Indian Institute of Technology Kanpur

National Programme on Technology Enhanced Learning (NPTEL)

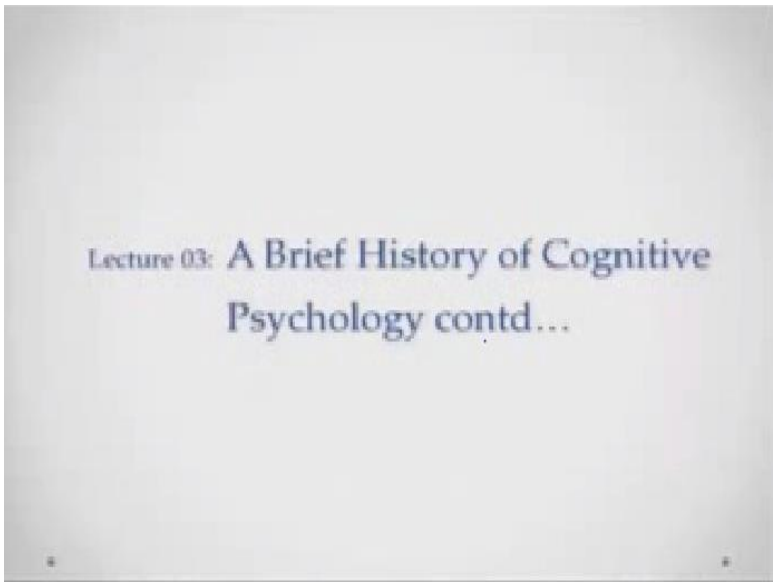
Course Title
Basic Cognitive Processes

Lecture: 3
A Brief History of Cognitive Psychology

by
Prof. Ark Verma
Department of Humanities and Social Sciences
Indian Institute of Technology Kanpur

Welcome to the third lecture of the series basic cognitive processes, I am Dr. Ark Verma assistant professor of psychology in IT Kanpur.

(Refer Slide Time: 00:24)



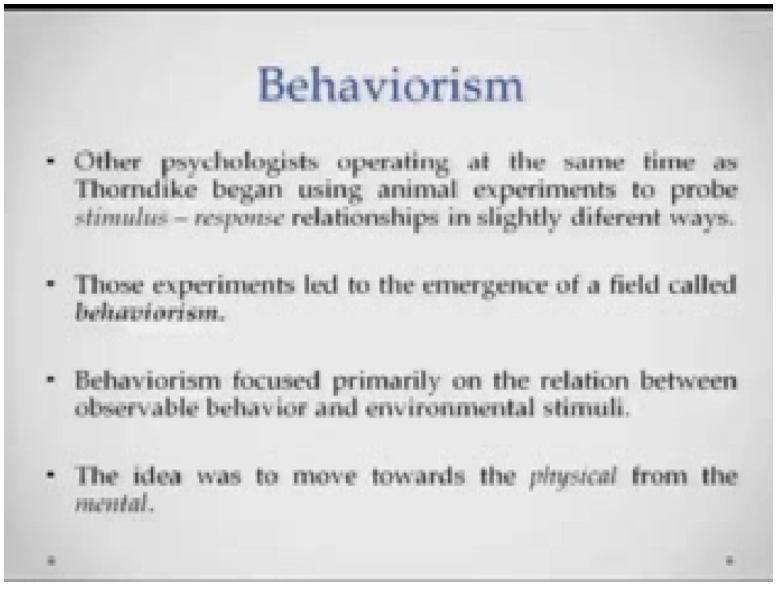
So the third lecture basically is also about the brief history of cognitive psychology if you might remember that in the last lecture we were talking about how is cognitive psychology developed from philosophy. We already talked about some of the earlier philosophers like Hippocrates,

Aristotle, Plato, we also talked about modern philosophers like Dicaught, Locke and Kant and we basically then moved on this various schools of thought that exists in psychology.

We talked about structuralism and now they wanted to chart a periodic table of human experience. We talked about functionalist like William James who wanted to know why people behave the way they do. And then we actually moved on to associationism, associationism basically talks about how people connect ideas or events together in time. We saw how bingos' basically connected and apply this principal of associationism to actually see how a person could learn certain information using processes called rehearsals.

We also talked about the principals of law of effect given by Edward Thondaik in which he says that the person learns a particular behaviour if he or she is rewarded for doing that. Let us today move on to another school of psychology which had deep impact on how cognitive psychology developed as a subject. Now this school of psychology commonly referred to as behaviorism basically evolved out of associationism itself.

(Refer Slide Time: 02:00)

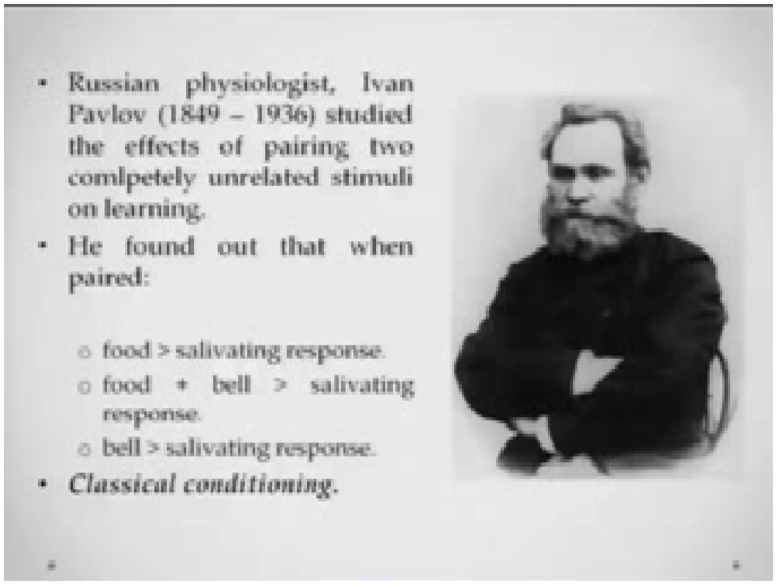


This people at the same time as the associanist Edward Thondaik and Harvan bingos had started doing experiments with animals. And investigating the various stimulus in response associations. These experiments basically led to this emergence of the field called behaviorism, behaviorism focus primarily on the relationship between these stimulus between the behavioral responses and the environmental stimuli.

Was to move towards the physical from the mental. If you remember the last lecture the discourse was mainly about what is mental, the mental processes the relationship between the mind and body and that primarily because the scope of thought was developing in philosophy. Gradually it came down to psychology where you again find the structuralist were also concern more with the mental than with the physical realities.

It was associanist so actually talking about physically when it response to stimuli that the environment presented.

(Refer Slide Time: 03:06)



Let us talk about this Russian Physiology Ivan Pavlov. Now Ivan Pavlov basically was a physiologist, who actually was studying the digestive system of dogs, and he had kept a dog in

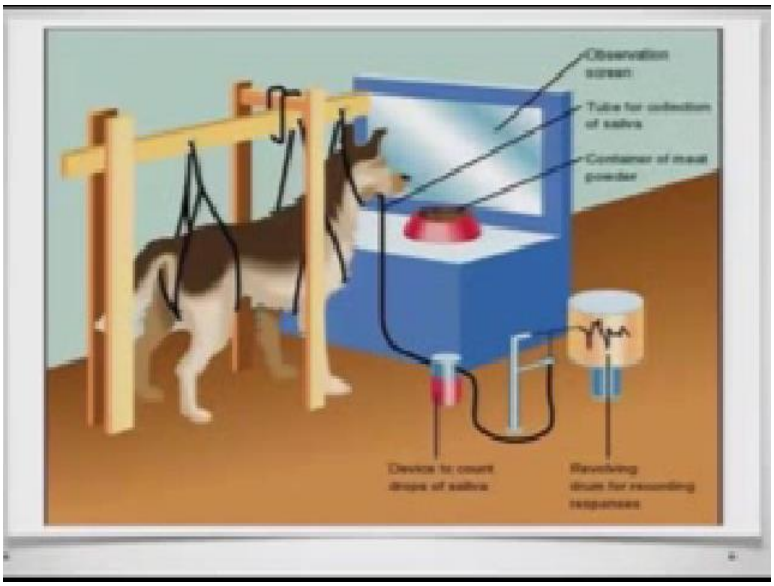
his lab and there was a technician who used to feed the dog regularly or periodically. Now what problem actually finds out let whenever the technician comes to feed the dog the dogs actually starts salivating there is a salutatory response when actually they just see the person who feeds them when they see the technician.

The technician might not be carrying food at that point in time. It is still in anticipation that may be we are going to get food that these dogs are salivating. Something interesting is happening here, these organisms are learning a particular response from seeing a particular event the event of coming of this technician. Pavlov basically then went on to study this pair more systematically.

He found out that if you pair an almost unrelated stimulus to a stimulus that is naturally eliciting a particular kind of a response people can be made to learn the pairing of these two stimuli. Say for example, let us take an example here, if you actually present food the response will be the salivating response. What you do is you start presenting the food along with the sound of a particular bell.

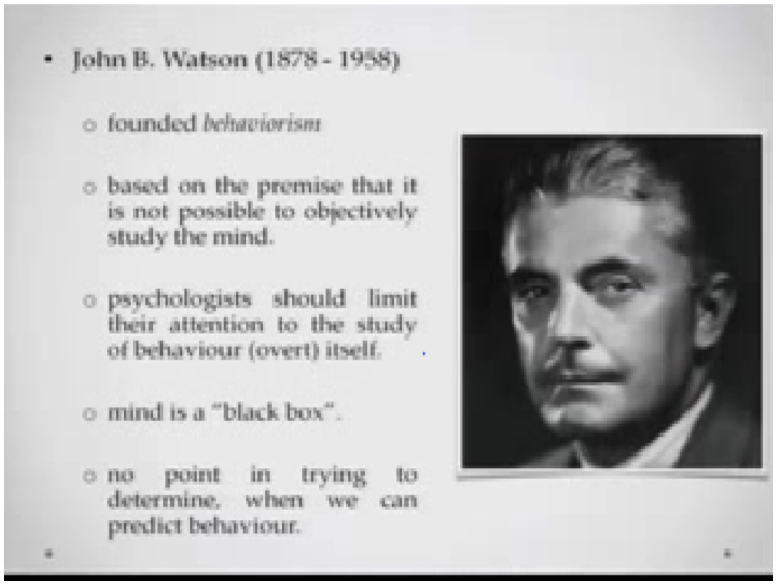
Now you see that because the bell is presented with the food the salivating response is still there. However, if you repeat this sparing few times and consistently you will find that the salivating response can be elucidated by using the bell alone itself. Now this pairing basically or this form of learning which is happening here was termed as classical conditioning. This is one of the central Tennessee of physiology which was basically investigated and principals of conditioning were developed by this Russian physiologist called Ivan Pavlov.

(Refer Slide Time: 05:24)



So this is basically the setup were you can see that the dog is actually tied down there is an observation screen, there is also a place to device place there to count the drops of saliva. So this is a typical set up in which you can actually measure or investigate these classical condoning phenomena.

(Refer Slide Time: 05:46)



Let as move ahead, another person actually who took this field of behaviorism much further or if suppose are basically supposed to be the founder of behaviorism was john Watson. John Watson was an interesting psychologist, because he believed that the premises physiology should only be the observable facts the observable behavior. He said that it is not possible to objectively study the workings of the mind.

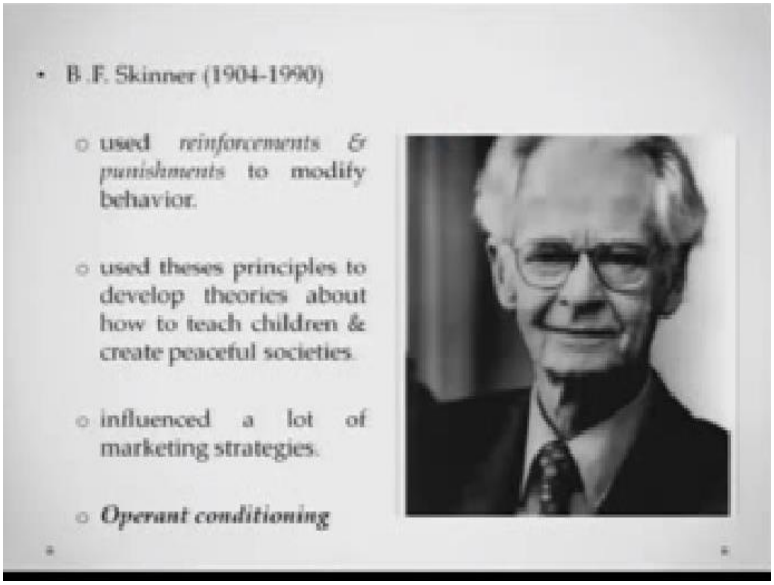
Because if you think he might make some sense, you know the process of thinking the process of feeling etc. cannot be really objectively measured, and that is preciously what the point Watson was making. He said that because we cannot measure these things there is no thermometer that can measure weather you feel sad or happy, then maybe we not study them at all may be psychology as a science should not concern itself we think that you cannot really measure.

So psychologist basically from this brand of school of thought called behaviorism basically viewed the mind as a black box. What they wanted about was that you present a particular stimulus and you get a particular response, and there is this black box in the middle. We should not be concern with this block box at all because we cannot actually engage with the black box.

So they basically were more interested in looking how different kinds of inputs or how different kinds of stimulus can be presented and what kinds of responses they would generate.

So they would basically manipulate the times and the pairings and the different kinds of parings there could be in a particular stimulus and particular kind of a response. And that is what the subject matter of psychology should be according to the behaviors.

(Refer Slide Time: 07:45)



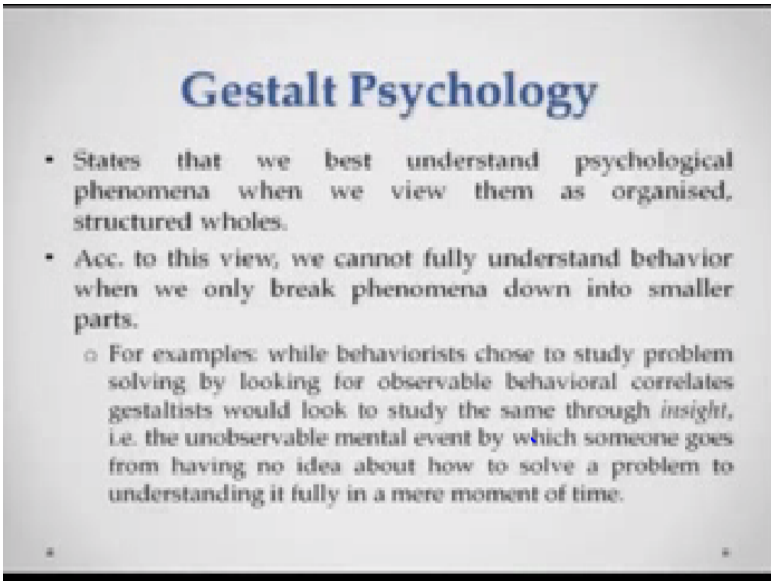
B.F Skinner was another of behaviors very influential and what he was using was the system free enforcements and punishments. So he basically said if you have to really teach somebody a particular skill if you have to make somebody learn a particular skill you might need to re enforce them. So you might need to add positive rewards to re enforce people to learn something or say for example, if you want people to unlearn something if you want people to stop behaving in particular ways, then what you should do are you should give them consistent punishments.

So this system of reinforcements and punishments was seen as the way of achieving learning and B.F Skinner actually believe that this is one of the ways in which all human behaviour is learnt. He said that it is only through a system of reinforcements or punishments that humans learn

whatever abilities skills and behaviors that they actually do. So he use these principles to develop theory about how to teach children and create peaceful societies.

One of the very popular quotes from skinner is that if you give me a child, and if you give in a perfect conditions two days the child and you ask me to make him any body from a scientist, to an artist, to an actor if you give me the right kind of conditions I will actually able to do that. This scheme of reinforcements and punishments and this form of learning actually came to be known as operant conditioning.

(Refer Slide Time: 09:18)



Another school of psychology which was rather slightly more removed from this behaviorism was that of gestalt psychology. Now you have to be slightly patient and you know you might want to recall all what we have studied still now and you will see what was the behaviour is trying to tell you is something which might be a bit disturbing for people to observe. What they are trying to tell you is humans are known better than animals or no better than machines because if they are given consistent stimuli with particular time pattern or you say for example with a particular contiguity they will reliably and predictably produce the same responses.

If you give a thought about yourself and how you behave or you know the behavioral patterns of any persons that you know you might realize that is not really the case. So there was this response growing up towards behaviorism and people gradually were also realizing that, if you really have to understand human behaviour you have to talk about internal events you have to talk about things that happen in the mind.

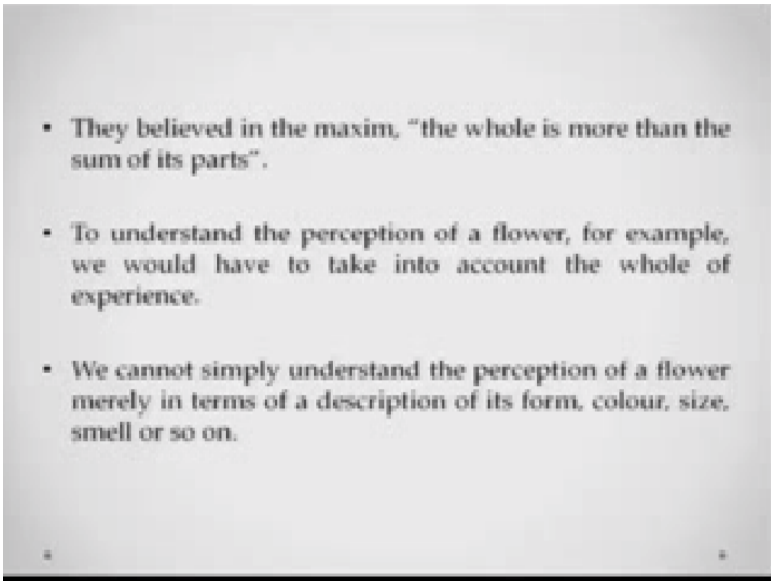
A behaviorist generally would actually disease from doing so, and you discourage you actively from doing so. But there was a another school of psychology that was actually that came in very close in time after behaviorism which brought the focus back to internal events this school of psychology was the Gestalt school of psychology, this school of psychologist like Wolfgang Kohler and some others who are actually in Germany, and this is very popular school of psychology in Germany.

They basically said that will best understand psychological phenomena when we view them as organized structured holes. So even though, they might be constructed of variety of components we would want to really view them as holistic patterns. So your experiences even though you might say that they are constructed of different components of experience, but if you want to really understand you want to understand them as holes okay.

So according to this view we cannot fully understand behaviour when we only bring the phenomena down into smaller components. Let us take an example, I was saying earlier when I was talking about structuralism that if you have to describe your experience of looking at a flower, you might want to talk about its color, you might want to talk about its order, you might want to talk about its shape, or the texture.

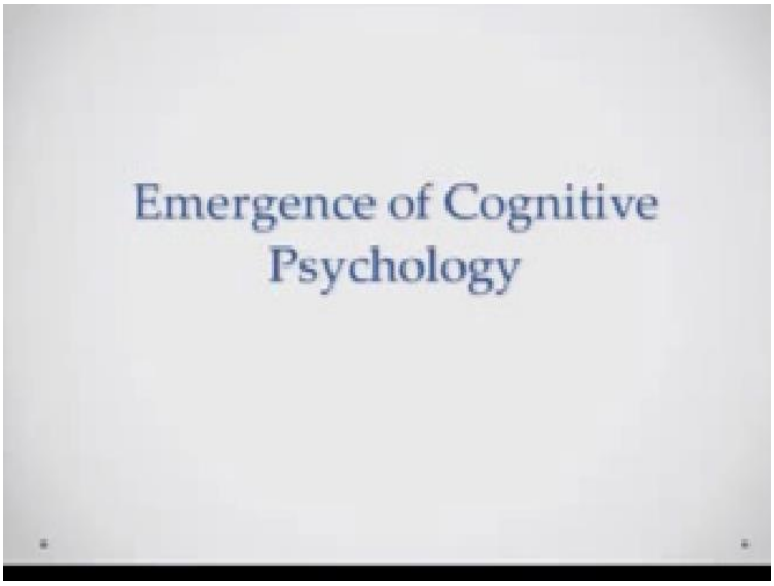
But the psychology would ask you that is the color of the flower, the experience of the flower in itself or let us say is the shape of the flower, the experience of the flower in itself. You would actually force to conclude then that it is neither of these components but all of the components put together that constitute your experience of the flower, that is pretty much what the Gestalt psychologies wanted us to understand.

(Refer Slide Time: 12:34)



So they believed in this maximum called the hole is more than the sum of its parts which makes a lot of sales if u see how people understands behavior. We cannot so, as I talked about this example already.

(Refer Slide Time: 12:50)

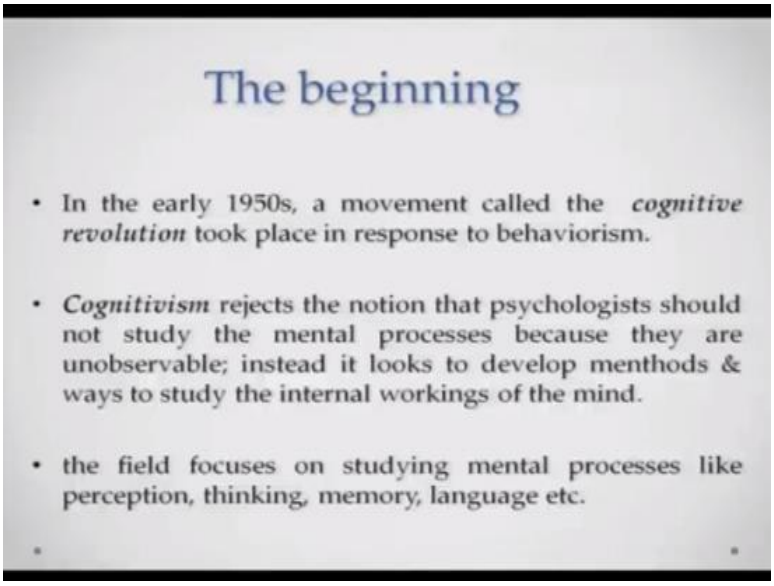


So let us move on to the emergence of cognitive psychology. Now you see we have actually charted the growth of the entire background philosophy to modern philosophers to these various schools of psychology which are structuralism, functionalism, associationism, and behaviorism. Behaviorism by far is actually the most radical school of thought, and it was the most popular school of thought in psychology in the early 19th century.

But things were changing around that time people were gradually realizing as I said from the Gestalts psychologies onwards that you have to really, in order to get complete explanation of the human experience or in order to get the complete understanding of human behaviour you cannot do without talking about internal mental events. The behaviorists were very against this proposal and they were continuously engaged and actually coming up with explanations which basic typically consisted of particular stimulus response associations.

And how this stimulus response associations lead on to more complex behaviors. So let us see how cognitive psychology emerged from all of this background.

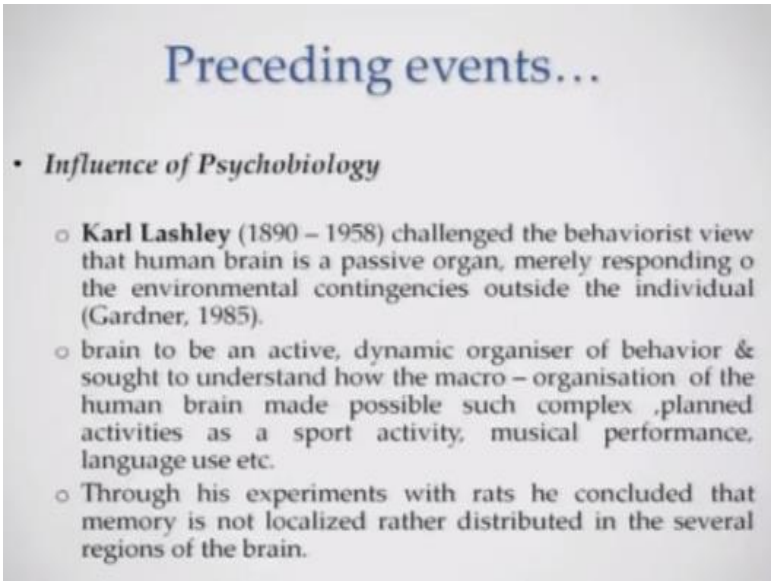
(Refer Slide Time: 14:06)



Now by the early 1950's there was a movement called the cognitive revolution that was slowing taking place. Cognitivism basically is this idea that rejects the notion is basically this idea that rejects the notion that psychology should not study mental processes, because they are unobservable. In state cognitivism actually looks to develop methods and base to study the internal workings of the mind okay.

So this field basically focuses on specifically mental processes those that cannot be absorbed, but through engineers base to engineers experience designed to study exactly those things those workings of the mind.

(Refer Slide Time: 14:40)



There was a few proceeding, there was a few events that actually lead on to the development of the cognitive psychology let us visit them slowly one by one. So one of them was this influence of psychobiology, you might remember john trying to say that mind and body are one in the same thing okay. So jumping right from there there were few developments going on in psychobiology that are actually telling people that it indeed it could be the brain which would be the seat of human behavior.

One of these prominent theorist in this field was actually Karl Lashley, Karl Lashley was earlier a disciple of, earlier a student of VS. Skinner and he basically went on to challenge the behavior's field. He basically said that its foolish to assume that the human brain is a passive organism, and it is just reacting to this continuously this stimulus response associations. He basically said and he believed that brain is an active and is a dynamic organizer of human behavior.

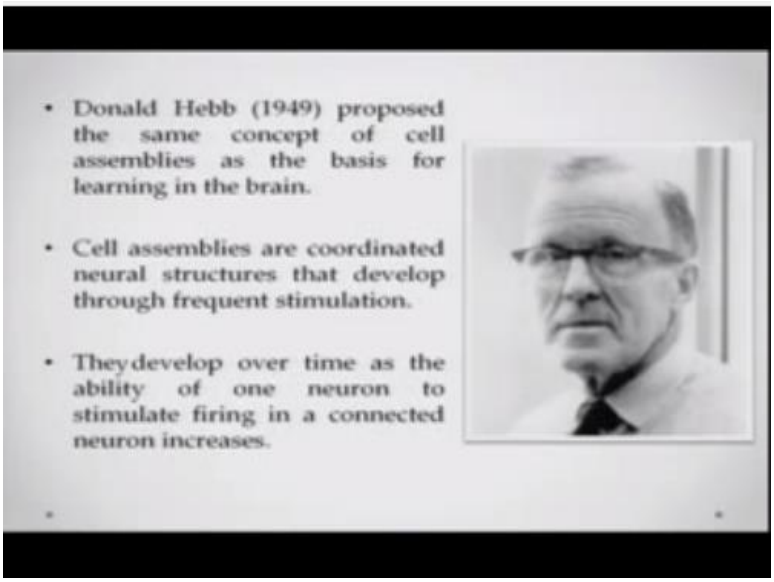
And thus he basically sort to understand how this macro organization of the brain how this organization of the various parts of the brain and various activities at the brain does go on to form this complex behaviour we engage a very lot of complex behaviour. Let us say a musical

performance or say writing a poem or for example playing a particular game now lashly was interested in actually understanding various symbols went or various symbol transferred behaviour come bind together to form this complex activities.

That humans are engaged in so lashley did lot of experiments with rats in his lab and actually found out what he actually concluded that memory is not really localized in a particular part of the brain it is basically distributed so you see that this connection is made that brain might be the seat of behaviour which is your memory and again which is un observable but not only that but also that memory is distributed across the various regions of the brain by this time lashly actually gave a view to all.

The people those who are interested working in psychology that actually you could link the brain and behaviour actually you could make a link between the mind and body and this is therefore considered to be one of the most important steps or one of the most important preceding steps which leads to the development of what is called cognitive psychology this is called lashly.

(Refer Slide Time: 17:36)

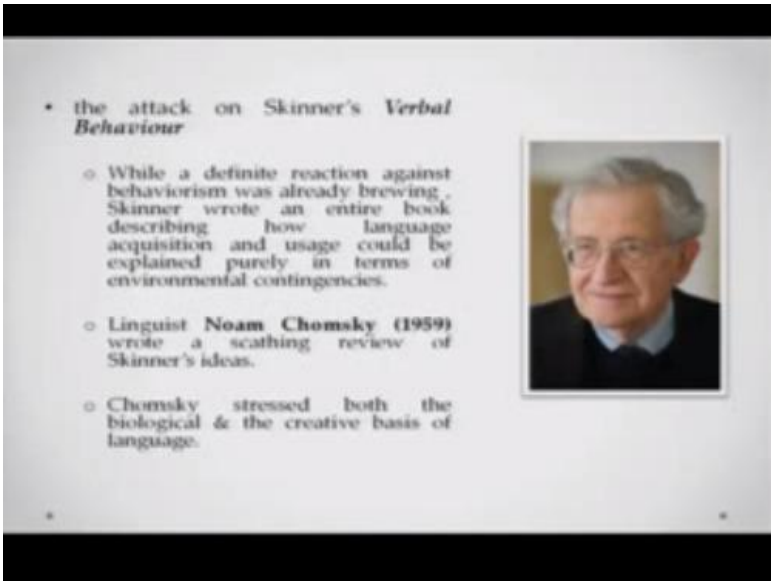


Another influential scientist who was basically working in the psycho biologicaltradition was Donald Hebb. Donald Hebb basically proposed the same concept of cell assemblies as the basis of learning in the field. Donald Hebb basically proposed that the cell is assemblies which have coordinated neural structures that developed through frequent stimulation. For example if you show a person particular shape or if you show the person particular line slanted or horizontal line.

There will be this assembly of cells that will be registering the different aspects of the line whether it is colored line or thick or a thin line or it is tilted or a straight line all of the cells might eventually start lighting up together or start firing together. Donald hebb was saying that it is finding together of neurons that leads to learning, so they basically says that cells developed over time the ability develops the overtime of one neuron to start or to stimulate firing in a connective neuron so once these connections are formed for example there is a first neuron which registers property.

A and then it leads to firing of the second neuron and all of these connections gradually lead to formation of a neuron assembly that which is responsible for you learning any particular kind of behaviour. Another interesting event after this emergence of psycho biology as interesting field of taught was the review of a book which and this book was titled verbal behaviour.

(Refer Slide Time: 19:27)



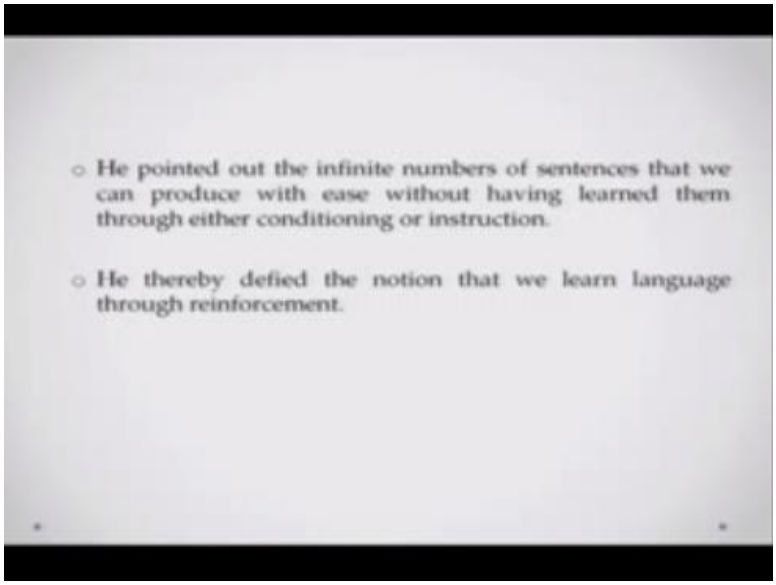
Now if you remember I have saying that is a behaviour is the behavior's psychology was still around 1950 and 1960 and what they were actually doing is they were attempting explanations of human behaviour through this set of associations reinforcement punishments and all of that Skinner basically wrote a book titled verbal behaviour in which he actually explained the entire chat of language accusation and language hues has built upon these stimulus response associations.

Linguist Noam Chomsky was a round at the and then he wrote a very scaring review of a Skinners idea he actually took the book apart while conducting the most fundamental all the fundamental assumptions or all the fundamental proposals that Skinner was making. Chomsky actually radical extreme said that language or accusation or usage of language has both characteristics it has the biological foundations while it also have the creative foundation so they actually said that it is not mere learning or its nor mere reinforcement or punishment that is not leading us to learn language that is actually boost things,

It is the biological substrates also the creative parts also the part that is unique human that is leading to us learning any language. Imagine for example if I come and tell you that whatever

sentence you have actually learnt and those that were thought to you by your parents or those that you learnt by going through this stimulus responses associations you say something you rewarded make a mistake you were punished how much of language you were actually learnt like that this is basically that Chomsky said. So likewise he pointed out the infinite.

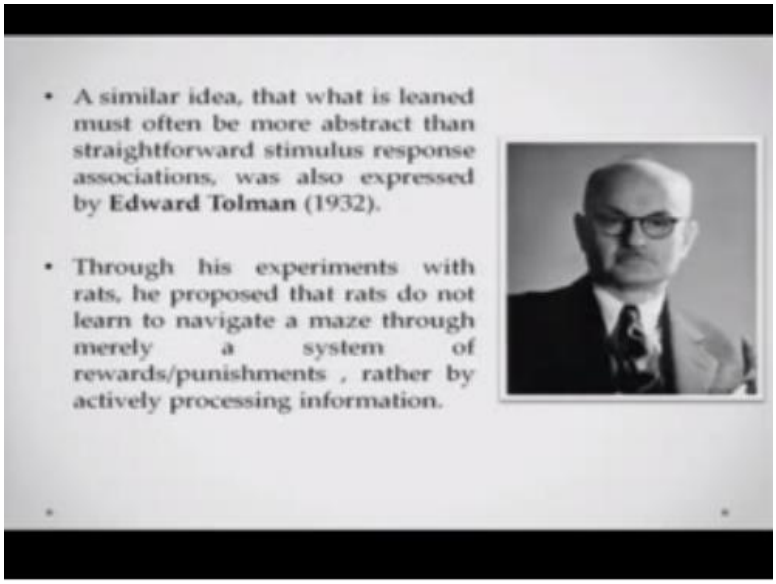
(Refer Slide Time: 21:32)



Of sentences that we can produce by ease without learn them specifically or without having either kind of conditioning or instructions so in this basically Chomsky while wrote this scatting review of verbal behaviour he made a very specific point he made the point thatthere are biological contributions to the human behaviour also he made the point that human brain is something that is actively processing information that is actively creating something new. Which in the behavior is paradigm was considered impossible. One of the reasons why they did not really want to study that.

So thereby you see the Chomsky defines the notion that we learn language through this reinforcement or punishment schedules.

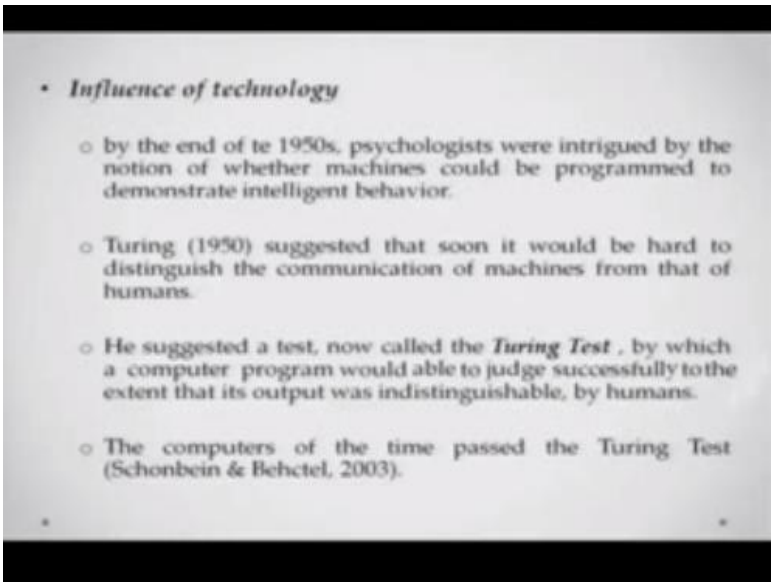
(Refer Slide Time: 22:28)



A similar idea to what Thomas you were saying is basically also presented by Edward Tolman doing the experiences of learning and actually found out that rats do not learned navigate to amaze mainly points were they are rain force ridded they are actually processing the entire you know information of amaze actively learning and storing the information so he basically said something called Latin learning that something having this some kind of cognitive generated in that sense again the brain is foot forward or mind is foot forward as an active processor of information rather than or instrument regarding stimulus response associations now you see these ideas actually or real or major departure.

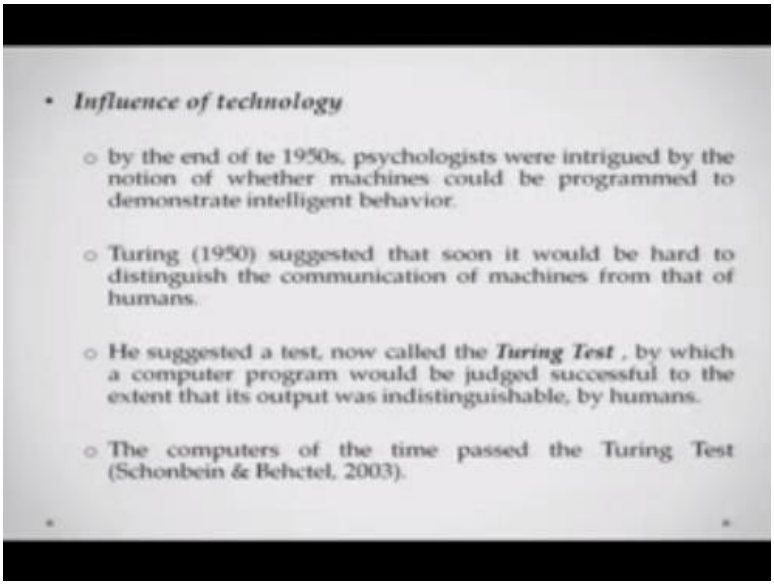
From what we are talking or talking about till now these basic and these were the you know contribute events that finally lead to what cognitive psychology become now so there is also in the 1950s influence technology you know this rime machine made advance machines were there and the second world war has ended ,there was many advance questions and psychology at the same time your wondering about particular question what that question was ,that question was that weather machines also were programmed.

(Refer Slide Time: 24:02)



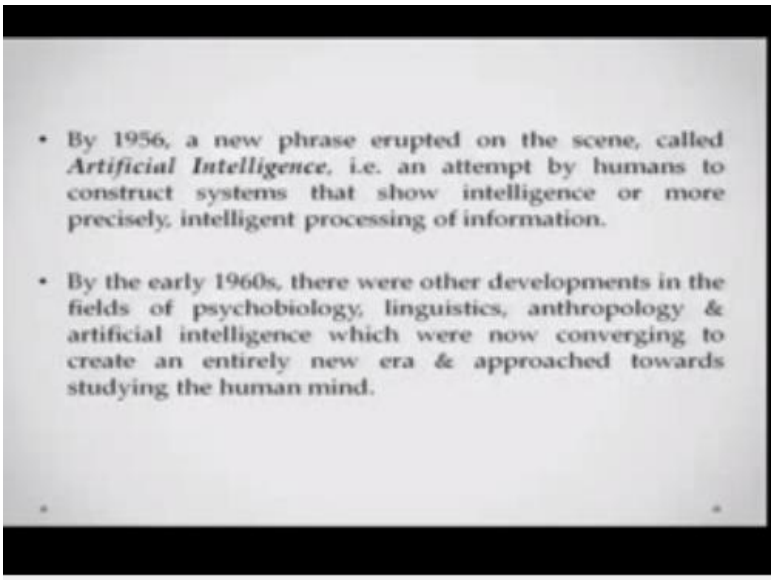
Should demonstrate intelligent behaviour okay, allen tured was rounded at time Allen suggested that soon it will be hard to disguising the communication of machines you know when the communication of humans, he said that gradually the machines will be sold once you will not able to differentiate whether small size giving by a machine or given by a human you also developed the test to effect which is now known as curing test they could be talking to machine and the machine could be responding back and by virtual of that test you will able tell that whether the person on the other hand is a machine computer the computer of that time actually pass the during test.

(Refer Slide Time: 24:45)



For people it is difficult for some sense difficult to tell that there response to a person question were generated by a computer or generated by a human so these were advance and technology that were taking place so it was obvious natural that people thought that there is an error where we can actually create machines we shall slate what was called human behaviour or intelligent behaviour much has humans are doing in sense you see that the kind of over estimated that the development of machines or let us say probably under estimated the sophistication or the complexity of the human brain.

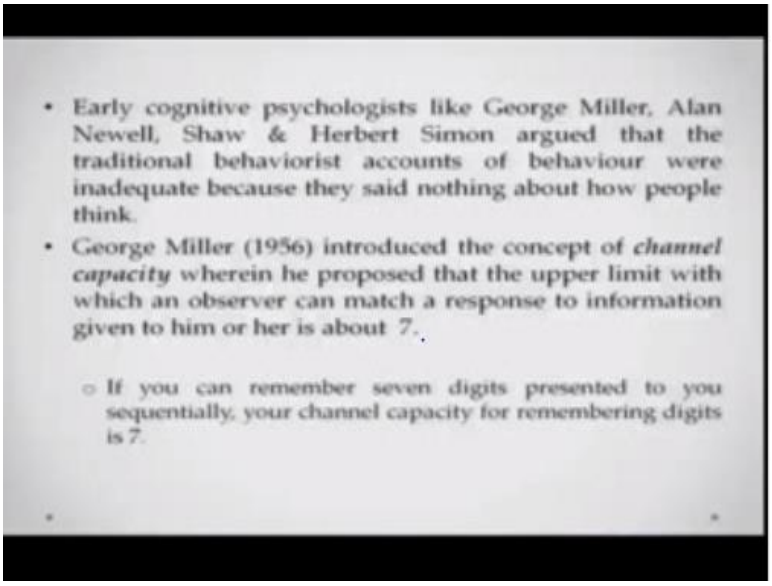
(Refer Slide Time: 25:34)



Then let us move forward by time around 1956 at the same era this is happening artificial intelligence is also born. The concept of Artificial intelligence basically defines as an attempt by the humans to construct systems that show intelligence processing of information. AI was around that time and I said it was been thought that the computers could actually stimulate or actually mimic the behaviour or intelligence processing information as the humans would do. By 1960's there were development happening in other fields as well. So for example in the field of psycho biology in the fields of linguistic in the field of anthropology, AI etc.

These developments all happening in the same time actually were converging to answer the same questions that were raised many years ago as we saw in the last class in the philosophical discourse the questions about mind and body and the questions about how mind can lead to complex behaviour or how mind controls the body. Those were the questions which now become very significant questions in all of the fields were converging together in the respective ways to answer these questions.

(Refer Slide Time: 26:54)



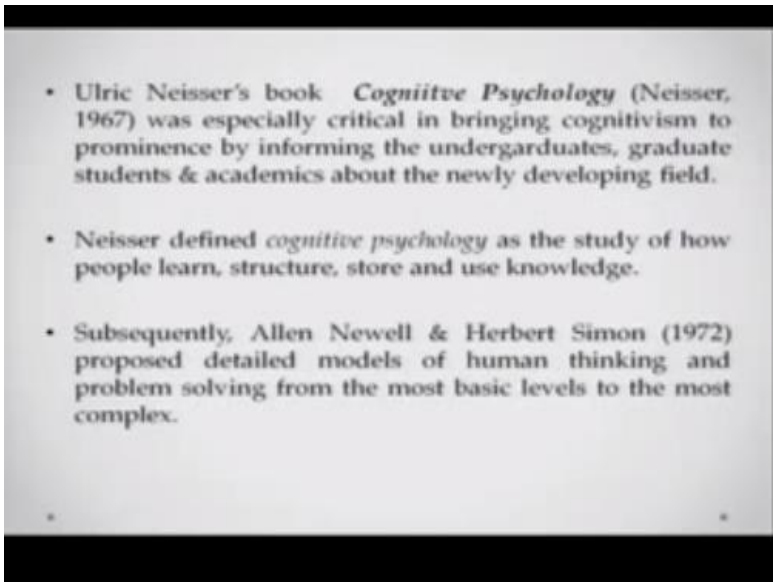
This then became the era of the early cognitive psychology. cognitive psychology was now coming into being plainly by the virtual of the kind of the questions that were being asked some of these rather famous like George miller, Allen Newell, Shaw, Herbert Simon and others now this early cognitive psychologist basically argued that the traditional behaviors accounts of behaviour were inadequate simply we were not talking about how people are thinking they are not talking about this human behaviour they are not talking about what mental processes are happening .

Their view was unnecessarily talk about the coward process unless you talk about the mental event you cannot completely explain the behaviour and in that lies the short coming and it is the person are interesting examples of response this kind was that of George Miller. George Miller introduces the concept of channel capacity was he proposed that the vision observer can match a response to a presented information you know is a round seven.

So he says that if you can remember seven digits presented to you sequentially your channel capacity for membrane digits is around seven so you see the focus is shifting towards seeing the processing of information by the UN mind much like the processing of information that goes on

in computers or in other machines. Newell Shaw wrote a book called cognitive psychology in 1967 which also begins especially critical in bringing.

(Refer Slide Time: 28:35)



Cognitive fore the idea was the idea was that you were explaining this book was attempting to explain the prominent of these field o undergraduate graduate students early carries academism and inviting all of them to field enquiry that was new and budding. Niesser defined cognitive psychology.