Demystifying the Brain
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Lecture – 13
Emotions in the Brain-Segment 1

Hello, this lecture is on emotions in the brain. So, we all know what emotions are right, we feel them in the daily situations and in very often and we express them in various ways. Suppose you are happy, that you smile a lot, and you wave at people or if you are sad; or even grieving, you probably know, you shed tears or you weep, right. Or if you are angry, you might shake your fist and bang on the table, and scream and so on, and so forth.

So, emotions, and there is a feeling that goes with emotions, and there is also an outward expression, in the form of body language or facial expressions. And which is a good thing, it is a convenient thing; especially in social interactions, because you know what the other person is feeling, based on the emotional expression. Right, and suppose you want to go meet your boss, and ask for a pay raise.

And if you cannot read the meaning of that, you know frown on your bosss face, with the eyebrows like going at an angle, then you will be in trouble, you know your requests will be turned down and or, there can be a negative reaction. So, but thing is, the emotions that mean ordinary people, like you and me feel, you know, day to day life are, they; there could be a wide range of them, but it is very hard to define them very clearly, because there is something vague and inexpressible about emotions.

Right, and also in emotional expression, ordinary people may not be able to distinguish and produce, very fine shades of emotion in terms of facial expression. So, for example, it may not be very easy for, so, you know, somebody who is not trained, to show the difference between jealousy or resentment or gloating right. It is, it requires a very, some kind of a training to express those kinds of emotions. And which is what actors do, that if actor cannot show difference between, you know, jealousy and resentment right, or sadness, then he would not be in business for too long, right. So, therefore, it is not enough just to have a vague idea of what emotions are. Right, you need to make a signs out of them; you need to have a complete list of all possible emotions. And you should

have a clear understanding of how to express them right in facial expressions and body language.

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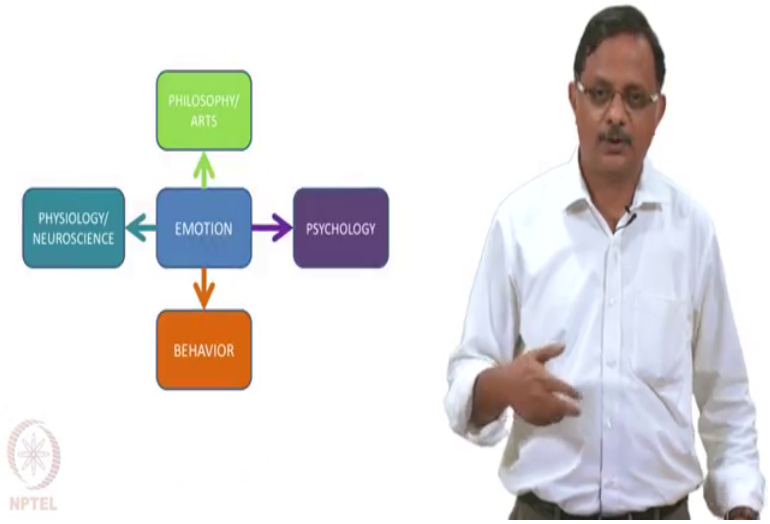

So, in liberal in arts, theatre and acting, you have to have a clear understanding, of the science of emotions. In philosophy also, people have speculative, philosophers have speculated about everything under the sun. So, they have written a lot about emotions, the nature of emotions and things like that. Right, here again there is a, metaphysical intellectual philosophies and also religious philosophies, also have talked about emotions.

Especially religious philosophies, they talk about what are the kind of emotions that you know, take you to the goal of religion, which is no right, reaching god or something like that right, and what are the kind of emotions which you know, take away from that and what are bad emotions, good emotions and things like that. In psychology, psychologists also are concerned with emotions, because there are some emotions which are you know. So, normally a person is supposed to have right, a healthy emotional condition right, which is necessary for polybius life. So, what are the kinds of emotions which are healthy and positive, what are the kinds of emotion which are negative and harmful for your health. Right, you need to have an understanding of that. So, psychology studies emotions as a science.

The emotions very often, there are two sides emotion. There is a subjective side, where there is just a feeling of emotion, and then there is objectives side, where it is expressing behavior right. So, you want to understand the relationship between the inner feeling and the external behavior. So, you can study emotions from behavioral point of view. Also in addition, since this course is basically about neuroscience, it is not about psychology, it is not about, you know philosophy. So, what are the neural or a cerebral underpinnings of emotion.

So, exactly what happens in the brain, when you are happy, or when you are sad. What happens in the brain, how does, which parts of the brain are active or participate in a certain emotion. So, those are some things that neurobiologists talk about. So, basically emotions or a science of emotions can be approached from different points of view right, philosophy and arts, psychology, behavior and finally, neuroscience. So, in this lecture we will talk about all these for, components of the, science of emotion. Let us begin with philosophy. Right, how our emotional discuss in philosophy.

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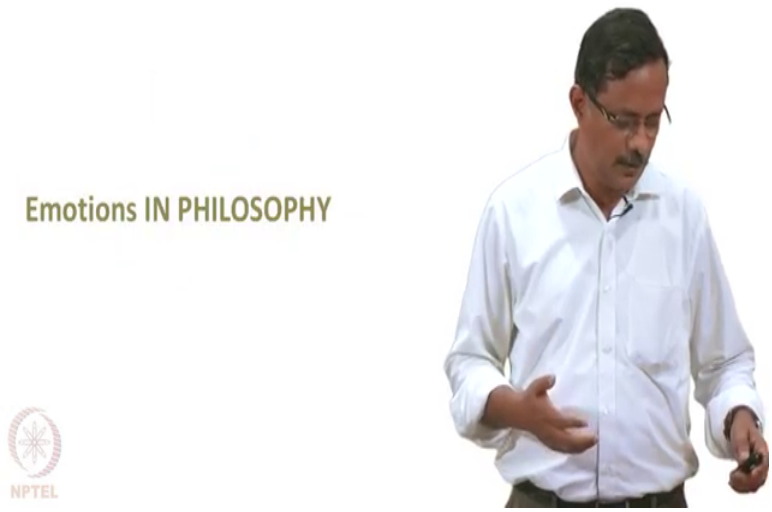

So, let us begin with Indian philosophy, and in Indian spiritual tradition, this lot has been said about emotions, particularly let us start with Bhagavad Gita.

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Right, in Bhagavad Gita, they; you know, it mentions 6 emotions, which he describes it, is in kind of negative terms, it calls in the 6 inner enemies right, the arishadvargas, ari is enemy and shad is 6 and varga is a class or a type. There are 6 types of inner enemies right, these are desire or Kama, anger or Krodha, greed or Lobha right, delusion Moha, pride or Mada right, in jealousy Matsarya. So, Gita says you know, once the seeker, that of perfection, against these inner enemies and you know, it urges the individual to identify these emotions and try to rise above them, to transcend them, reach a certain state of inner tranquility. So, that is see typical you know, undercurrent that you see in Gita.

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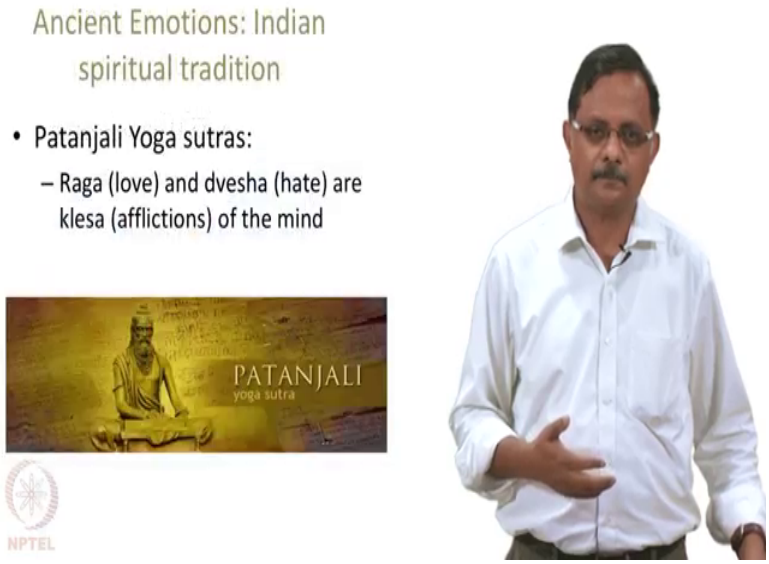

Now, also in Patanjali Yoga sutras right, emotions have been mentioned and described.

So, 2 major emotions, the 2 polar emotions, the raga; which is love and dvesha; hate right, your attraction towards something or you know, your revulsion towards something, are called klesa or afflictions of mind. So, basically the yoga sutras say that, bad for you right, stay away from both. So, normally people think love is good and you know, hate is bad, but right, yoga sutras say both are emotions, both bind you to, you know, objects of either love or hate. So, rise above them, because they are afflictions of the mind. Now emotions are, so, emotions if you look at in religious philosophies, so, there is a kind of, a note of you know, negativity about them.

Because, typically in Indian philosophy, Indian spiritual philosophies, emotions are considered as something negative and something, that have to be transcended. Whereas, you cannot afford to do that in aesthetics right, or in drama and dance and these different kinds of a art forms, you cannot afford to put down emotions or looked down upon emotions, you have to give them their rightful place and in the scheme of things and be able to deal with them you know, properly in a scientific fashion.

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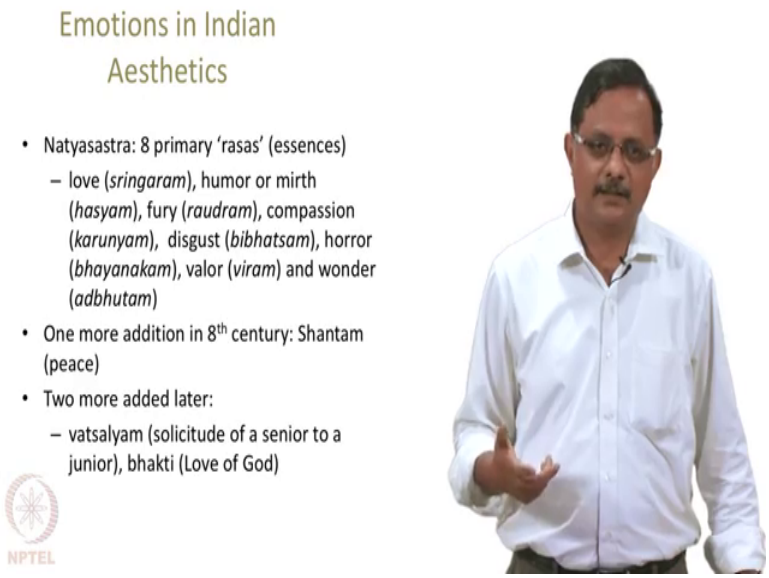

So, if you look at Indian aesthetics right, in Natyasastra, which is a science of dance, this is based on a book written by the sage Bharata right, it talks about 8 primary rasas. Rasas in common parlance is translated as soup, but here rasa means essence or it is a essence of experience. When you, so, you know sublimate experience, what do you have, what are the basic elements or essences of experience.

So, Natyasastra talks about 8 primary rasas these are, love or sringaram, humor or mirth, that is hasyam, fury or raudram, compassion or karunyam, disgust or bibhatsam, then horror or bhayanakam, valor viram and wonder adbhutam. At a later point, somewhere around 8th century, another emotion is been added to this list of 8 rasas, that is shantam or peace, and then subsequently 2 more have been added, these are; vatsalyam which is a kind of a love or a solicitude, that a senior person like a teacher, as towards a junior, like a you know, like a disciple or a student and then bhakti; which is you know, the same love, which is directed towards god. So, this we have a list of a 11 emotions that in Indian aesthetics.

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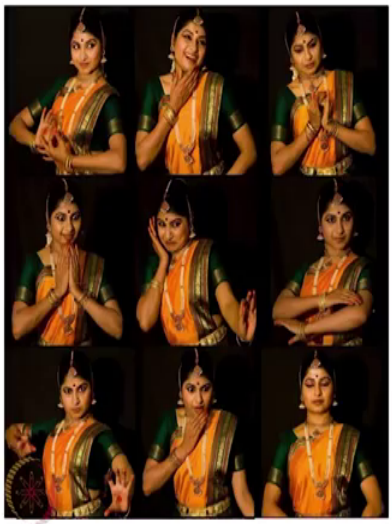

So, this picture shows, how different emotions according to Natyasastra, particularly this is from the tradition of Bharatanatyam right, how can these emotions be enacted, in dance forms.

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So, Indian theory of rasas has another interesting site through it. It associates these rasas with a deity or a god right, and also a color. So, associating emotion with deities is interesting, as an aspect of art, but its kind of off limits for a science, like neuroscience. But association or emotion with color is very interesting because, a lot of western

science, the western treatment of emotions, also represents emotions on some kind of a palette of colors right, which is very a convenient way of representing the internal relationships, the interrelationships among various emotions.

So, we will come to that later. So, in Indian theories of theory of rasas, the sringaram is associated with the god Vishnu right, and the with the color light green and the hasyam or mirth or comedy, is associated with a god named Pramata right, whose color is white and raudram the presiding deity is Rudra right. In fact, the word raudram comes from the word rudra and the color is red and, so on, so forth.

So, it is very interesting, that the emotions are associated with gods and also different colors.

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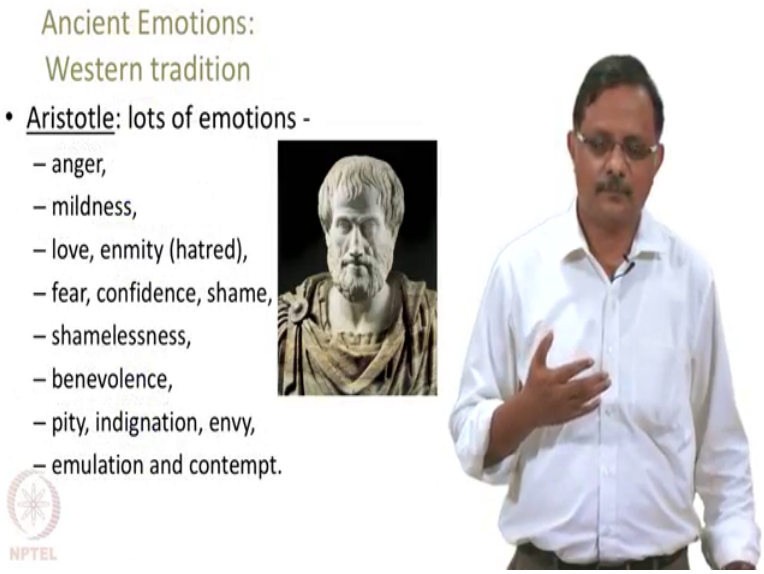

So, there is lot has been written on emotions, even in the western tradition. For example, aristotle was written a lot about, various aspects of science, extensively. It is also given kind of a list of emotion, he named a lot of emotions, like for example, anger, mildness right, love, enmity, fear, confidence, shame, and its opposite shamelessness, benevolence, pity, indignation, envy, emulation and contempt. So, you can see that, different authors have at an, at various apex in time, have proposed different lists of emotions and there is a little problem with that because, there is no, nothing standard about these kinds of lists of emotions.

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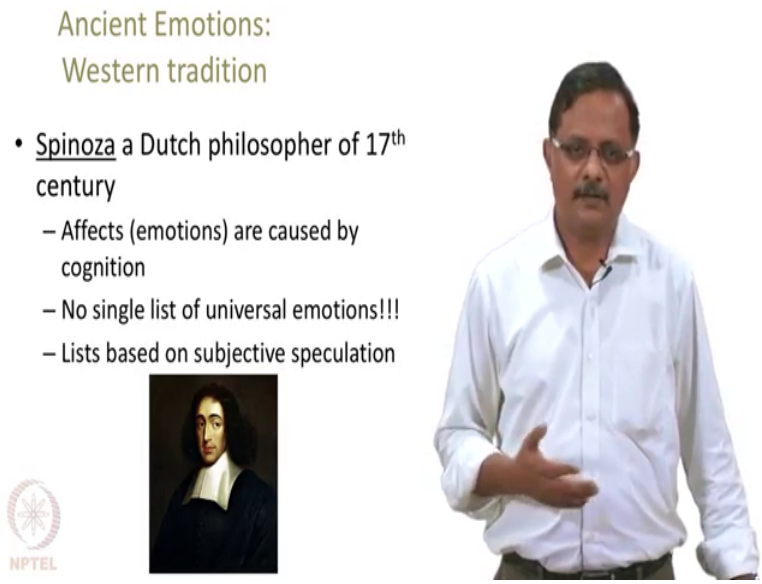

Spinoza, who was a Dutch philosopher, of 17th century, as stated he, has emphasized the role of cognition, in emotion so. In fact, this is a question that will come to, it will written to again and again, in this thought right.

But the problem is, different authors have given different lists of emotions, but there is nothing like a universal list of emotions. A lot of these lists are based on subjective speculation. So, they do not have the kind of a strength of universality.

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Now, Emotion and Facial Expression, a lot of study on emotions right, has depended on special expression. Because, in philosophy people depend on their, you know, introspection and you know, subjective analysis and you know, things like that, which cannot be considered as proper methods of science because, science depends upon objective measures, objective measurement.

So, if you just give a list of emotions, because you feel them that way, we feel they are universal, then that is not really science. So, if you give a list of emotion, you should map them onto something objective, something you can measure and see. So, one way you can measure a emotion, since you cannot really understand, what other person is feeling, the only thing that you can understand or measure, is what other person is showing right, in the form of facial expressions.

So, people have tried to classify facial expressions and map them onto emotions and lot of work has been done on these lines. And, at least work of this kind has been done by Charles Darwin.

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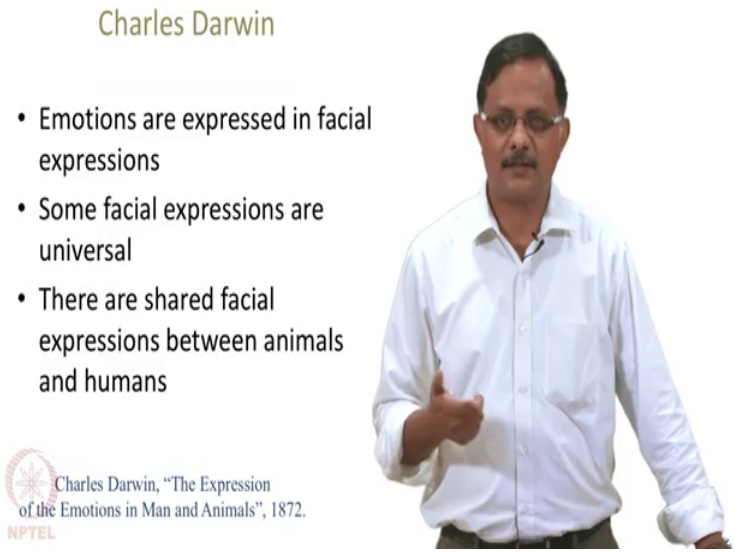

Who is also the theorist of an, the theory of evolution. He, Darwin noticed that you know, it is that emotions are expressed in facial expression and lot of the facial expressions are universal and they are not only universal among humans right, certain facial expressions are shared between animals and humans ok.

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So, look at this example right, now here is a snarl, that is seen in a human and an animal, and you can see that, bearing of the canines and lifting of the ends of the upper lip and stewing of or, you know, the kind of stewing of the eyebrows right, you can see the patterns between the, this kind of an expression in man and animal.

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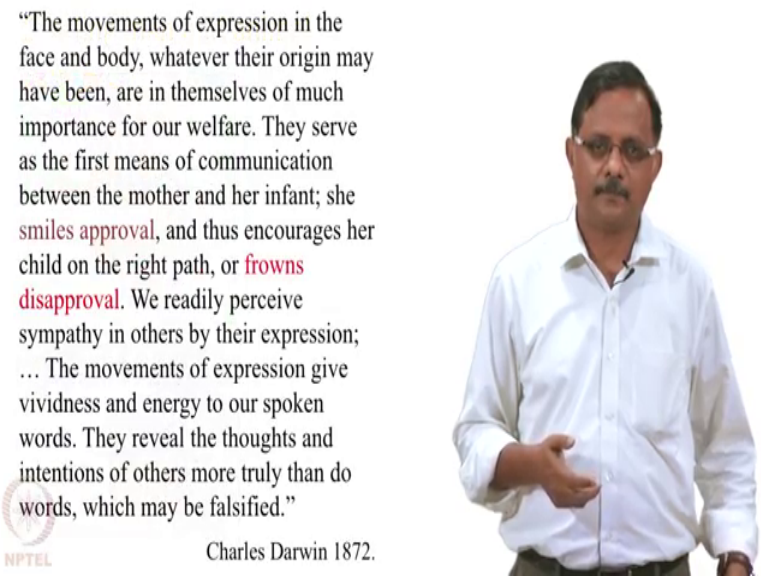

So, what Darwin says about this kind of a mapping is that, "the moments of expression in face and body, whatever their origin may have been, or in themselves of much importance for our welfare. They serve as the first means of communication between the

mother and infant. Because of the facial expression, right or bodily the expression or emotion, you can convey your emotion to somebody else, that will facilitate you know, social interaction.

So, therefore, they serve as the first means of communication, between the mother and her infant; she smiles approval, and thus encourages her a child, on the right path, or frowns disapproval. We readily perceive sympathy in others by that expression; the moments of expression give vividness and energy to a spoken works right, they reveal the thoughts and intentions of others more truly than do words, which may be falsified.

Because, what you are saying is, it accompanied by movements of the hand, movements of your facial expression, then it has more vividness; it has more impact on the listener, than just uttering the words without any emotion and without any warmth or color in them. So, with the, this has starting point, that is the idea that facial expressions reveal emotions, a lot of workers have worked on them and tried to give classification of emotions.

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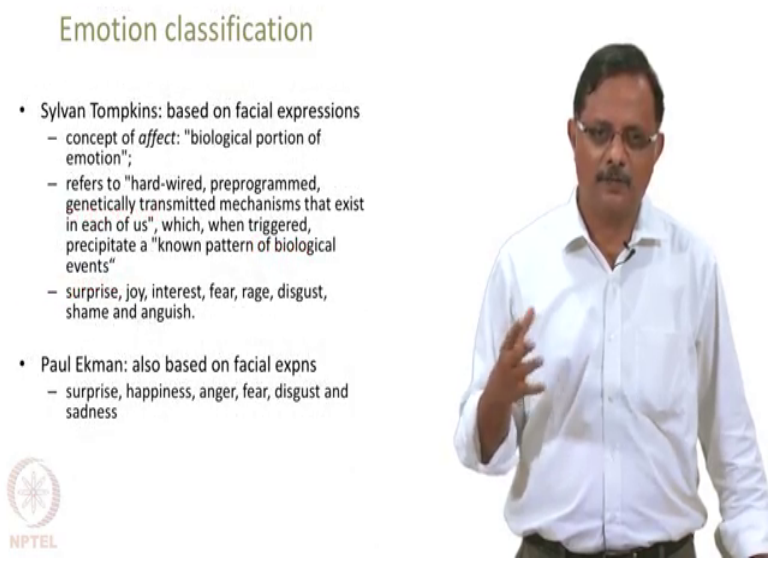

So, Sylvan Tompkins represented one such classification, he proposed a concept of an effect. So, emotion has, as we already mentioned has 2 sides to it, there is a outward expression of emotion and then there is the inner feeling. So, inner feeling is something that is known subjectively only to the person, the subject right. So, you cannot really build a science around that. But the outward expression, right or the biological side of

expression right, that is what is defined as effect in Sylvan, by you know, Sylvan Tompkins.

In fact, there is a whole field of neuroscience called “Affective Neuroscience”, which deals with emotions as are expressed in the nervous system. So, the effect is defined by a Sylvan Tompkins, as a biological portion of emotion. It refers to “hardwired, preprogrammed genetically transmitted mechanisms, that exists in each of us”. Which, when triggered, precipitate a “known pattern of biological events”. So, he is talking about the neural underlying machinery of, emotion expression and emotion generation.

So, based on his analysis of facial expressions, he gave a list of emotions, these are; surprise, joy, interest, fear, rage, disgust, shame and anguish. And he further classified this emotions into neutral, positive and negative. So, surprise apparently; according to him as a neutral emotion and joy interests are positive emotions and fear rage and others, are negative emotions.

So, Paul Ekman also has, studied facial expressions and gave a, given the classification of emotions. And the list that he has proposed consists of you know, surprise, happiness, anger, fear, disgust and sadness. So, thing is, some of these previous classification, this list of emotions right, they do not really tell you, how those emotions are related to each other. So, for example, love and hate are opposite emotions, but if you give a list of these things, you do not know that they are opposite.

So, similarly amazement and astonishment right are shades of the same thing you know, different instances of the same thing. If you just give them as a list, you would not understand their interrelationships. So, similarly people have found that, to express the relationship in terms of positive and negative or open and see between emotions and also the different shades of intensity of the same thing.

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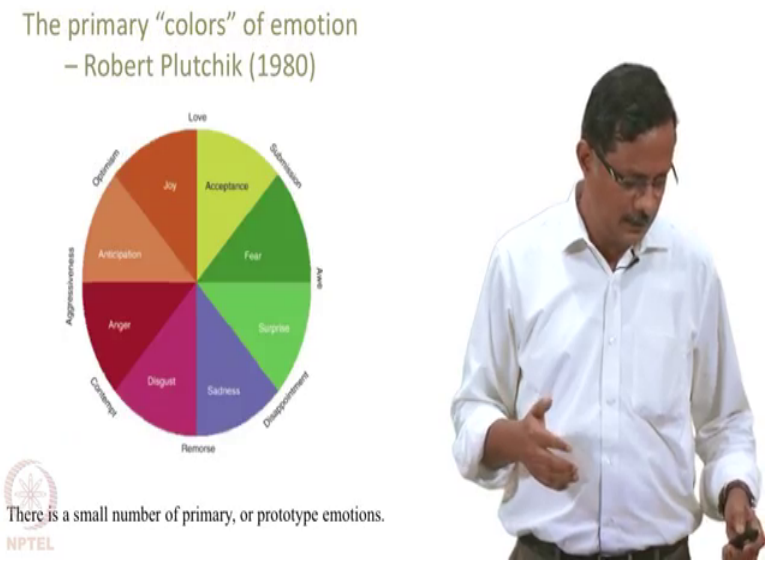

People felt, it is convenient to describe emotions in terms of color right, it is interesting that, in Indian theory of aesthetics, a people have also have associated emotions with color. With that, but that mapping is totally different from the kind of mapping that you are seeing here on this slide, this map of colors of emotion, was proposed by Robert Plutchik and you see, look at actually, a very simple map here and this has been further elaborated, in more complex color maps that Plutchik had proposed. So, in this picture you can see that Joy and Sadness right, Joy is in the red side, red and sadness is in kind of purple, they are in opposite side.

So, that indicates a joys opposite of sadness. Then, Acceptance and Disgust you know, Accept is attracted towards, that you welcome it and then Disgust you kind of push something away. So, they are also opposite. Then, Fear and Anger are, I dont know, its not very clear by that opposite, but. So, Fear is you want to run away from something right, in Anger you want to act on something and harm something you know. So, in that sense, probably they are opposite then Surprise and Anticipation.

So, if you are expecting something that is Anticipation and you are not expecting something, you suddenly springs upon you and in a surprise and that is surprise. So, you can see, how in this very simple palette of colors, different emotions are place, with respect to their interrelationships. Further on the circumference, you see these other terms, like you, know, submission and awe and disappointment. Which indicate

combinations of emotions like for example, at the top you have Love, and Love is according to this picture, is a combination of Joy and Acceptance.

Because joyful acceptance of something, is something that you feel as love and submission is acceptance in fear and acceptance. But without joy right, with fear right, is submission or surrender. And awe is a fear with surprise and disgust, and remorse is disgust with sadness so, and so on and so forth. So, you can see, how he is trying to build some kind of an algebra of emotions where emotions are expressed as colors.

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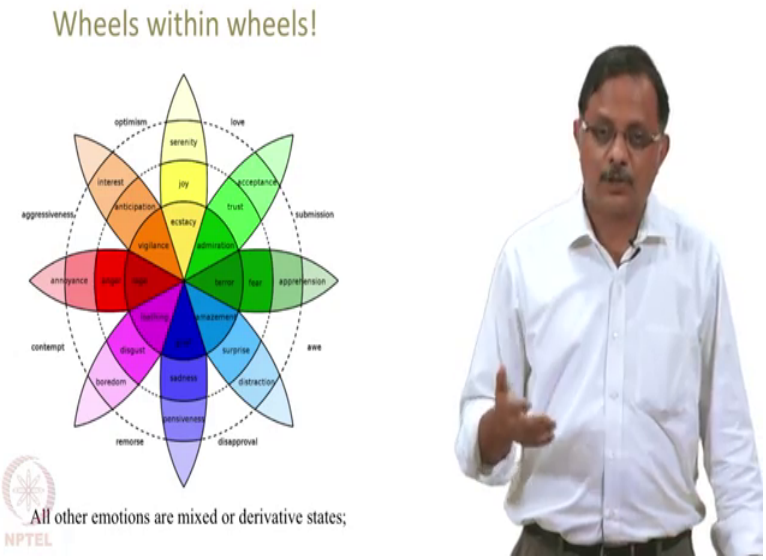

So, Plutchik also, published more complex, color charts like this, and these are with like, wheels of color, as where you can distinguish between the primary colors and the derivatives and shades of emotions in terms of the, you know, different intensities. So, for example, here in the, this green petal, going to kind of to the northeast right, you have admiration and then trust and acceptance. Or the green petal, going eastward, you have terror threat and fear and apprehension.

So, terror is a very intense form of fear. And fear is slightly more intense form apprehension. So, you can see the shades of intensity of different emotion, similarly on the left side going westwards, you have a rage. Which is the most intense form of the, of anger, and then there is annoyance, which is a weaker form of anger and so on. So, its very interesting that, it indicates the opposite, opponents is among emotions, the shades of difference among emotions also. So, for example, here the upward petal going

northwards, has ecstasy and joy and serenity and on the opposite side, you have grief and sadness and pensiveness. So, you can see how this kind of a color chart, very nicely places the emotions in terms of their interrelationships.

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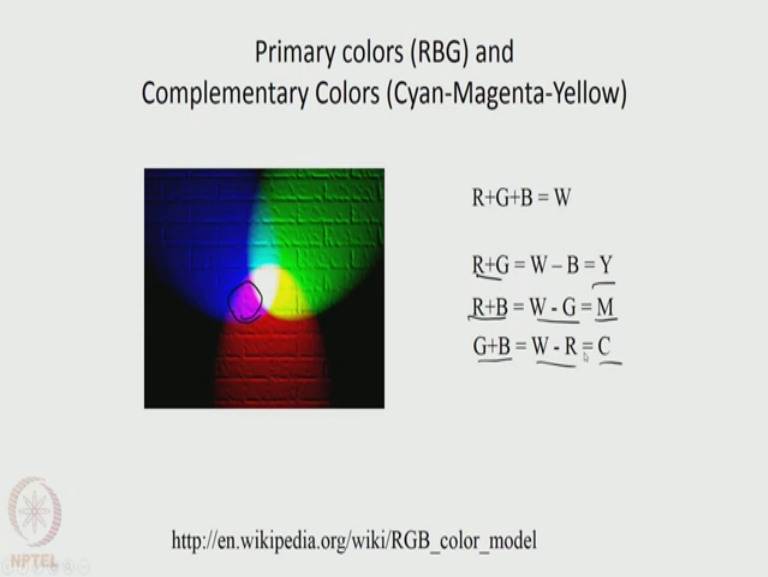

But, what is the connection between color and emotion? Actually, colors also seem to have a very similar internal structure. Right, as we know that, if you combine R G and B, red green and blue you get white now; that means, R plus G is equal to W minus B and you get yellow, which is what you can see in this color chart.

So, in the center you see a white patch of light and that is where the blue R G and B meet right, and then you have other sectors, where only 2 colors meet. So, in this part right, you can see so, this is magenta, where you have blue and red meeting. So, R and B combined to form magenta and there is equal to green, getting removed from white. So, similarly red and green when they meet, you get yellow. That is like, removing blue from white.

So, similarly green and blue, when they meet gives you a cyan; and that is like removing red from white and you see all these different clanships among primary colors and derivative colors right, and they are, they complementary colors, in this color chart. So, like that starting from the facial expression, people have given various classifications of emotion right, but that is still quite superficial, because it only talks about how emotions are seen in facial expression.

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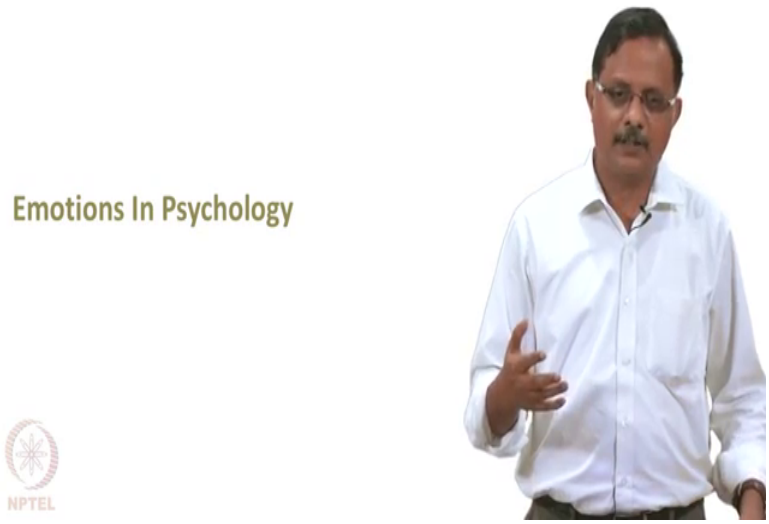

Let us go deeper, and look at some of the prevailing theories, some of the dominant theories of emotions in psychology ok.

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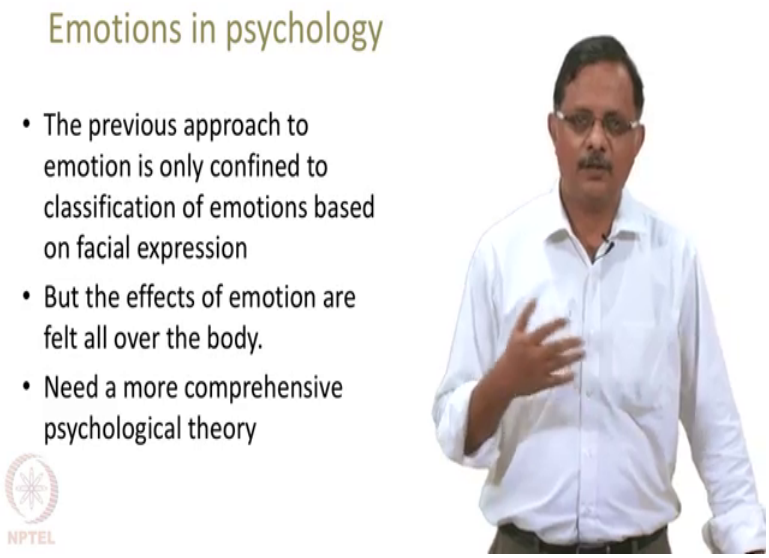

So, previously we have only looked at facial expression, but actually emotion is spread all over the body. Right, because when you are angry, no not just frowning or you know, just pursing your lips and things like that. You are probably shaking in anger, and you are you know, shaking your fist and bang on table and in addition to the outward movements of the body. You also feel certain inner moments and responses in the body. Like for

example, your heart rate might increase, your B P might increase, you know temporarily right, and so on and so forth. So, emotion is something that is, what is very special about emotion right, it is effects are seen all over the body. So, therefore, if you would not understand emotion, you cannot stop at facial expression, you have to go deeper and look at it is kind of an all body response.

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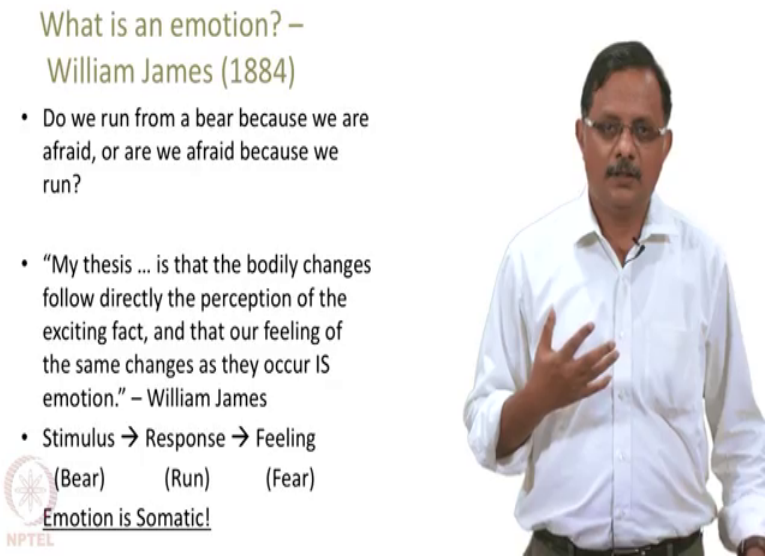

Now, so, one of the first theories that talked about this, bodily response of emotion or the relevance of the bodily responds to the emotion experience right, it was a, such a theory was proposed by William James, was an American Psychologist. Who worked in the, you know, towards the end of a 19th century. So, his work starts off with a simple question, do we run from a bear, because we are afraid? Or are we afraid because we run?. So, the normal common sense understanding, of how emotion works is that, let us say, you see a bear and you are scared.

So, you first cause of it is the appearance or the of the bear or the stimulus. In response to that, you first get scared, and then that fear makes you right, run away from that, from the stimulus. So, they are normal sequences, stimulus then the feeling bar of emotion and then responds. But William James turns the table around and gives a totally different sequence.

Let us see what he is saying, "my thesis or my hypothesis is that the bodily changes followed directly from the perception of the exciting fact, and that our feeling of the

same changes as they occur is emotion". So, what is saying is you know, to cut it, make it simple, the stimulus is the bear, it first produces a response of running, it is that response in the body, which is running, creates a feeling of fear. So, the sequence is not stimulus, Feeling and response when a sequence is stimulus, response and feel and feeling. therefore, he is saying emotion is somatic, emotion is something that is felt all over your body, its not just something that is happening in your head.

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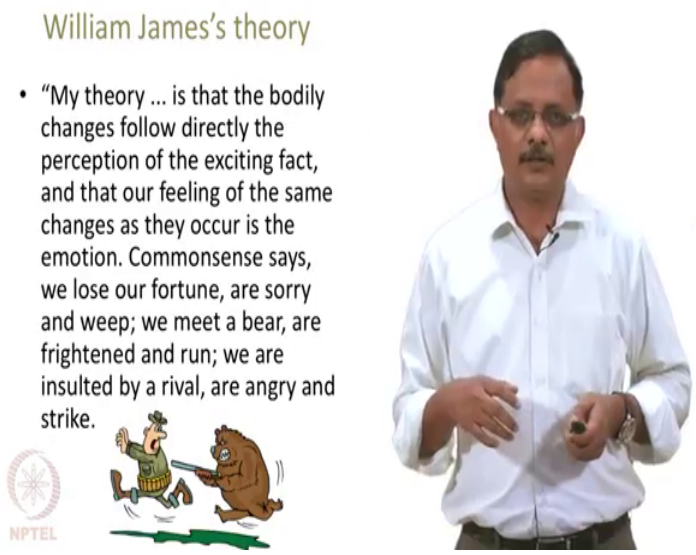

Right. So, therefore, comments in this too convey his quotation Jamess Quotation right common sense says, we lose our fortune and our sorry and weep we meet a bear or frightened and

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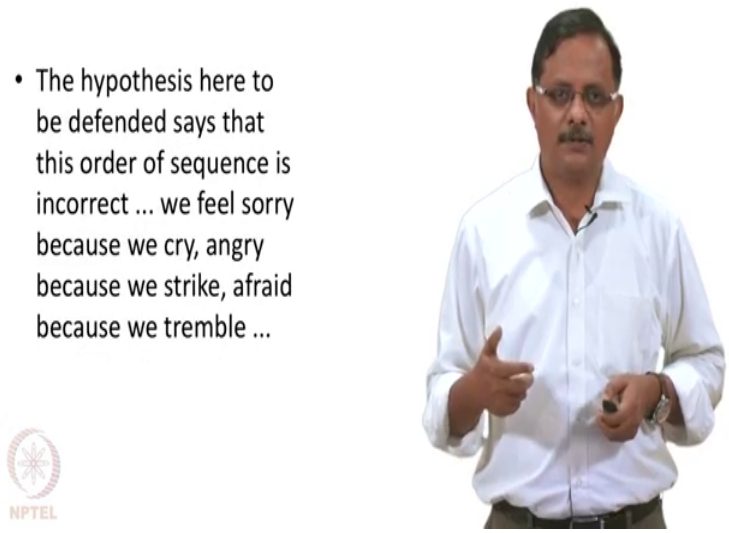

Run and we are insulted, by a rival and are angry and strike right, but the hypothesis to be defended here, says that this order is incorrect.

We feel sorry, because we cried, the act of crying, is what makes gives you the feeling of sorrow. So, angry because we strike, and hit and scream, they feel the emotion of anger and afraid because we trembled. So, this is.

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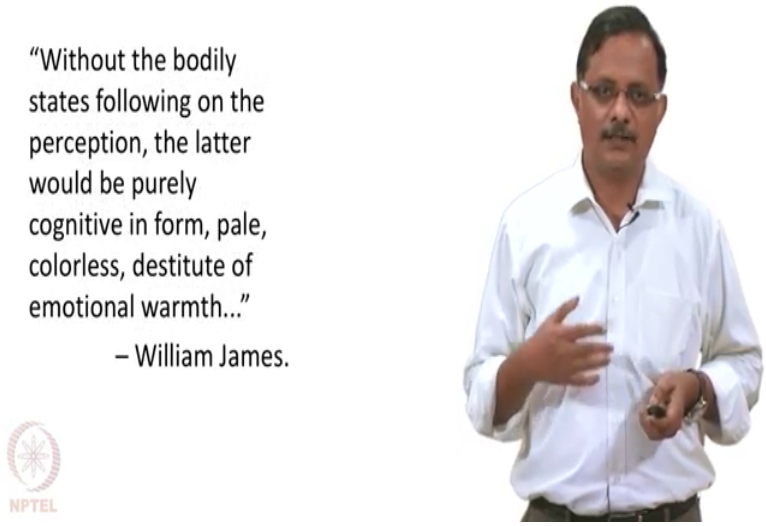

So, "without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colorless, destitute, of emotional bonds". So, what is basically

emphasizing, is the response of the body, the participation of the entire body emotion, without that kind of a participation, your emotion would be purely you know, mental intellectual right, it lacks the color and warmth right, of a full blown emotional response.

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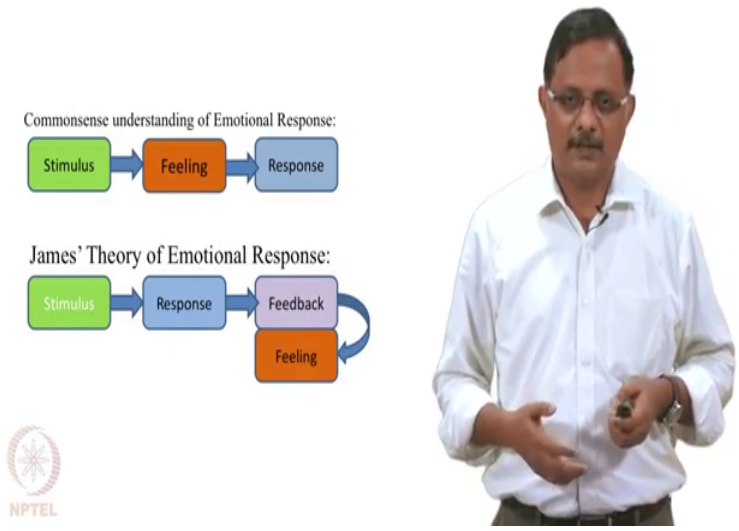

So, that is a very important emphasis so, but there is a misuses with that, we will see that in a moment. Right, just to contrast the common sense understanding of emotional response, the stimulus first feeling next and response later, there is a normal sequence that people believe. What James theory is saying is stimulus first, then response of running or whatever and then that, creates also a bodily response, and bodily response is then fed back to the brain and that is what creates the feeling in the brain.

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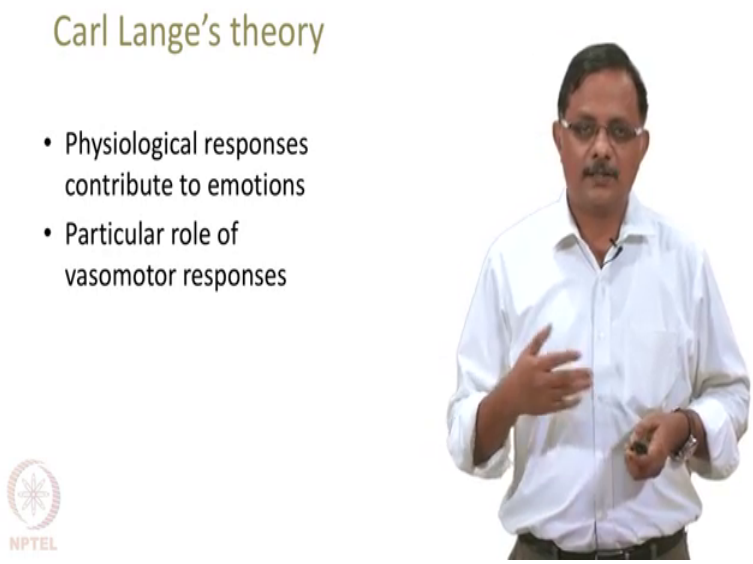

So, then there is also another researcher, Carl Langes, who also talked about the Psychological responses correspond to emotions. Particularly he emphasized the Vasomotor response, that is the response of the heart and the circulatory system to emotions.

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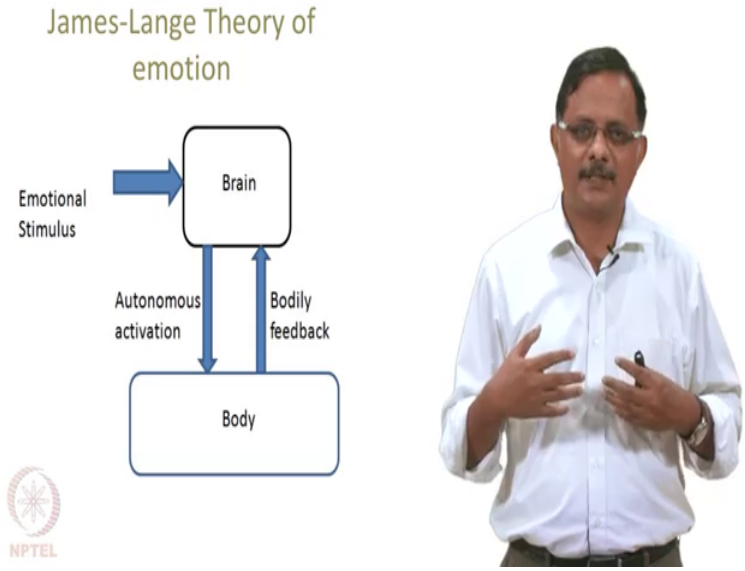

So, these ideas together are called the James Lange theory of emotion. So, basically what the series is, there is an emotional stimulus, like the appearance of the bear, which goes to the brain, which goes to a sensitive areas and they get processed. Right, that directly

produces an activation, of the body. Which could be external activation or the internal; like the pounding of the heart and perspiration and things like that, then body sends feedback back to the brain and that is what creates a feeling of emotion.

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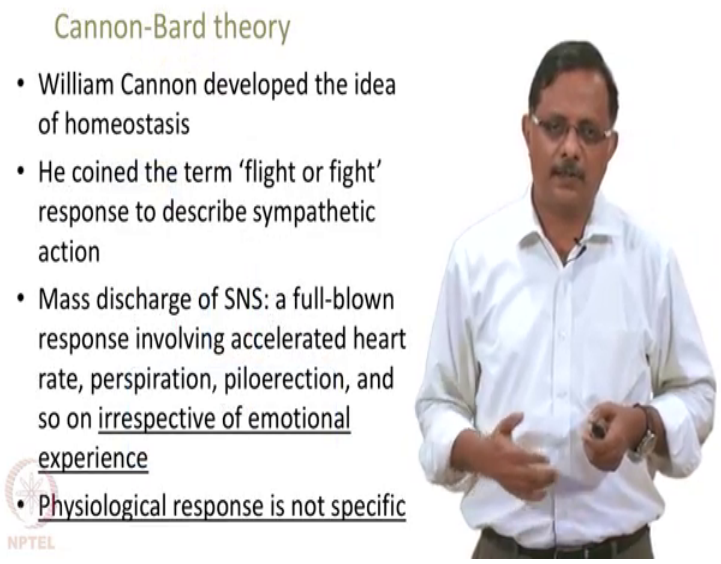

So, this is James Langes theory of emotion. Later on came another theory, proposed by a Cannon and Bard. So, William Cannon developed the idea of homeostasis, which refers to the idea that certain parameters are maintained at inert, fairly constant levels in the body. For example, we know that our internal core body temperature is held at 98.4 or you know 6 degrees celsius.

So, their active mechanisms, which try to maintain the temperature at that level or your blood pressure you know, is the systole is at 120 and you know the diastole is at 80 and their active mechanisms, which made and maintained in that way. So, this homeostasis, Cannon also coined the term fight or flight response to describe sympathetic action. So, in certain, this is the sympathetic nervous system, is actually part of your autonomic nervous system, which in itself, is a part of your peripheral nervous system, because we talked about the center and peripheral nervous system, actually we did not spend much time on the peripheral nervous system.

So, in peripheral nervous, system you have the somatic nervous system, and the autonomic nervous system. Autonomic nervous system refers to, the part of the nervous system which is not in your conscious control, in not in your voluntary control. So, here

there are again 2 branches, the sympathetic and parasympathetic. In sympathetic nervous system, right it produces a whole body response, this is a kind of response that occurs when you are facing a challenge and you want to either fight the challenge or flight or run away from the challenge right, it simultaneously produce a lot of you know, responses in different organs in the body. So, for example, and the a full mass discharge of sympathetic nervous system activation is associated with, accelerated, a higher heart rate, higher force of contraction of the heart. Right, perspiration, piloerection or what you call goosebumps right, they raising of hair and so on, and so forth.

So, all these occur simultaneously right, by a generalized activation of the sympathetic nervous system. So, what these people are, Cannon Bard in his theory is saying is, we agree that, there is a physiological response right, in the body, but that is response is not specific.

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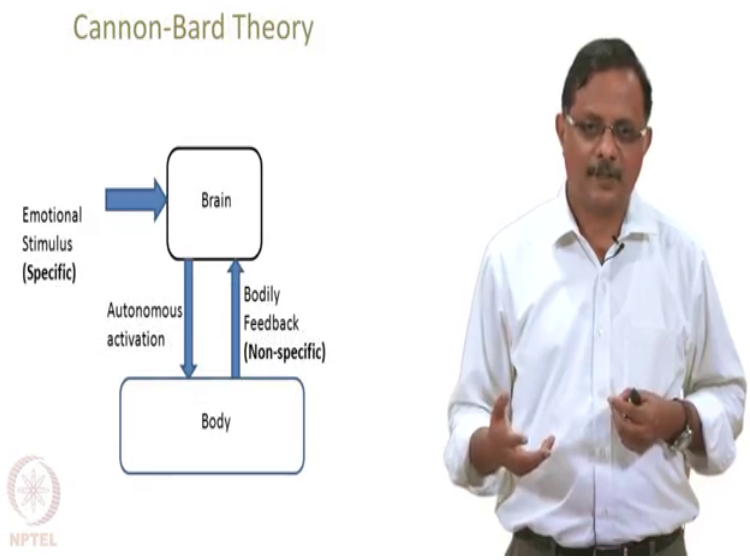

Because, if you think about it, take an example, like a positive emotion, like love. Like imagine somebody, who is trying to, you know, this young boy; is trying to propose to a girl. So, this guy, got a whole bouquet of flowers and you know, he is even written a poem about this girl and then, he is you know, he is trying to said, right propose to the girl. So, i mean naturally, he is not going to just read out the poem in a calm, in a fashion right, in a stoic fashion. Is this going to be some emotion? So he is going to feel the pounding of the heart, is going to perspire, is going to, lips are going to dry up and so on,

and so forth. But imagine in totally different situation where you are suddenly walking on the road and you know, you suddenly see a snake in front of you and with it is you know, cobra with it is raised hood and so on, right.

Do you freeze in your tracks? Right, for a moment you do not know what to do, and again yours heart starts pounding and you, your lips start drying up and you perspire right. All these different changes occur again, right. The thing is, what is the difference between, a guy, who is trying to propose to a girl, and a guy who is like, you know, facing a harmful snake right. The bodily response is nearly the same. Because, in both cases what you have is simply the sympathetic activation. So, the bodily feedback is same, it is nonspecific, it is not different for different emotions. So, then how do you distinguish emotion? How do you feel differently in case of different emotions?. So, this is what Cannon and Bard theory says.

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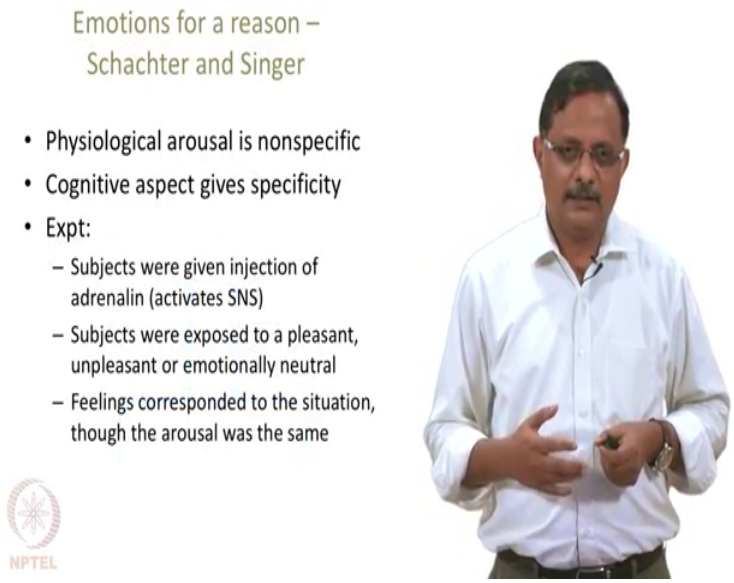

So, thing is, where is this facility coming from? So, the Schachter and Singer wanted to explore that; and they their answer to those says, the bodily response is definitely nonspecific and it is clear, the specificity comes from the cognitive aspect.

So, your high level cognitive and conscious, interpretation of your external stimulus that, that is where, that is what gives you, a specificity. So, to test this, they have done is an interesting experiment. In this experiment, there were a bunch of subjects placed in 3 different rooms. Right and they were given an injection of adrenaline. Adrenaline is

basically a drug, which will activate the sympathetic nervous system, we all know that we talked about adrenaline rush; that is, when you are very excited right, your heart is pounding and you are perspiring and you are totally excited, that is because, you are sympathetic nervous system is activated.

So, they inject this drug, to activate your nervous system. So, for all these subjects and in the 1st room the subjects were x. So, exposed to pleasant experience, basically they have introduced actors, in each of these rooms. This actor enacts something and different things, in different rooms. In the first room the actor enact something pleasant and funny and you know kind of anytime the crowd. In the second room, the actor enact something unpleasant and kind of sad, in the third room, the actor enact something that is emotionally neutral.

So, all 3 of them were given the same injection of adrenaline same dosage. So, at the end of the this experience, our exposure, the subjects were integrated about what they felt. It turns out that the feelings were corresponding to the situation right, that is the people who are exposed to the pleasant experience right, as I said, "I had a good time, I felt very happy", and all that. People who are in the second room, where the actor did something unpleasant, they said, you know "it was very, as very, felt very bad and I am sad", or something like that.

The third room where the action, the content of act, acting was emotionally neutral, people said, and they are in find anything particularly, you know in interesting or emotionally significant. So, although the autonomic reaction or the response is same in all 3 cases it is the high level cognitive interpretation right, that is what is giving specificity, its not coming from the body from the physiology.

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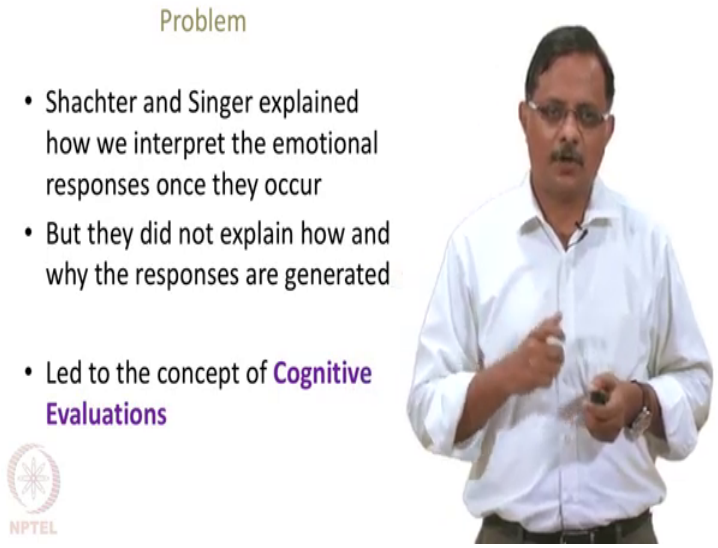

Ok, but still there is a problem right, if what these people, Shachter and Singer showed is, that how we interpret, emotional responses once they occur. But what they did not explain is, why do they occur in the first place.

Because you see a stimulus, you see like a bear or a snake right, you know, somebody doing something pleasant, or an sort of a girl to whom you want to propose, or whatever. Certain stimuli are neutral, they don't produce any explain, if I look at this you know, this pen; that does not produce any emotion responsively right. So, why does, why is there a difference? What is causing this difference? So, none of these previous theories talk about them, they only talk about the bodily response and then something that happens later. So, this questioning has led to the concept of cognitive evaluations and that gave

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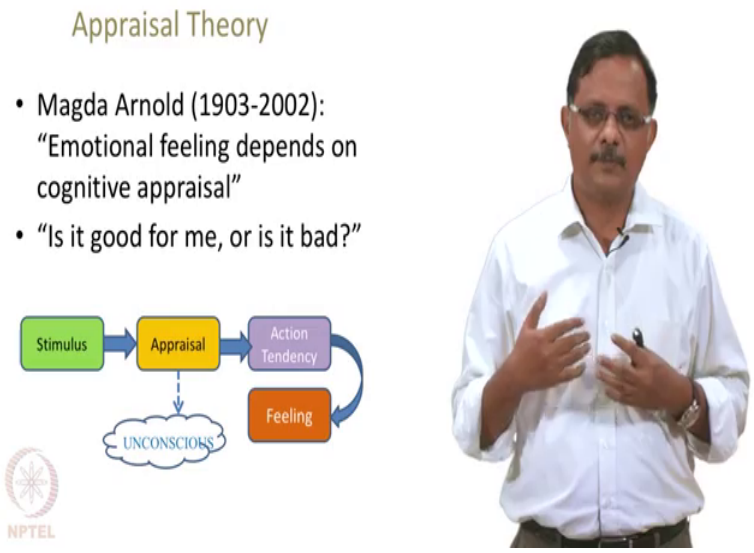

Birth this whole line of thinking, called Appraisal Theory. The key proponent of appraisal theory was, Magda Arnold right, who will actually lived a very long and fruitful life, close to a century. In fact, she is, Magda Arnold, has seen their whole evolution of their emotion, theory of emotions, over a whole century, they are all the ups and downs that occurred in this, in this domain over a whole century.

So, her main contention is that, emotional feeling depends on cognitive appraisal right, what you feel depends upon, how you interpret, the external stimulus right, cognitively that appraisal consists of basically, asking and answer the, answering this question. So, what I am looking at, what I am facing, is it good for me or bad for me?. That is what is called appraisal.

And the key difference in appraisal theory, compared to some of the previous theories is that, the appraisal, although it depends on cognitive input, the stimulus that you see; and the actual appraisal happens unconsciously. So, in fact, the unconscious element of emotions is very important and that is emphasized by you know, further other workers, that we encountered later on in this lecture. So, although the starting point is cognitive right, the appraisal actually, the proper is unconscious and that is very often, it is very hard to express your emotions, you feeling something queasy, something odd and right now you just said know, you know, "I am in a bad mood you know I just want to be alone".

And things like that, that is because, a lot of, what we call "Emotion Experience", is difficult to put in words, there is an unconscious element by it is very nature. So, in the appraisal theory, the appraisal part is thought to be occurring unconsciously. Now, it also leads to an action tendency that is unlike say William James, who took a kind of extreme position right, where he says, the action itself gives rise to emotion experience or emotional feeling.

In Magda Arnolds theory, the I there is only action tendency and not explicit action and that. So, you want to do something, in response to that stimulus because, you evaluated the stimulus to be good or bad or whatever and that action tendency gives rise to a feeling that is your emotional feeling.

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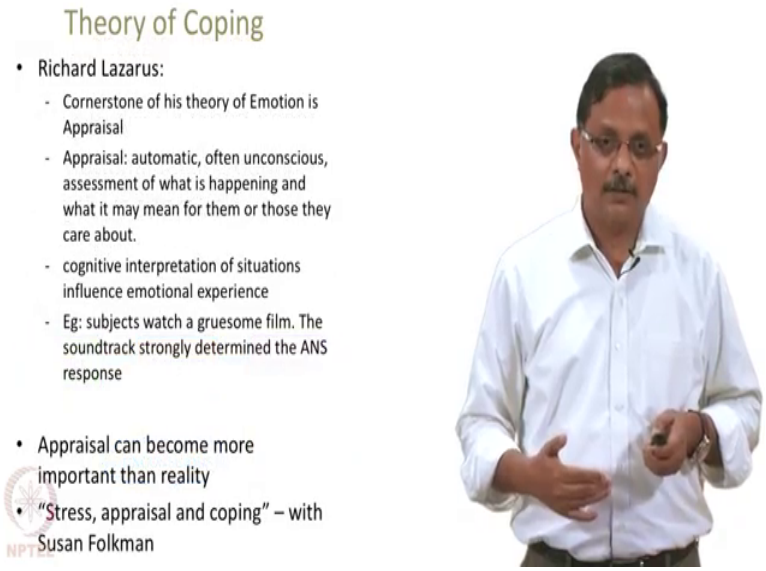

So, others have extended these ideas. In fact, Richard Lazarus has developed a whole theory, of coping. That again, in the cornerstone of his theories, is that emotion, of this theory of emotion is appraisal, and he says appraisal is automatic.

And often unconscious, an assessment of what is happening and what it may mean to them, to the person or those who care about. So, again appraisal has to do with the question of is it good for me? Or bad for me or is it good for somebody I, you know, care about or is it bad for them? So, cognitive interpretation of situations right, influence emotion experience, right. So, for example, in one of the experience that Richard Lazarus has performed or the subjects who are, who watch a gruesome film, it is about, some

kind of a gory ritual, that is performed by Australian aborigines. So, in one case, they were also, there is also, has very solid, a very scary soundtrack, that goes along with the video; in other case the soundtrack is you know, very simple and emotional neutral.

And, so, they actually measured the (Refer time:34.45) the autonomous response in terms of you know, heart rate and change in blood pressure and things like that. It turns out that the emotional response was much stronger, in case of the video, when the video went along with, a kind of a strong and a kind of a disturbing soundtrack. So, in this case the autonomous response, itself was determined by the sensory stimulus. In this theory of appraisal, proposed by Lazarus, where appraisal can be become, more important than reality.

Because, appraisal is all that depends upon on the sensory stimulus, which comes from the world and therefore, objective the appraisal process itself is unconscious and also it is completely personal. Right, some people can take a very simple thing, evaluated right, or appraisal is evaluation right. So, evaluate in a, very big way. For example, you walk along the corridor and you feel you know, you see somebody you know, that you know, did not smile at you they just ignore you.

And you can make a mountain of that mole, you know of that molehill and you know, interpreted in a very negative way. Or, somebody has just lost a job and the person could be taking it very coolly, you know very casually. Right, the appraisal is something. So, the, what about fact is same, all right, or that is an objective part of it, but your inner evaluation or appraisal of it could vary a lot from person to person right. So, when the, what we call stress, is actually something that arise out of appraisal, your appraisal or the way you appraise, your day to day situations. So, along with you know, Susan Folkman is written this book called Stress and Appraisal and coping. So, how does appraisal lead to stress? Or abnormal appraisal can lead to stress? And then how do you cope with it? Right, and how do you reduce stress?

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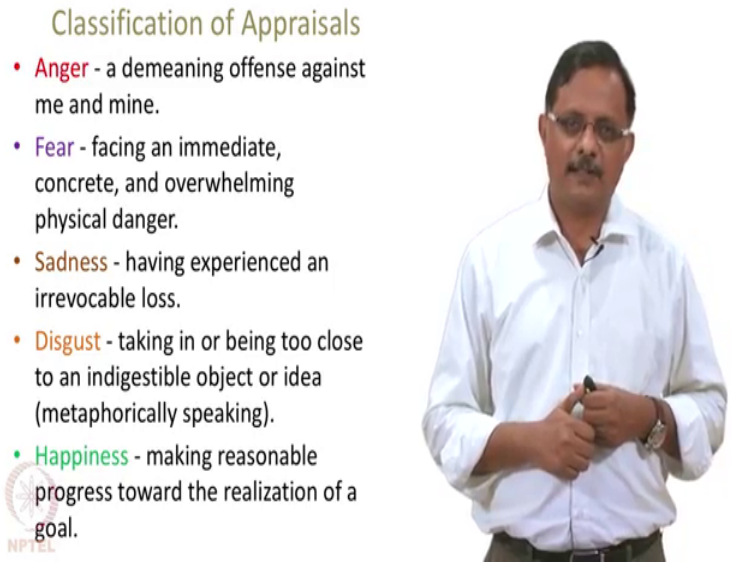

So, Richard Lazarus, gave a classification of appraisals, are in terms of like, you know, these are again the same emotion that we have seen before, what is it, but its commentary on the emotion in terms of an appraisal is slightly different.

So, anger is defined as, "a demeaning offence against me and mine". Fear is defined as right, "I was facing an immediate concrete and overwhelming physical danger", the sadness is defined as, "having experienced or irrevocable loss", disgust is defined as "taking in or being too close to an indigestible object or an idea, metaphorically speed", and happiness is, "making reasonable progress at towards the realization of a goal". See, in all these things, actually most of these definitions of emotions, that what you see is something good is happening to me; or something bad is happening to me; or something good is likely to happen, in future; something bad is likely to happen, in future. It is talking about the an actual realized, positive or negative for me or at the prospect of something positive or negative for me in right, in future.

So, he is kind of, trying to break down the whole gamut of emotions into certain axis. So, we will return this to this idea later on, towards the end of this lecture, when we try to outline, the whole theory of emotions, which has certain neurobiological grounding.

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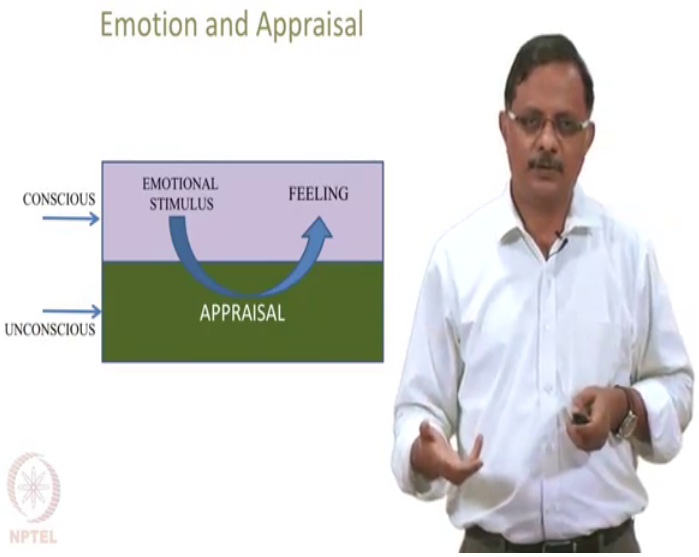

So, basically if you look at the relation between emotion appraisal, there is emotion stimulus, which is senses; means which comes from world and therefore, that objective, but the emotion, the stimulus enters your unconscious and that is where appraisal occurs, and comes back up as your emotional feeling. So, that is again your is conscious. Now this, so the, they are 2 parts of emotion, there is a conscious part, there is cognitive part, this is a unconscious part. But it so happened that, as people kept developing and defining the theories of emotion, the conscious and cognitive part started becoming more dominant. Right, that is because of the way in which psychologists evolved during the 20th Century.

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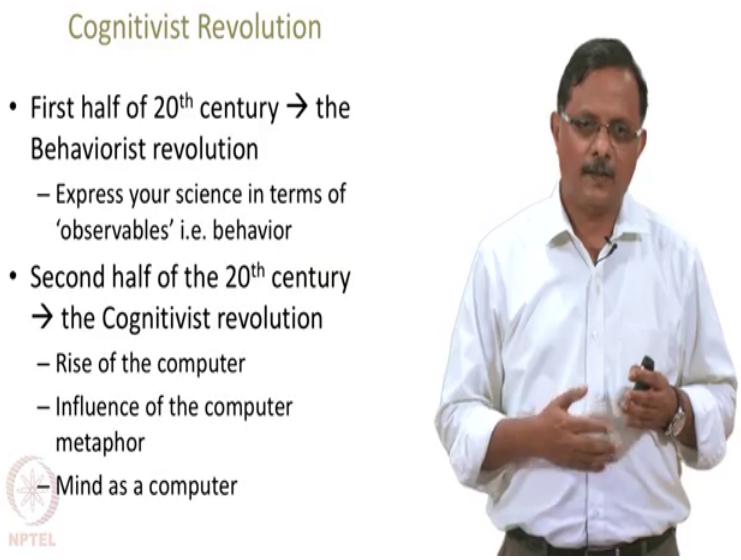

In the first half of 20th century right, we saw, what is called the behaviorist revolution.

Because, before that people are talking about you know, when people talked about persons nature right, or mind. They would use the things like, you know; instincts and drives and motivations and so, and so forth. But, these are the abstract things you know, you cannot, pinpoint them, you cannot observe them. But science is all about dealing with things that are observable, that are measurable and put in it, can be and that can be expressed in numbers right.

So, how do you express, how do you quantify and measure something like an instinct or a drive or motivation? So, there is a, as reaction to those kinds of loose technology, that were quite popular, in earlier in the late 19th century. The 20th century has seen this, reaction to that, called a behaviorist revolution. Where people like you know, Skinner and Watson and a whole lot of behaviorist, they have insisted that, you always talk in terms of observables of behavior. So, they do not talk about motivation, they only see the animal has pressed some liver ten times.

So, that is a number and I can measure that, I can observe that. So and also the part of the reason you need the behaviorist revolution was, because we did not know much about inner workings of the brain, at that time. So, there was; so, people had to depend a lot on outward behavior. But things have changed in the second half of 20th century, particularly what happened in the, towards the middle of the 20th century is, the

computer revolution. So, people have began to build as large computers, they use them in the second world war. And therefore, the computer metaphor became very popular, became very influential, thinking of the brain, because people also have thought of brain, as a big computer. We have seen that, in the work of Mcculloch Pitts, they thought that when is a big computer and neurons are like logic gates and so on.

So, therefore, so, that gave rise to cognitive is revolution in psychology. So, because, of which people kept thinking of everything. As a result of some kind of a cognition, as some kind of cognitive processing. So, even emotions were dragged into that kind of a attempt right.

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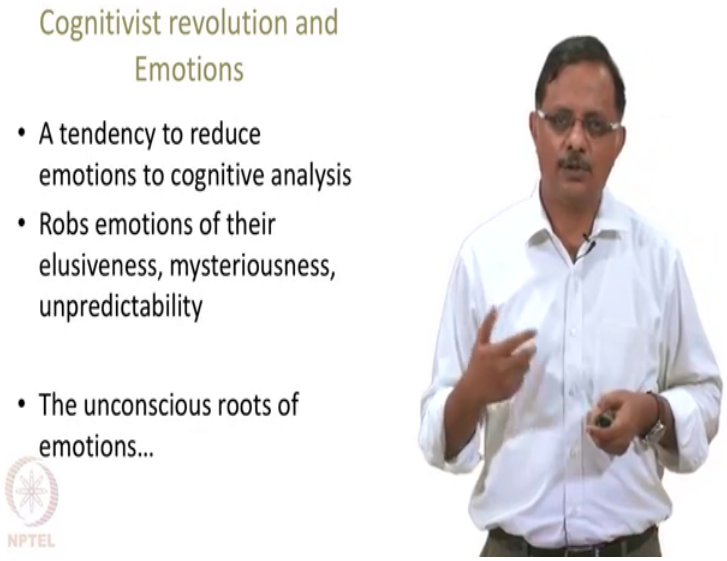

So, there was a tendency to reduce emotions to cognitive analysis. So, but that robs emotions of the elusiveness, their mysterious quality and the unpredictability. So, then the reaction, again started, to this kind of a attempt to reduce emotions to cognitive processing and; so, people began to probe, the unconscious roots of emotions one of the key figures, who has emphasized the, that the emotions are unconscious, is Robert Zajonc.

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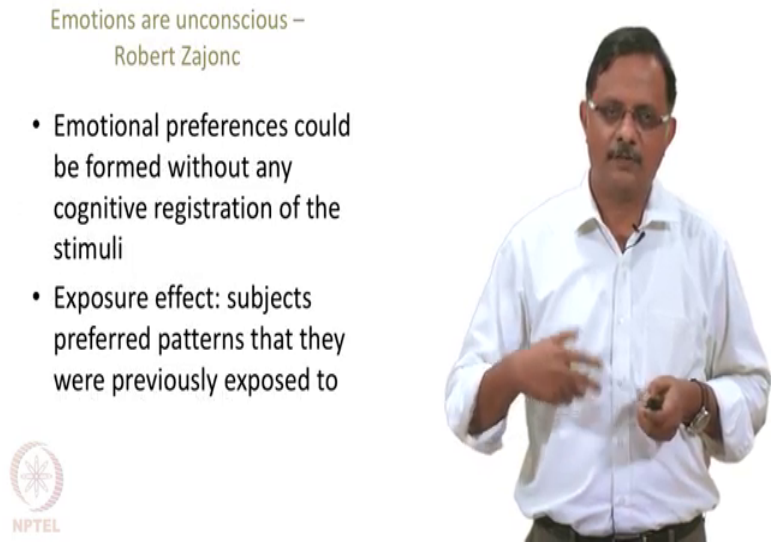

So, he said that emotional preferences could be formed without any cognitive registration of the stimuli. So, although the theories that we have seen, have said, the starting point of emotion is this cognitive interpretation, but appraisal itself happens in the unconscious. But Robert Zajonc, he emphasized that you can have emotion feeling, you know, feeling without any right, cognitive registration of it.

To illustrate this, he studied what is called exposure effect. So, in these kinds of studies, our subjects were presented certain sensory patterns. These patterns are, were shown in such a for such a short time that, it is not enough for those stimuli to enter your conscious experience right. But still the subjects preferred patterns, that they were exposed previously exposed to. So, let us look at some and look at an example of exposure effect.

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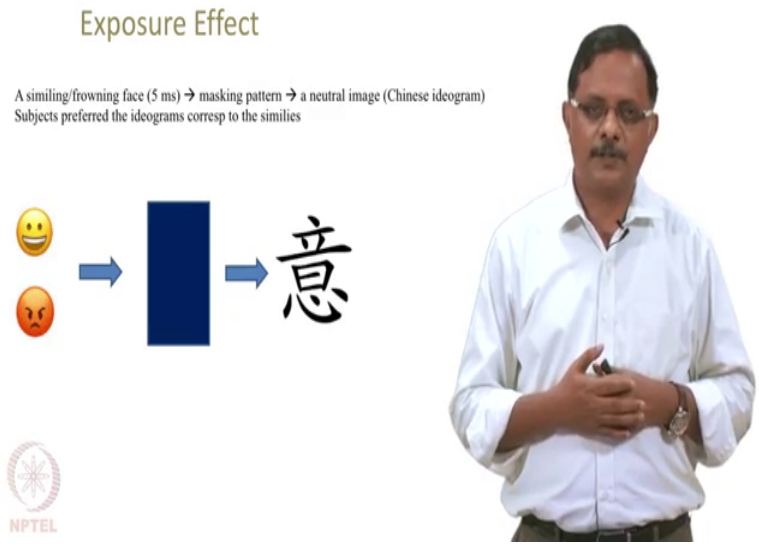

So, here in this picture, you can see 2 emoticons and 2 figures, one is a smiley and another, is like a frowning, I mean, which was a frowning fates. And these image are shown very briefly, for only 5 milliseconds, and that is too brief, for a person to consciously realize an, have an experience; have an experience of what they are looking at. So, after that very brief presentation, was a for just 5 milliseconds right, the image or masked by some kind of a dark, rectangular mask. And after that then, they show a kind of a neutral picture, like a Chinese ideogram, like a Chinese character.

So, the assumption here is you know, actually in the experiment, none of the experimenters could read Chinese. So, for them a Chinese character, is just a an emotionally neutral pattern, an abstract pattern. So, after they were exposed to lots of these pairs of emoticons and Chinese patterns, but then, they were shown only the Chinese patterns and asked him, “which do you like more”? Since a patterns are basically neutral normally, you would think that, they would not have any particular preference, to these patterns.

But it turns out that, the patterns which were paired, with a smiley, but preferred more, than patterns which were paired with a throwing fits. So, that is very interesting, which clearly shows, that your emotional experience that you had or emotional bias that you had, nothing to do with your cognitive interpretation. So, this gave rise, to a whole body

of work, where people studied the, these subliminal, subconscious or components of perception.

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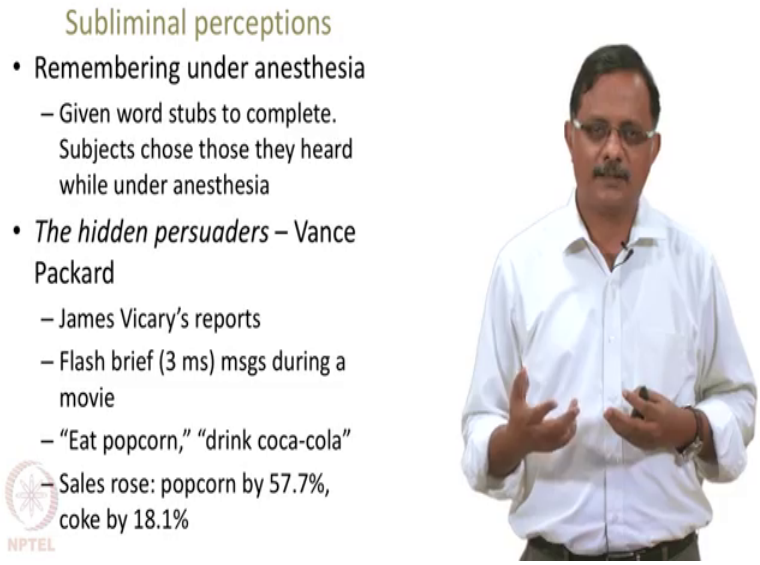

So, in some studies, how people who are given anesthesia and the people who are under anesthesia, they were played, certain words, while they were in an anesthetic you know, anesthetized. Right, through some kind of headphones and once they are back again and in the waking condition, they were given stubs upwards. So, for example, and they were asked to complete for example, during anesthesia, they are played as word like, cordial and after they were, they you know, became awake right, they were given a word like c o r and they asked them, "will you fill them as cordial or correct"? So, they chose, cordial more often, than correct because, that was the word that they have heard, while they were in anesthetist.

So, obviously, were anesthetist is, there is no conscious experience right, but the words are entered the unconscious and therefore, that is showing up as a bias to the choice. So, again there is a interesting, book called Hidden Persuaders, which is written by Vance Packard, he has you know, studied or covered the reports of James Vicary right, who has talked about a lot of these, subliminal perceptions or experiments with subliminal perception, where they use this phenomenon for advertising.

So, it is all these say, advertisements. They flash a very brief message, very short message, only for say 3 milliseconds in the middle of a movie. So, message could go

like, you know, “eat popcorn”, or “drink coca-cola” right, and then, in the intermission, they found that, the sales of popcorn went up by 57 percent or coke by 18 percent. In fact, there is a, when the society came to know about these kind of experiments or you know, this kind of advertisements. There is lot of outrage against this and because, it is like, you are influencing minds, by playing with their emotions, by, without their conscious. You know, knowledge of that they, are being manipulated unconsciously.

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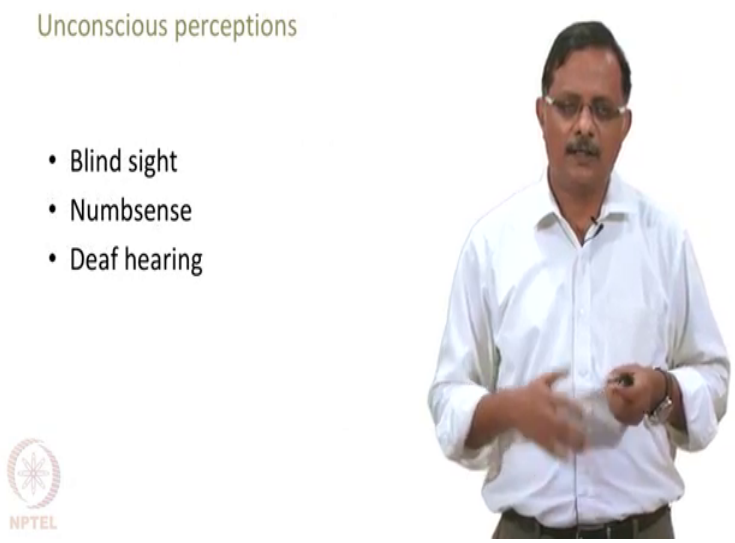

The other phenomena in neuroscience, which also talk about, how the unconscious can also give rise to perceptions and feelings and things like that. So, for example, this is phenomenon called blind sight which is a kind of a paradoxical site. So, people. So, we know that site requires eyes, you know, your eye need to have intact eyes, to be able to see something.

But this not sufficient, that you also need to have intact brain, you need to have your visual maps, to have form correctly. So, that you can, receive the information coming from your eyes, interpret them and experience these visual experiences, right, in your brain. And lot of the a visual awareness, occurs in the visual cortex, right. So, in certain patients, who are said to have, what is called blind sight. There is a visual cortical damage.

Therefore, they do not have a visual experience that is conscious visual awareness. But, very often they can show evidence, of being able to produce, visually based

performance. So, for example, if you take a blind sight subject and if you say, “I am throwing a ball at you, can you catch it”? Initially, the subject might say, “oh no, no I cannot see”, you know, “maybe, I would not be able to do it”, but if they tried it, they would be able to catch the ball, with a very high probability ok.

So, similarly, they can show evidence of visual perception. Although, they do not have a awareness of visual experience. This is a paradoxical thing, but, it is a fact and it is a fact of neuroscience. So, similarly there is something called numb sense, you know, to which are, they are numb, there is a damage to the (Refer Time: 47.11) sensory cortex. So, they cannot feel the touch, but if you let them palpate something, simply by feeling it, they might be able to say what it is as soon as there is this paradoxical hearing, called “Deaf hearing”. So, all these phenomena say that. So, there is, there is unconscious sight, to experience and so, for emotions also you need to look at this unconscious sight.