a country called India, you might have now recollection of some philosophies that is now call as Gandhian philosophy, whole lot of things gets recollected okay.

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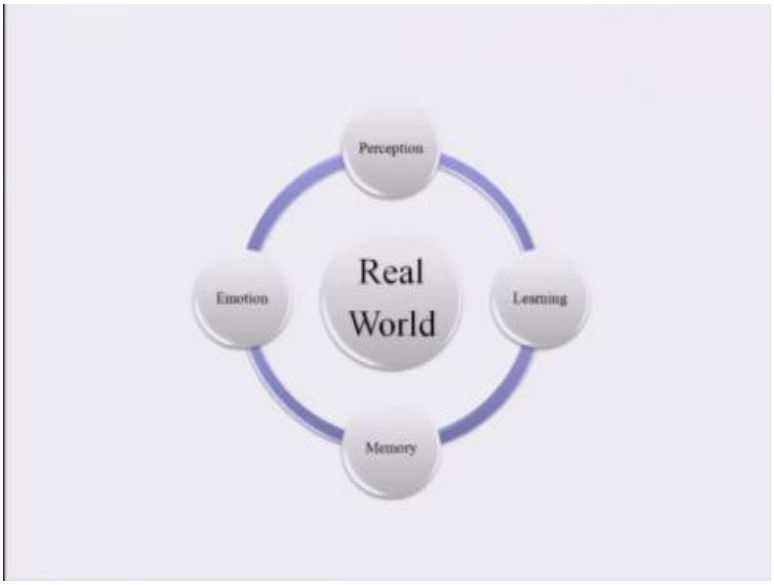

So actually when you look at the real world we take sudden inputs from the external environment, sometimes it might be that we might draw some inputs even from our internal mechanism and then we try to assign a meaning to it, in psychology this is what we call as the process of perception. Now the fact that I failed to decipher the line even though it was being extended couple of times till I got substantial q to identify that I am looking at the line drawing that represents the father of the nation.

I was searching for a possible q so that I could assign meaning to it, this process is what is called

as perception and the first topic that we would be taking as part of this very course is the topic called perception, the perceptual processes. We would know succinctly going into certain details the reason I am saying that I would be brief in my approach is the, primarily the fact that we have a limited number of hours available to us it is just a 10 hour course, 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 okay, so these are the four prominent processes that we would be talking about as part of this course, so initially we will begin with the process of perception, then we will go to learning, then we will come to memory and finally we will be talking about emotional processes, the effective processes and that would complete our no, 4 topics that is designated for this very course.

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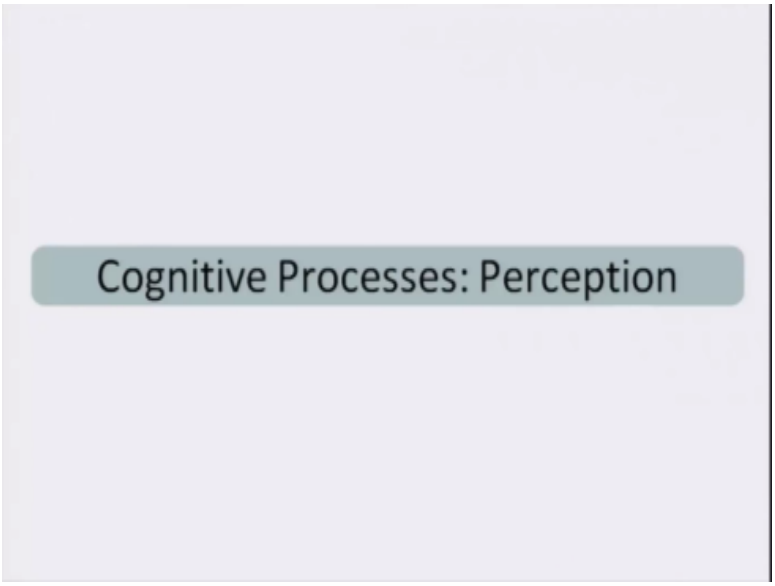

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Before we come to perception let us understand one thing, that the brain before it arrives at a conclusion, before it assigns a meaning to something it would require a trigger, it would require a sensation from outside okay, so any information that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

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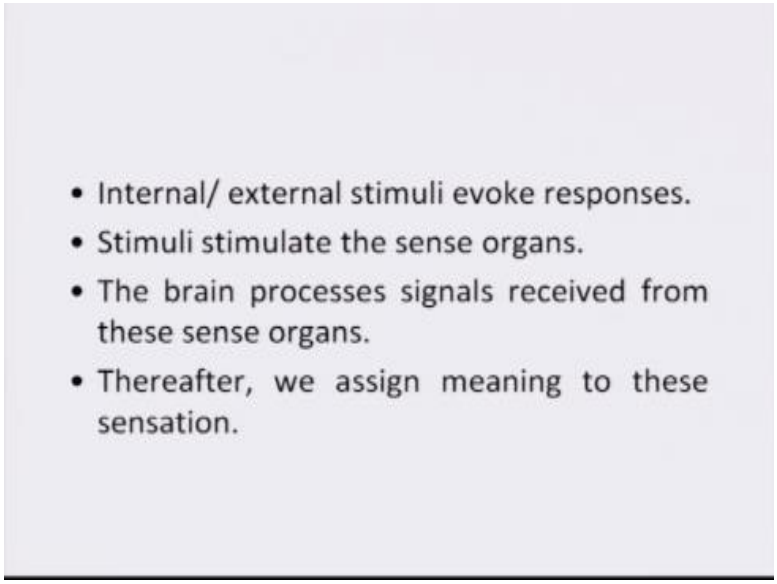

So these sensory organs whether it is eyes, ears, the somesthetic senses, tongue, okay all these senses they sense certain type of stimuli to the brain okay, so the internal or external is stimuli that evoke responses in us okay is always important for a perception process to begin okay. So when the brain will start processing the signals that it receives from the environment okay it will then suddenly go ahead with the process of assigning.

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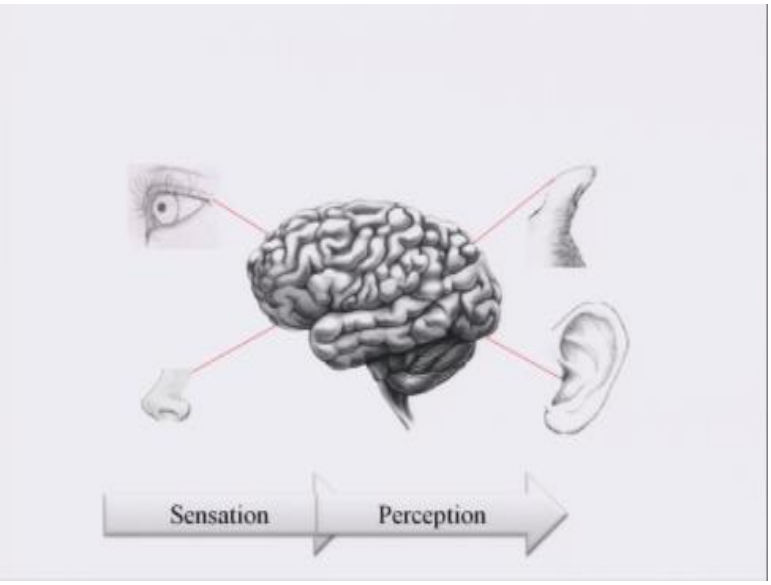

Meaning to it okay, so any perception process that we are looking at from the point of view of the sensory input coming through since modalities will finally look for a possible meaning that would be considered as the most appropriate representation of what the brain has finally deciphered and this is 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, okay the somesthetic senses, the kinesthetic senses, the vestibular sense, the all factor mechanism.

And then we would know or try to get a feel that okay 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 a boy who is primarily playing in the park. This boy is primarily trying to aim at the color disc that he is looking at, suddenly he finds a bird there and he starts following the bird because the chirping sound attracts him, he feels hungry and then he removes the rapper and eats the chocolate and then suddenly while eating he sees a rose in one of the corners of the park and he goes and smells it okay, these are the processes that all of us experience throughout our life.

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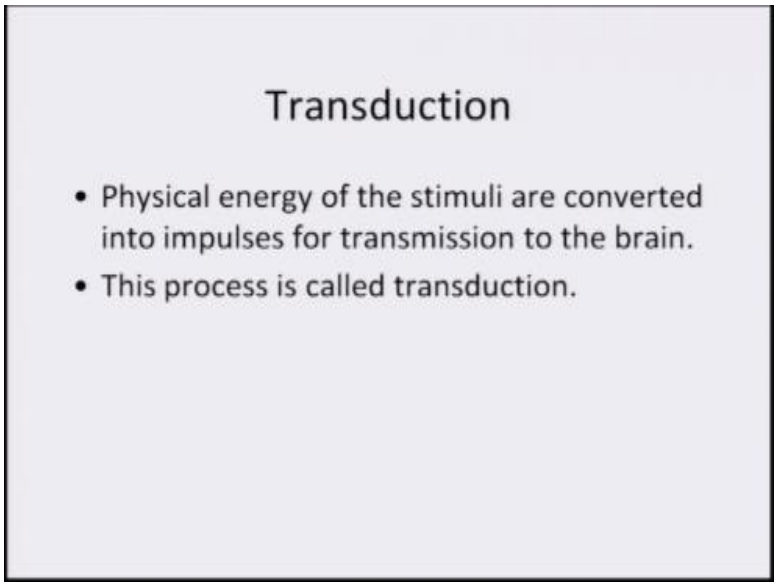

So when the physical energy of the stimuli, when it gets converted into the impulse and gets transmitted to the brain so that the brain can finally make a meaning out of it this is called as the process of transduction okay. So the physical energy getting converted into a, an impulse which the brain 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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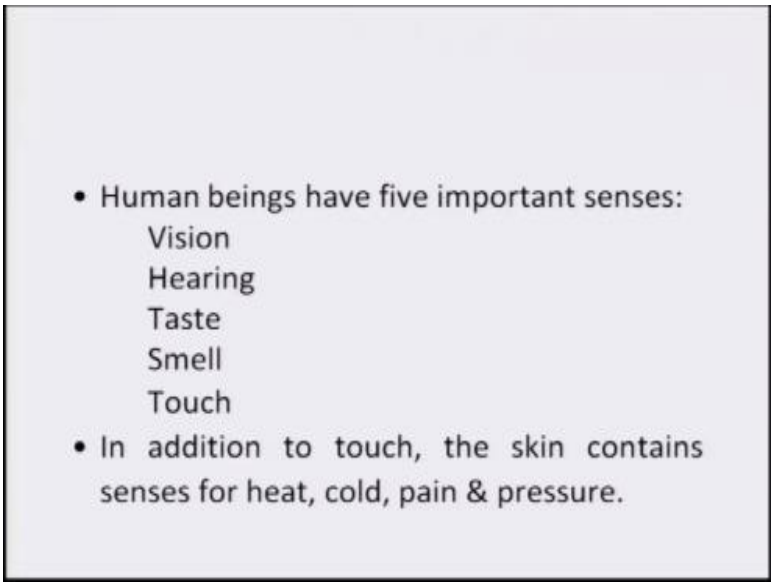

So we have as human beings five important sense organs vision, hearing, taste, smell, and touch and in addition to touch the skin also now provides you with the census of heat, cold, pain, and pressure okay. Now look at this very video.

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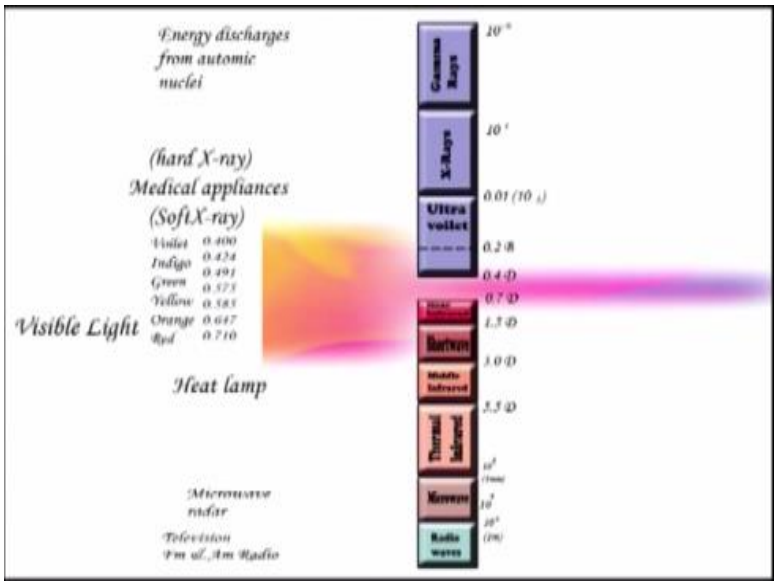

Let us now understand that fine once we know that this is what our eyes can process how does the visual system work.

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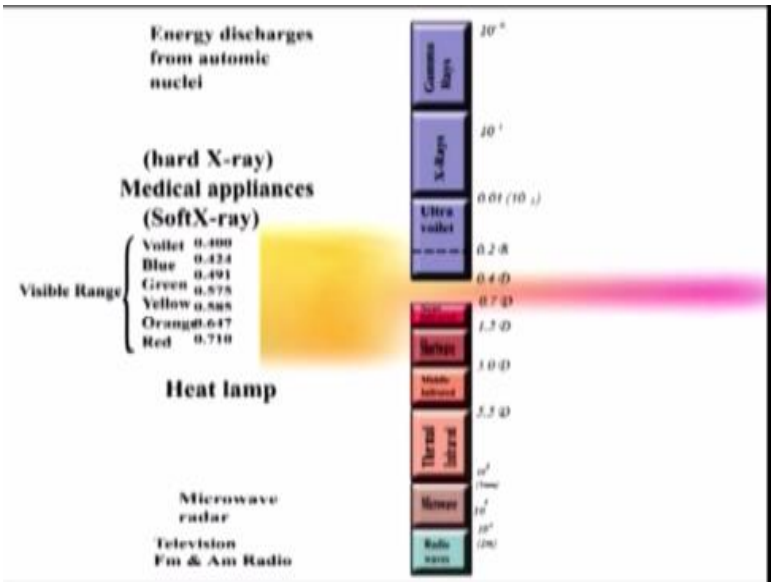

To comprehend the visual mechanism clearly let us look at this video, here you see the electromagnetic radiations emitted by various objects, as you already know the visual spectrum extends from about 38o to 780 nanometers, the colors represent the visible spectrum.

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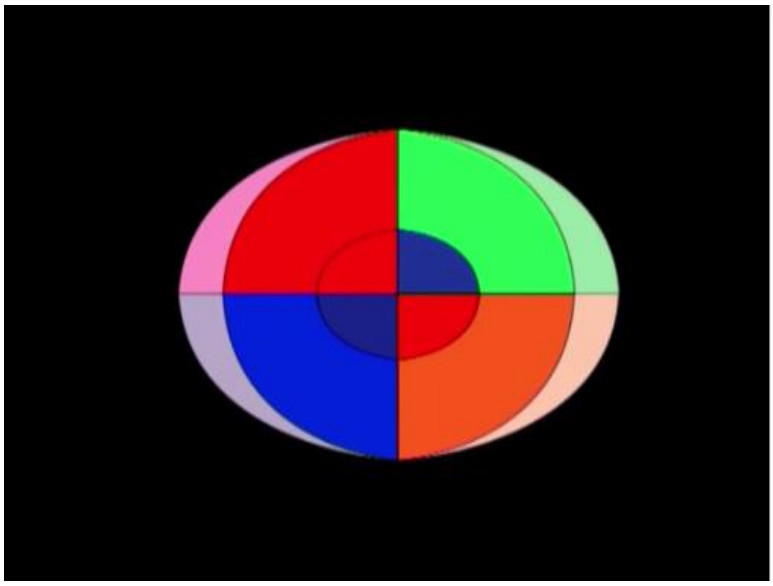

This is a color disc

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And this boy is aiming at it, we are trying to understand the visual mechanism so what did he see.

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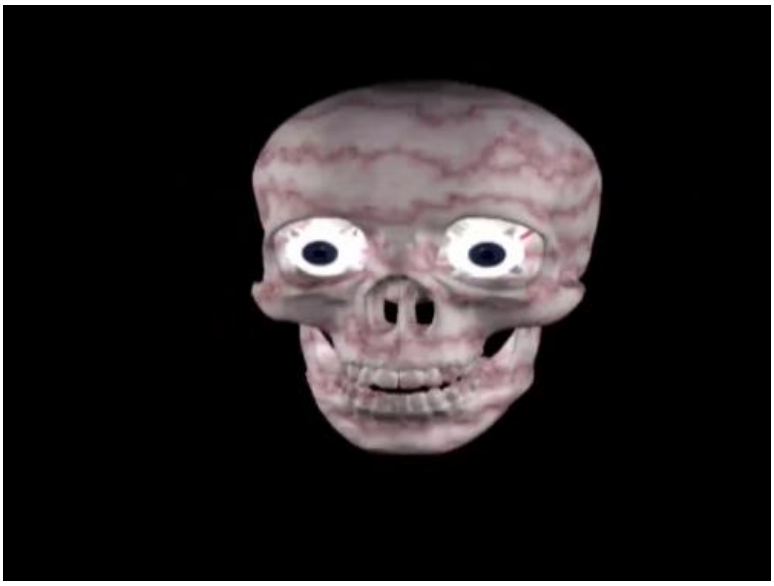

To comprehend this let us look into his eyes.

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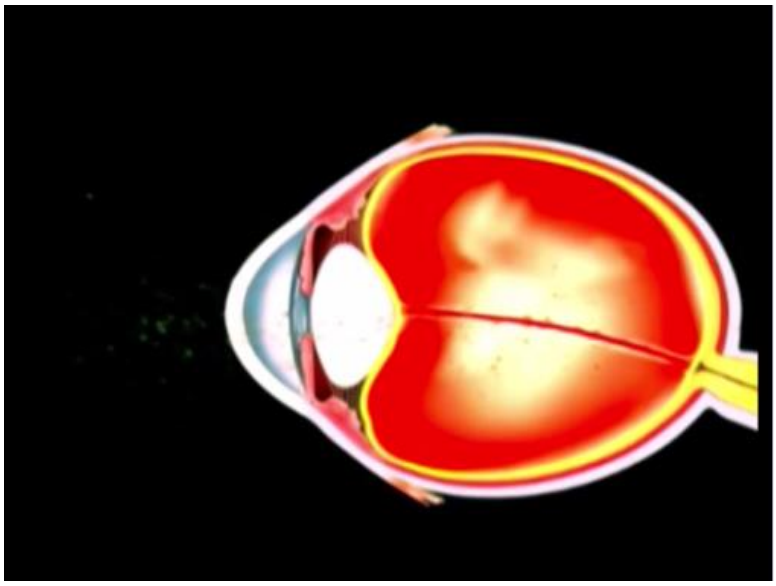

The light from the color disc entered the eyes through pupil, cornea, lens, and interiors of eyeball, it has now reached the retina.

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

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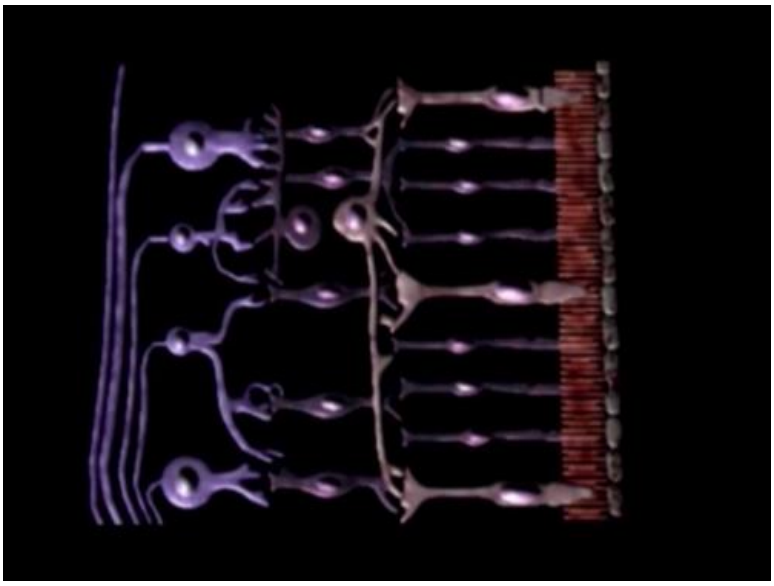

You are now looking at the ganglion cells that is the M and the P cells and the bipolar neurons, the light passes between the ganglion cells and the bipolar neurons, the bipolar neurons send the signal back to the ganglion cells, thereafter the optic nerve carries the signal.

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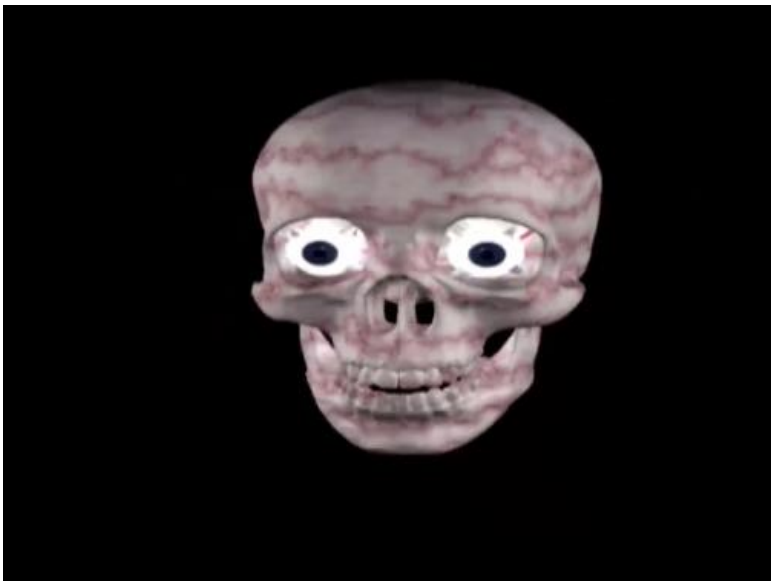

To the visual cortex.

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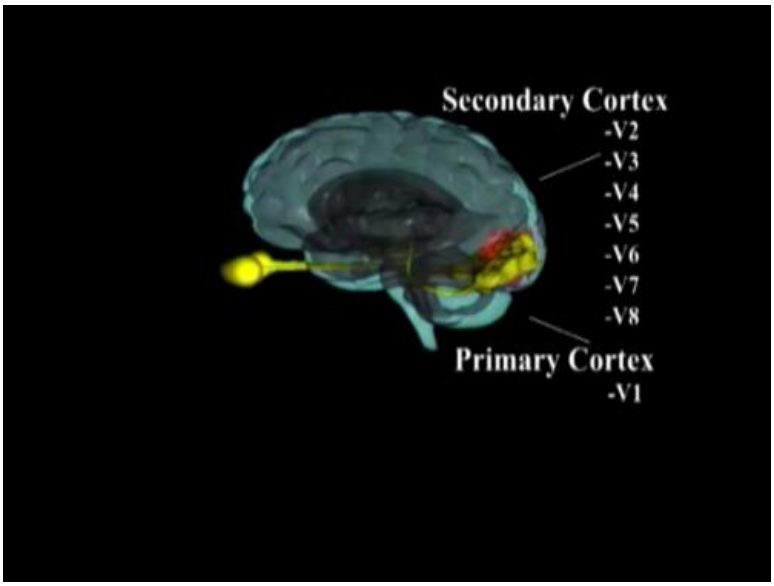

You now see the primary and the secondary visual cortex, that is visual area 1 mentioned here as V1 and areas 2, 3, 4, 5, 6, 7, and 8.

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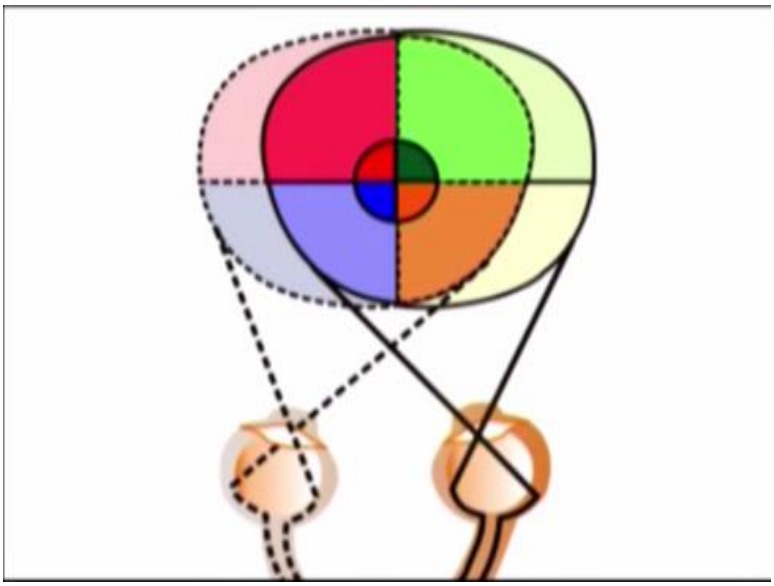

Here you see the optic disc fovea and blood vessels. The visual sensation in this boy is completed now, he was aiming at the color disc so what did his brain see? The extension of the color disc that you see with dashes shows the visual field of the left and the right eyes respectively, the part of the color disc.

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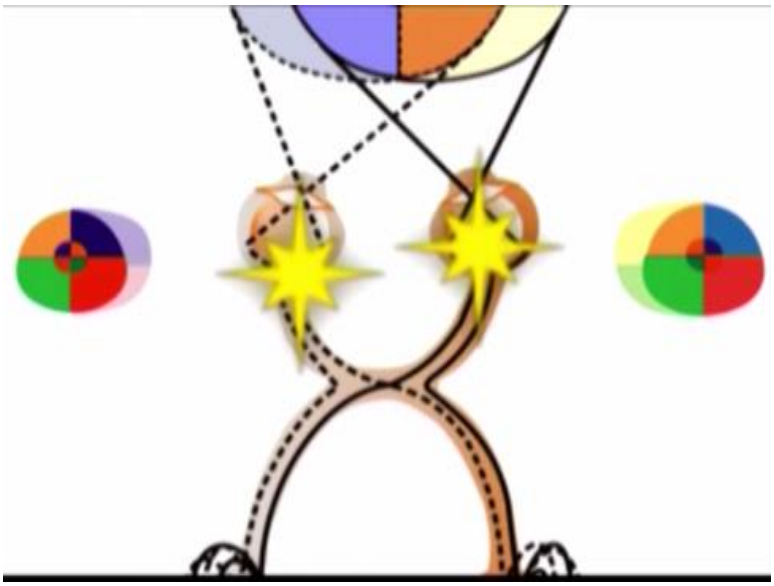

That you see next to the eye balls show their respective projections on the retina of the left and the right eyes, the bright yellow light represents the movement of signal across the brain.

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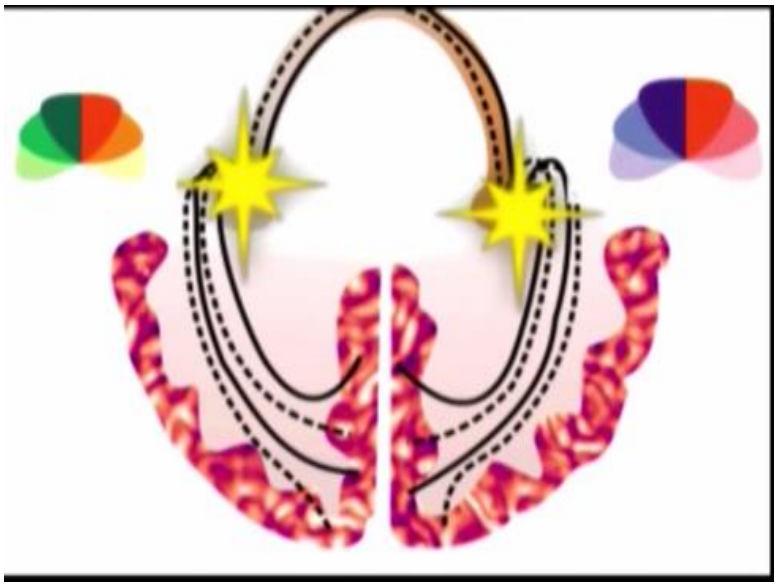

Some of the optic nerves from both the eyes cross to the other side of the brain at optic casim, the neural conduction in the optic nerve reaches the lateral geniculate nuclei, the spread of colors on the left and the right sides show the inputs to the left and the right lateral geniculate nuclei respectively.

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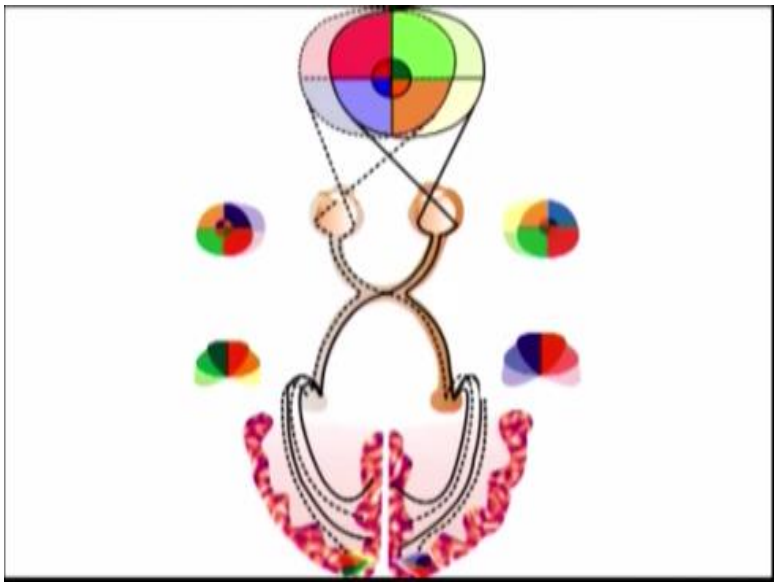

Finally the input reaches the visual cortex. Once again the colors that you see in the part of the cortex represent the input that has reached the primary visual cortex on the medial surfaces of the left and the right hemispheres of the brain. It is worth looking that the full color disc that the boy was looking at.

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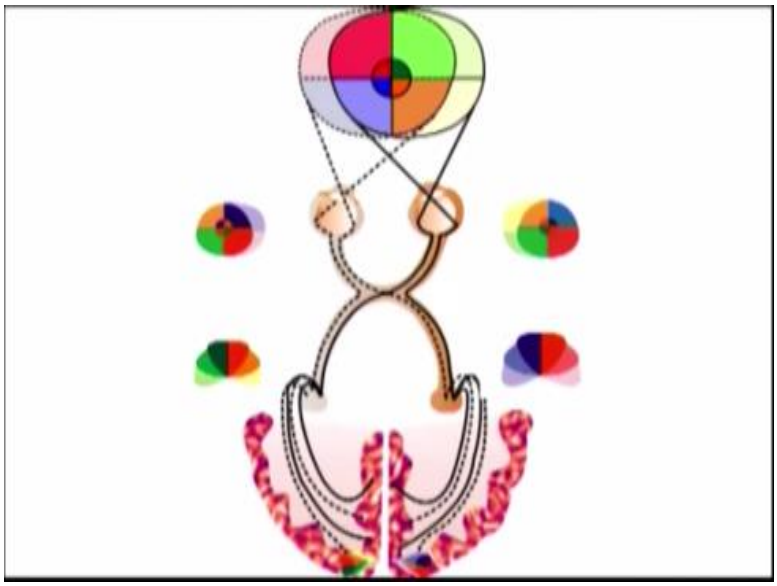

Has been processed differently by the two eyes and of course the two hemispheres of the brain, what is remarkable is that the parts of this information finally combined and we perceive it as a color dis. Now primarily what is important?

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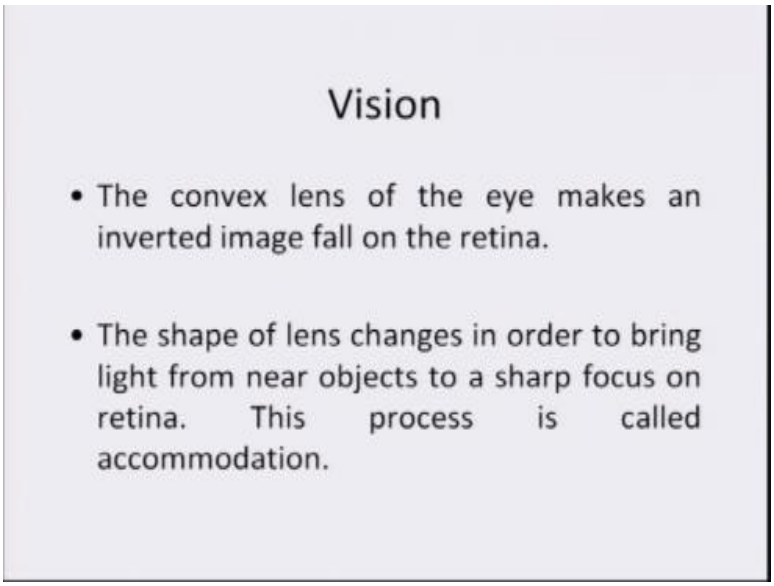

For us to understand here is that the convex lens of our eyes it makes an inverted image fall in the retina okay, and the shape of the lens changes in order to bring light from near objects to a sharp focus on the retina and this very process okay of a no, bringing a sharp focus on the retina is what is called as accommodation, so what we have done we have talked about the transduction, we have right now talked about accommodation okay.

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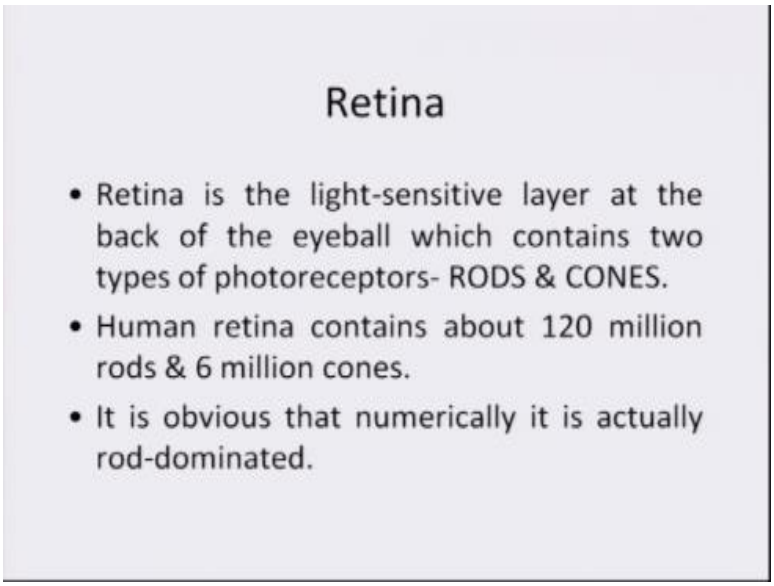

Now the retina is a light-sensitive layer at the back of our eyeballs which contains two types of photoreceptors, the rod cells and the cone cells okay, and what it is very interesting to understand that numerically our retina is.

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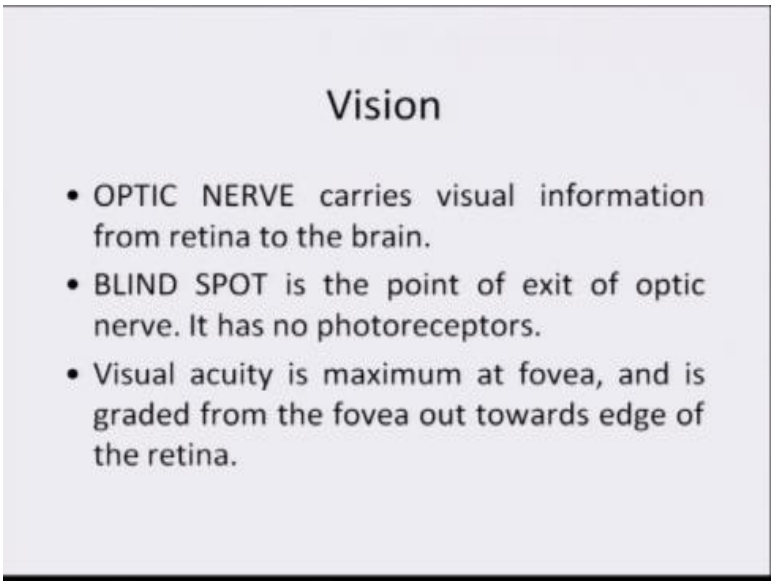

Rod dominated okay, then the primary things that you saw in the video right now were the optic nerve which carries the visual information from retina to the brain, and the point where the optic nerve now makes an exit from the eye is called the blind spot because it does not have any photoreceptor.

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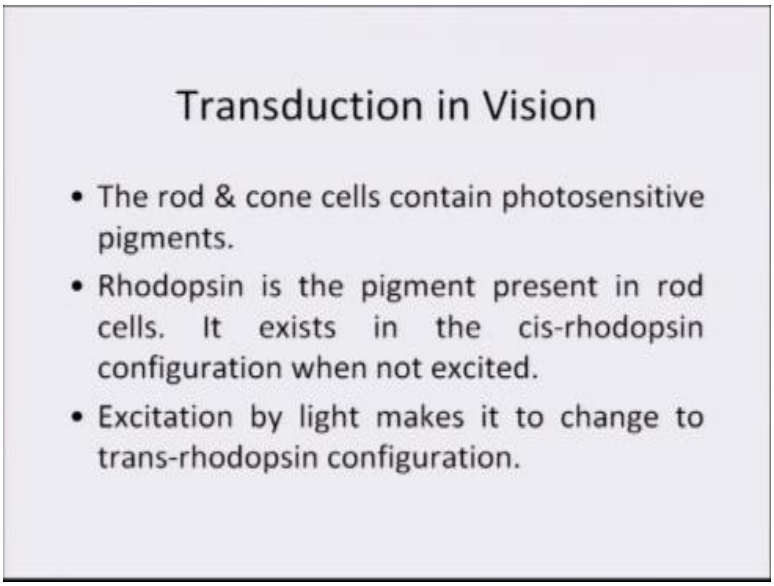

Now the rod in the cone cells they contain photosensitive pigments okay, and very interestingly the rod cells for example when it is not excited it is in the cis-rhodopsin configuration and when the light falls on it changes into the trans-rhodopsin configuration, and this concept we will again carry 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, certain amount of time very brief period of time.

Some amount of information is retained okay, 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 okay that the chemical configuration changes okay and to have a second round of excitation this trans-rhodopsin configuration will have to return back to it is since this configuration a state okay.

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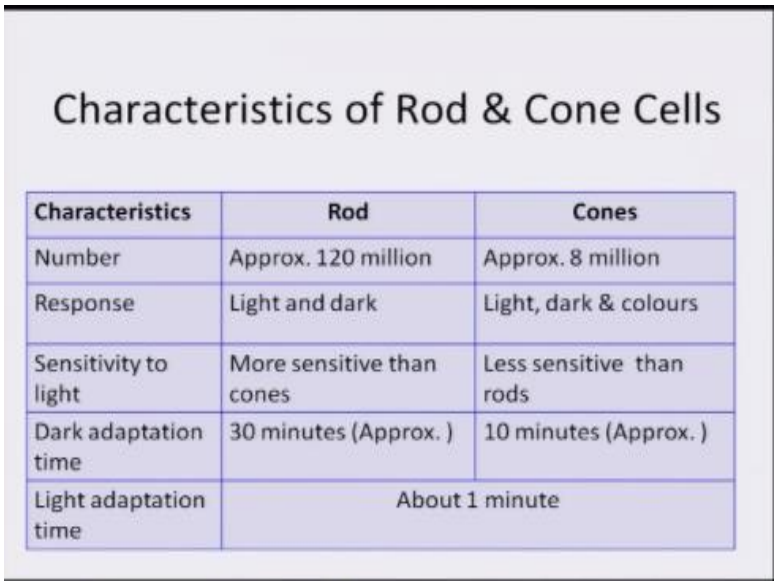

Now let us just compare the characteristics of the rod in the cone cells. In terms of number of course as I said that are pretty nice rod dominated so we have approximately 120 million rod cells compared to just 8 million of cone cells into some response. Rod cells are now of course now supposed to process that light in the dark condition and 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 so in terms of dark adaptation time the rod cell it takes approximately 30 minutes to adapt whereas the cone cells take approximately 10 minutes to adapt, whereas in the light condition both these cells they take approximately 1 minute for adaptation.

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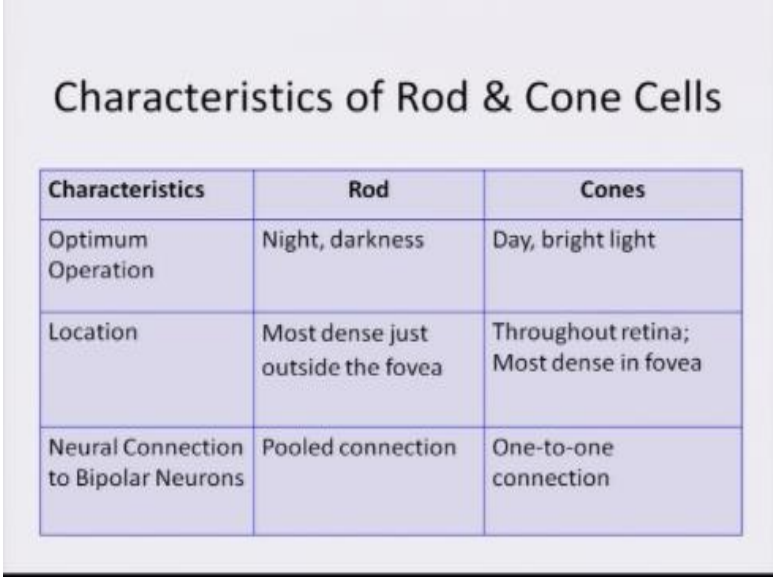

And again now the optimum operation of the rod cells can be seen during darkness whereas cone cells maximum operations can be seen during bright light, and in terms of its location on the retina the rod cells are more dense just outside the fovea whereas cone cells are and distributed throughout the 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 no they are into pulled connected form format, whereas the cone cells they are 1 to 1connected.

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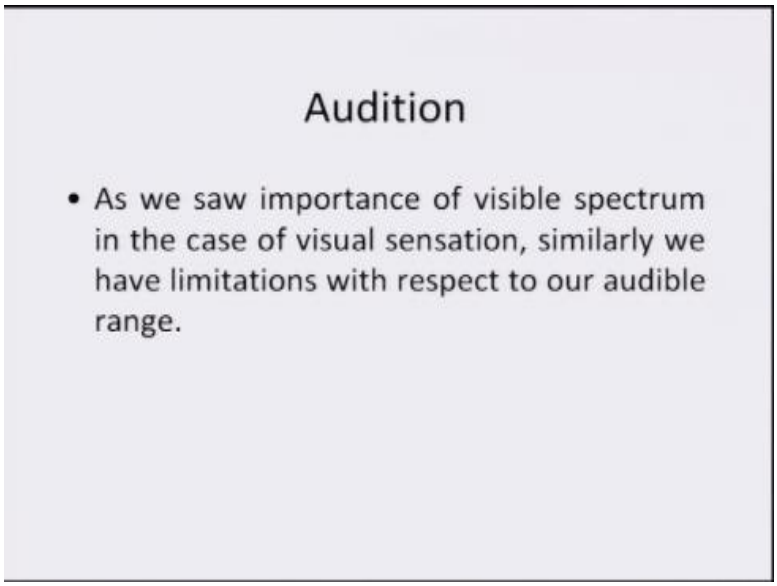

Now in the video that you saw for the visual mechanism you realized that we have a limitation in terms of our visible spectrum, it is not that the entire range of light can be seen by us, so is the limitation even with our auditory mechanism, look at this very video.

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To comprehend the auditory mechanism let us look at this video, this young boy is facilitated to the chirping sound of the little bird, he is crawling and approaching the bird, how does he hear the sound? Look at his penna, his penna collects the sound energy that is generated by the bird.

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This sound travels through the ear canal and strikes his tympanic membrane that is his eardrum, here sound energy is transformed into mechanical energy, the oscillation of the eardrum makes the malleus incus and steps move besides transmitting the energy these bones also amplify the sound, you can see the oscillation of steps in the middle ear.

This now presses the oval window and the vibration inters cochlea, you now see the organ of corti, the wave in the cochlea has reached there.

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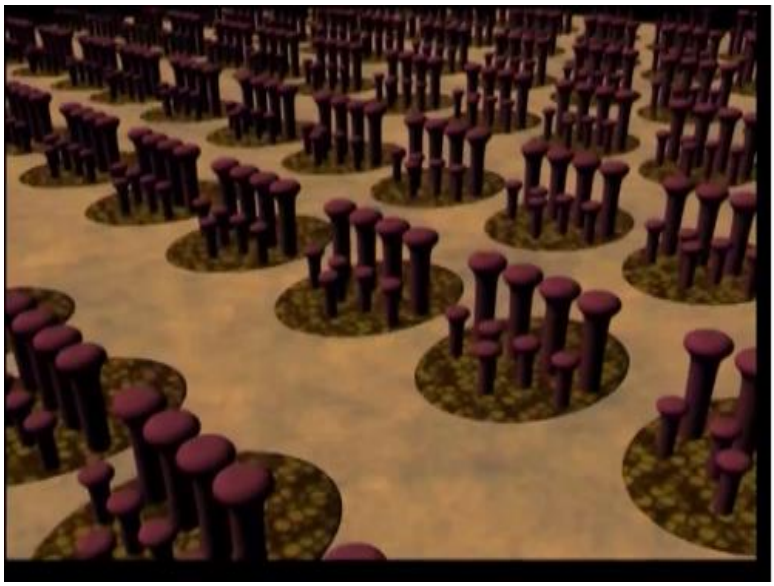

The organ of corti has numerous ear cells which act as receptors.

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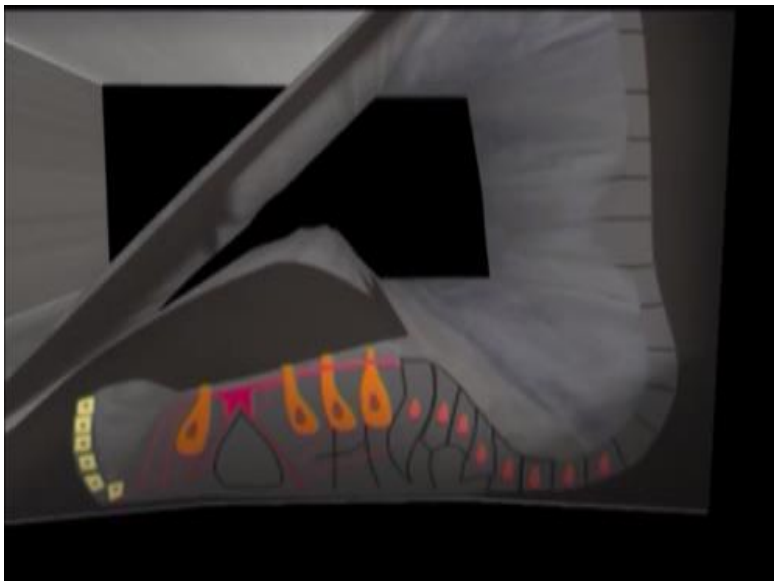

The pressure on the waves stimulates these hair cells which in turn generate a deceptive potential.

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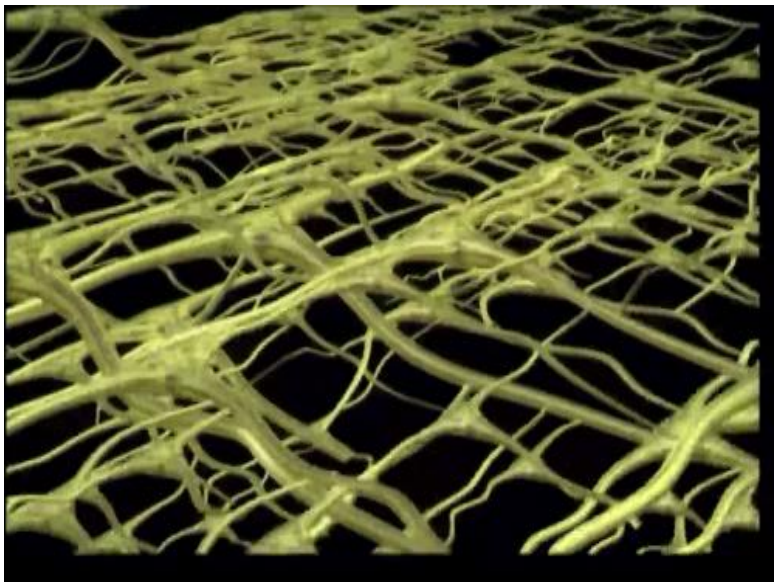

This neural firing travels to the brain through the auditory pathway and the child senses that he is listening to this melodious sound of the bird.

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Having seen now how this child was actually listening to the chirping sound of the bird let us now come to the mechanism of olfaction okay. This boy now after now chasing the bird goes to a corner of the park and 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?

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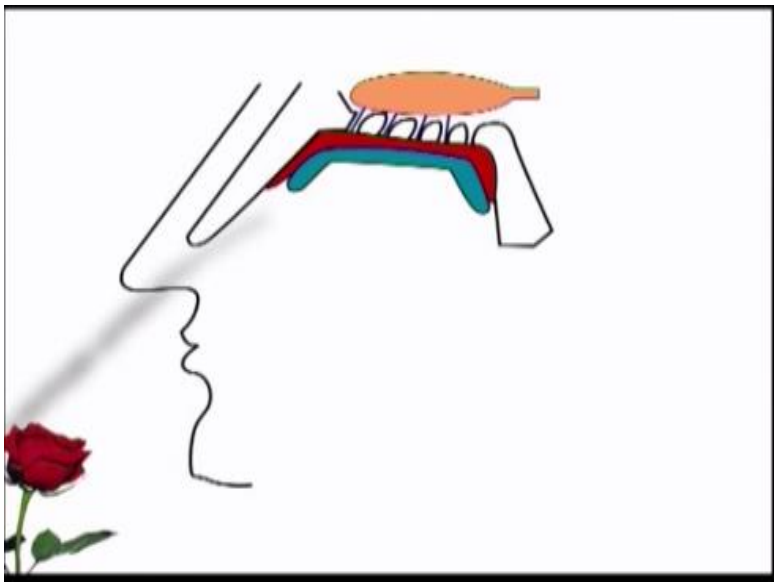

As you see here the vigorous intake of air by this boy has made the OBP release in his nose.

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The receptors at the olfactory epithelium specialize in a particular smell, this unique order reaches his olfactory bulb, you see the olfactory bulb, olfactory nerve, and mitchell cells.

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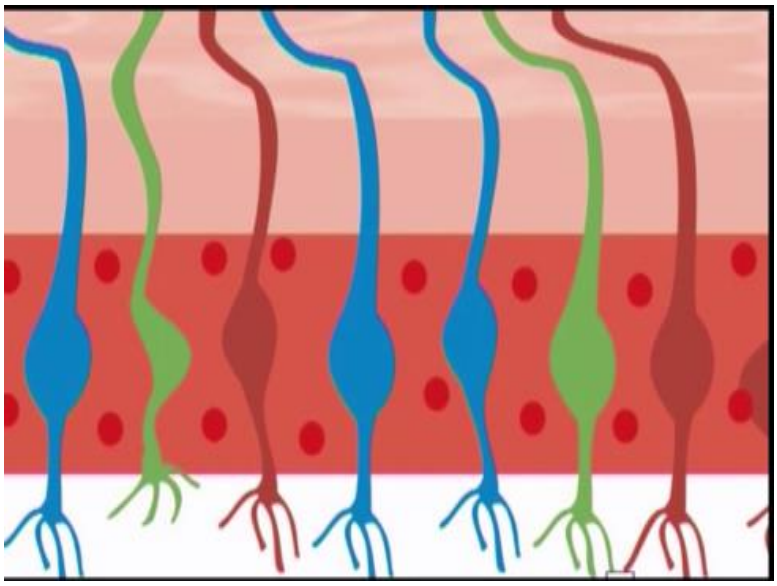

You now see the olfactory receptor neurons that are blue, green, and red in color here.

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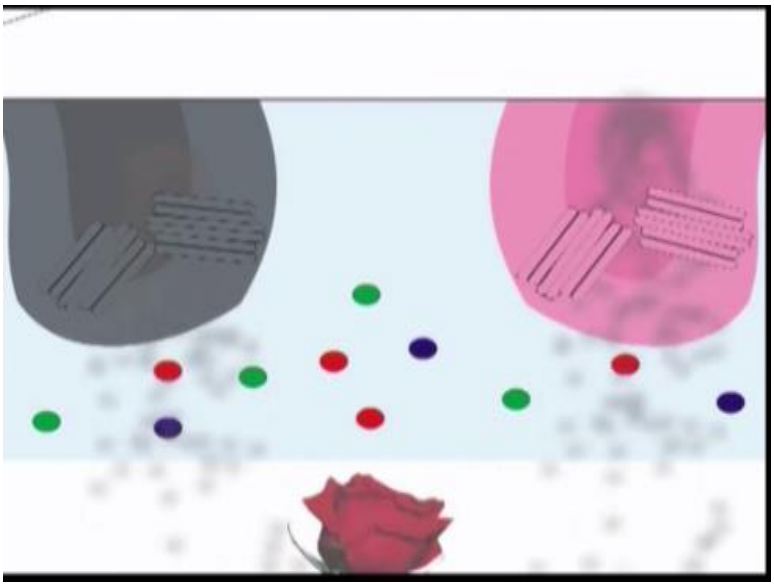

You can see the OBP release and the conduction of order signal in the olfactory receptor neurons.

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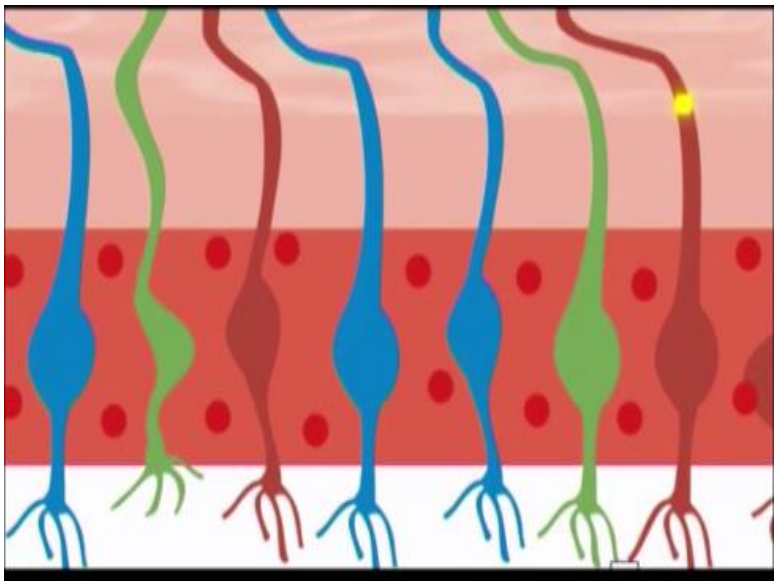

These order signals are now transmitted from the olfactory neuron.

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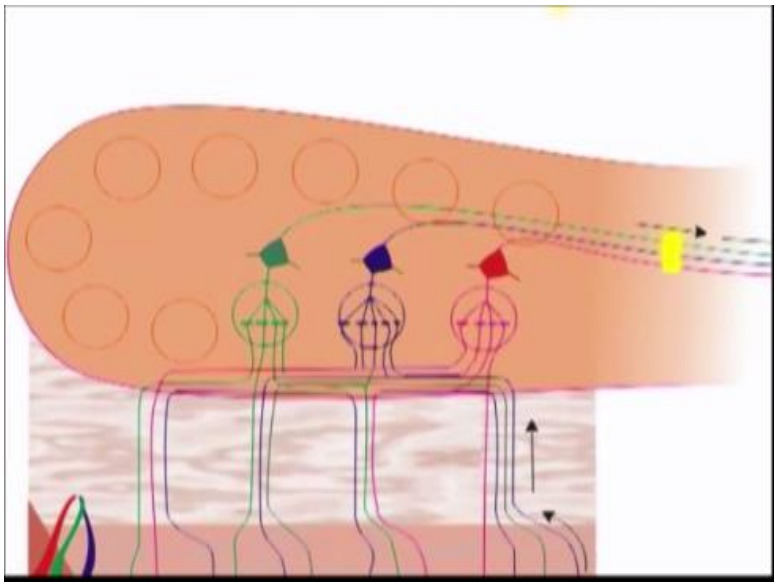

To the mitral cells and finally the olfactory track carries the message to the brain.

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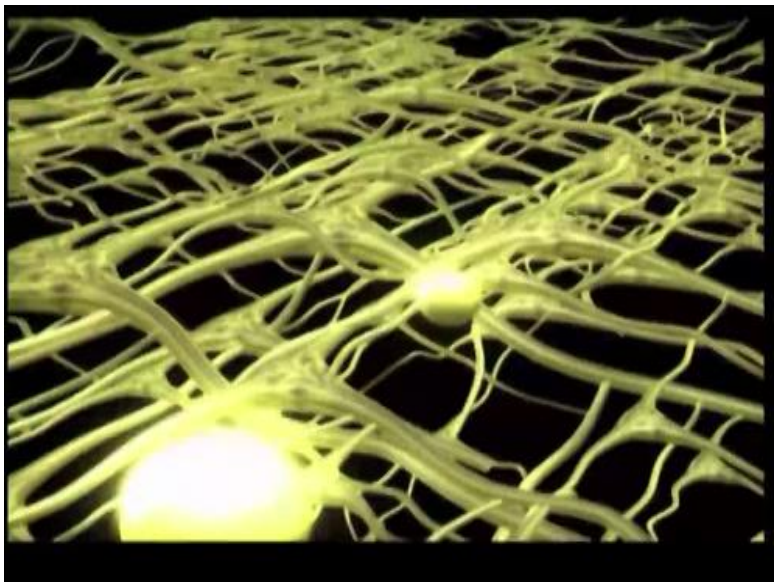

This is how this young boy got the smell of the rose. Now after having know how the smell of the flower now the boy feels hungry and he thinks of eating a chocolate, look at this very video which would explain the mechanism of taste. This young boy is enjoying a chocolate, how does he get the taste of it, look at his tongue.

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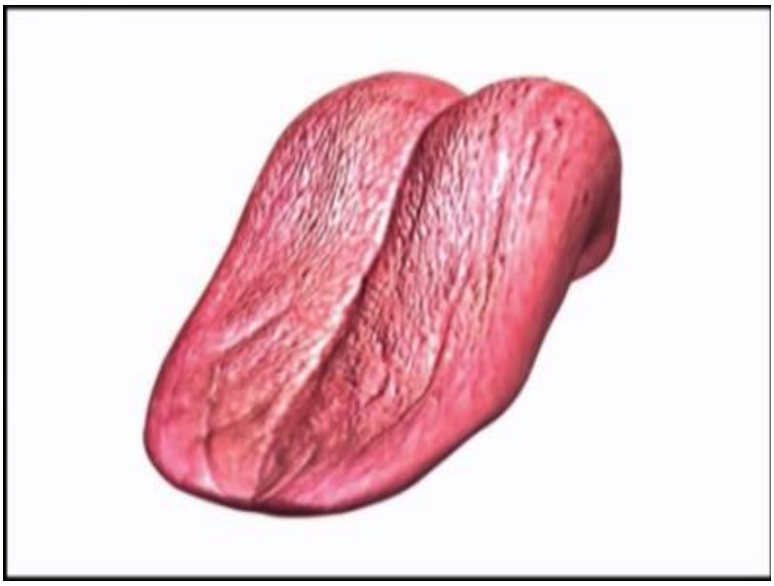

The tip of the tongue is sensitive to sweet and salty tastes, side to sour and the back to bitterness, you can see small bumps that contain the taste buds.

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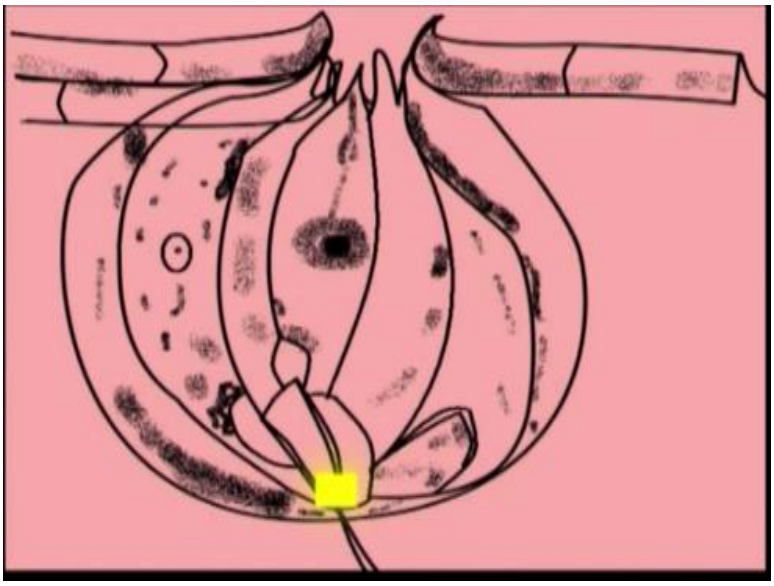

These bumps are called papules, you can see a taste bud, the chemical components of the chocolate dissolve in the saliva and goes down to the services between the papule, this chemical interaction triggers the adjacent neurons.

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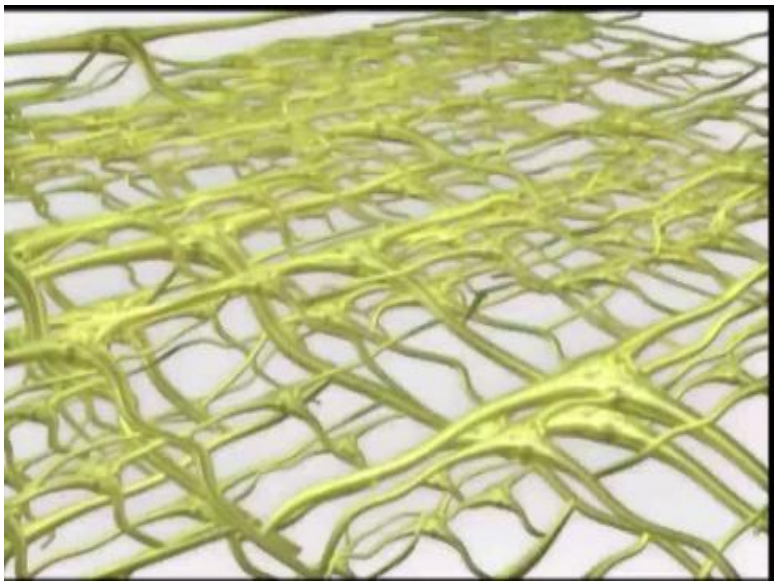

And these impulses travel to the parietal lobe and the limbic system of the brain of this boy, this is how he got the taste of the chocolate.

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Now if you combine all the videos that you have seen, you saw a video for the visual mechanism, you saw the video for the auditory mechanism; you saw the video for the olfactory mechanism, and finally the taste mechanism, so if you combine all these videos that you saw right now you can very easily sense that fine

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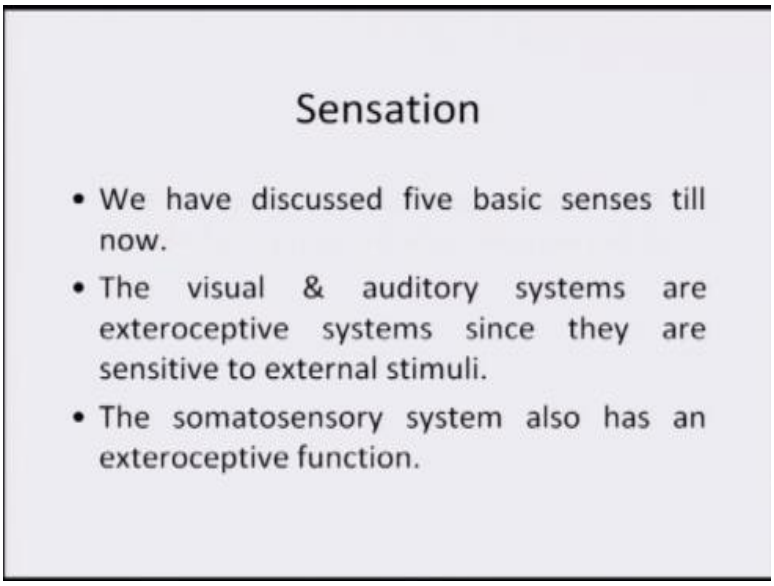

This is how we make a sense of the world okay. So till now we have discussed the five basic sense modalities, the visual and auditory systems are exteroceptive systems since they are sensitive to our external stimuli whereas the somatosensory system also has an exteroceptive function to perform.

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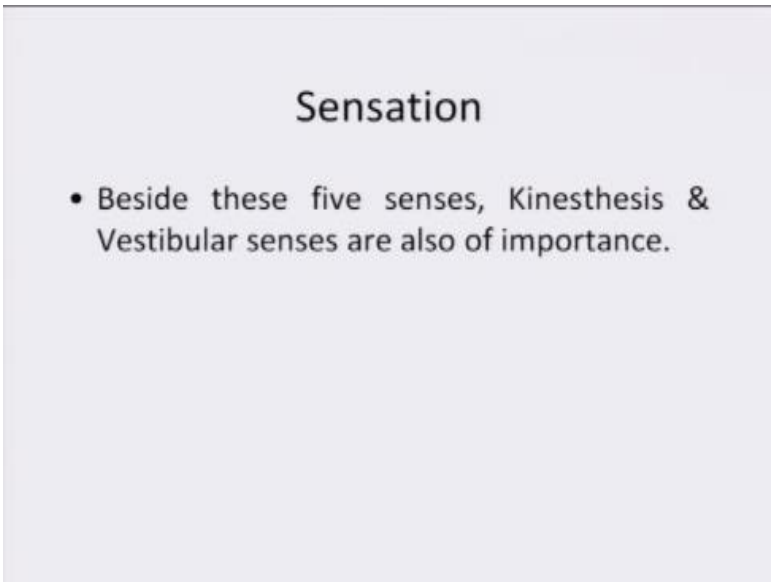

So beside these 5 senses we have two important sensations, one is the kinesthesis senses and another is the vestibular senses, and both of them help us like anything in terms of living in this very world.

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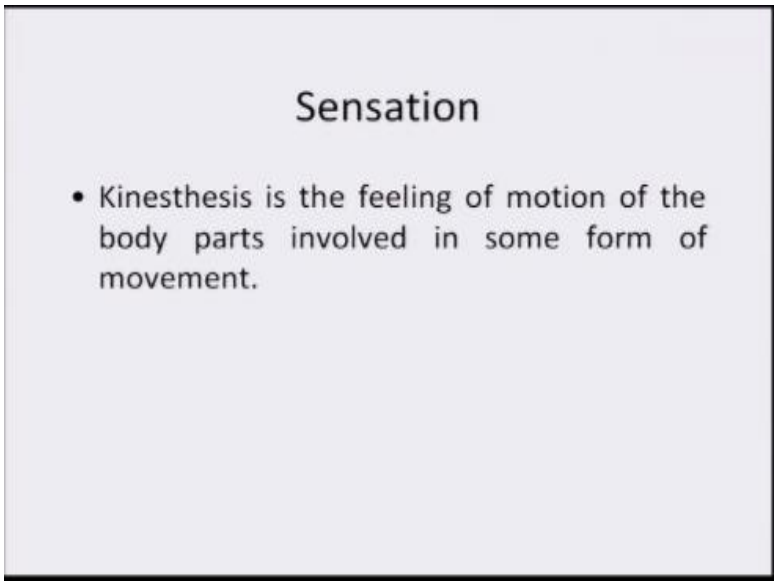

Now kinesthesis is the feeling of motion of the body part involved in some form of a movement. Imagine the situation say for instance you are traveling, you are walking, you are running okay, now basically what you are doing is that you have a perception of your body parts how it moves okay, and that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

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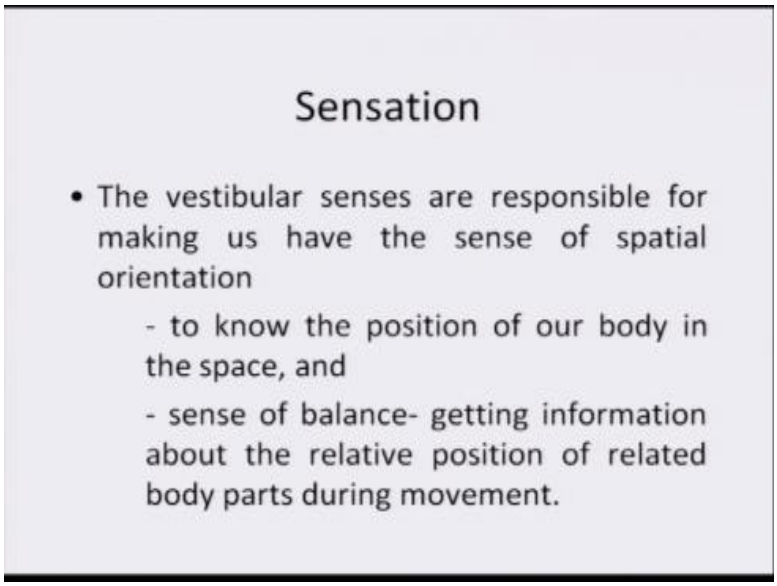

That we are now coming to is the sense what is called as vestibular senses and these are the senses which are responsible for making us have the sense of the spatial orientation okay, special orientation would mean that it helps us know the position of our body in the space okay. Say for example if you are say trying to jump for instance okay, you have to understand very well at the relative position of your body in the space okay. So the sense of balance okay, during movement all types of movement is basically dependent on the vestibular senses.

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Let us now see this small video clips from the BC Olympics, these are some of the finest movements that human beings are capable of performing; all this requires extreme degree of coordination. Now that the video footage that you saw you had a gymnast who was moving without looking at the object that his hand was now resting the body weight upon, in the other case you saw know an athlete performing on the surface of the ice okay, and it was a perfectly synchronized movement even though the body weight was rested on 1, 4, 2, 4 both the feets and then.

Even while the whole body was swinging very fast okay. Now these are the processes for which you require sound vestibular mechanism okay, so with this we come to an end to our discussion on the first topic where we focused exclusively on the sensory mechanism okay. Just to recapitulate we have discussed about the visual mechanism, we have talked about the auditory mechanism, we talked about the olfactory mechanism, we also talked about the taste mechanism, these four mechanisms and then we additionally we took into account the kinesthetic and the vestibular senses.

So this is how the input comes to the brain, once this now following the process of transduction the information comes to the brain our brain then tries to assign an appropriate meaning to this

okay, if we succeed assigning an appropriate meaning to what we have sensed this is what is called as perception.

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