Advanced Cognitive Processes
Dr. Ark Verma
Department of Humanities & Social Sciences
Indian Institute of Technology, Kanpur

Lecture - 07
Visual Imagery – I

Hello and welcome I am ark verma from IIT Kanpur, we are talking about advanced cognitive processes in this course and today I am going to begin a new topic and now the new topic is basically it is called visual imagery and so what is visual imagery? I will in this lecture I will actually talk to you a little bit about the concept of what visual imagery is actually about and I will also try and describe visual imagery to you in some few terms, I will also try and you know present to you the basic debate that is been going around visual imagery research, since it is beginning.

There were there are different ways in which these things are talking about and sometimes it is interesting to course you know to chart the course of evolution of how people started talking about a particular topic and how they actually these 2 where they are anyways that apart; let us talk about talk a little bit about visual imagery to begin with. So, let us let me you know.

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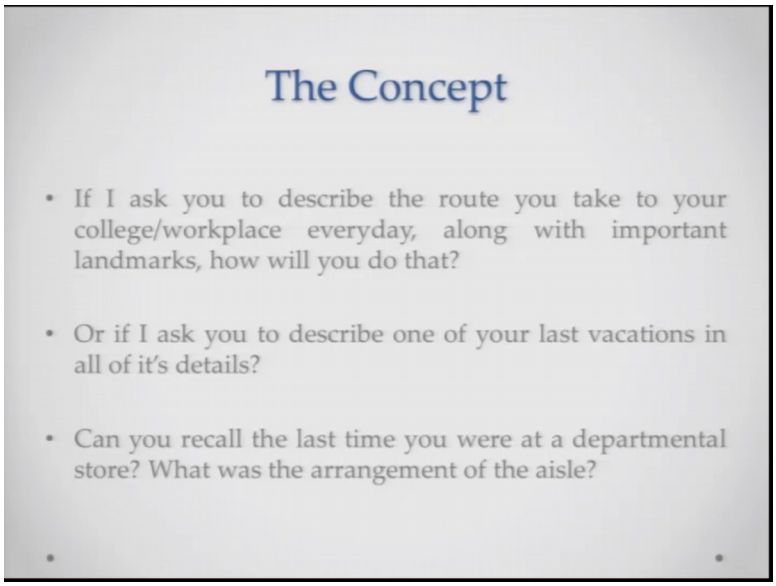

Ask you to think about visual imagery in this way. If I ask you to describe the route that you take to you know your college or your workplace every day from your home along with important landmarks.

Suppose I tell you know please tell me how do you reach to a particular building from your home, what are the things that you do what is the route like are there any important shops on the way, you know do I turn left or the right from this particular circle or let us say you know are there a important rest are there any good restaurants on the way; how would you tell me how have you memorized everything or much simpler that you will try and recall that episode that you do this travelling, you recall the you know sights and smells of that journey that you are taking every day and then pick up the relevant information that I am asking you for right here and then throw it to me ok.

So, that yes there is this particular restaurant when you turn left from that circle, you just have to go 200 meters from there to find another restaurant which is probably a better place, where it is more maybe more expensive things like that or even smell you know some very good coffee when you are passing this street, because that is a very good coffee place there things like that or suppose I ask you that you know can you please describe me you know describe to me one of your last vacations, where ever you went to did you go to you know what say for example, did you go to a hill station or did you did you go to a beach city or did you know go outside India or maybe to Europe or to Canada or America can you please describe what all happened, which are the places that you know.

Sometimes when you come back from a vacation you know some of your friends or maybe family members they will ask you to describe everything in great details, you know it is almost as if they are actually visiting that place themselves through your description, how is that happening?

You know how is it; that your description of that experience is actually giving them some taste of those things as well if you describing you know I went to this place and there was so much fun and people who are lying on the beach and you know there was very good music and it was so relaxing to be on the beach and you kind of sometimes be amazed that you know this person who is hearing you describe this, is also almost equally enjoying. How is that possible? you were the one who had that experience

firsthand, but how is this person being able to you know take your experience from your description and building a world there, you know almost getting a drenched by the waves of the sea right through your description.

How is that happening? How is that even possible? this is you know or you can I or I can ask you a more mundane question; I can just ask you say for example, what you know when you went to the departmental store last time what was the arrangement of the eyes, which product was put where say, for example you were visiting your visiting Spencer or a big bazaar or some mart you know somewhere in your vicinity, can you tell me where I will find the milk or when I find the spices?

How do you enter? And all of these kind of questions that I am asking, you are basically asking you to do something very specific, they are asking you to recall your sensory experiences, they are asking you to almost rebuild re simulate the entire you know the entire experience as you have lived it, this my friend is basically what is called visual imagery.

So, it is not really you know that something it is linked to only vision, because were calling it visually this kind of you know a imagining can be happening with the other senses as well, but we I am just we are trying to peg it with one word. So, we are talking about visual imagery in a slightly specific sense. So, if I can describe you what visual imagery is I am basically, so visual imagery has to do with vision?

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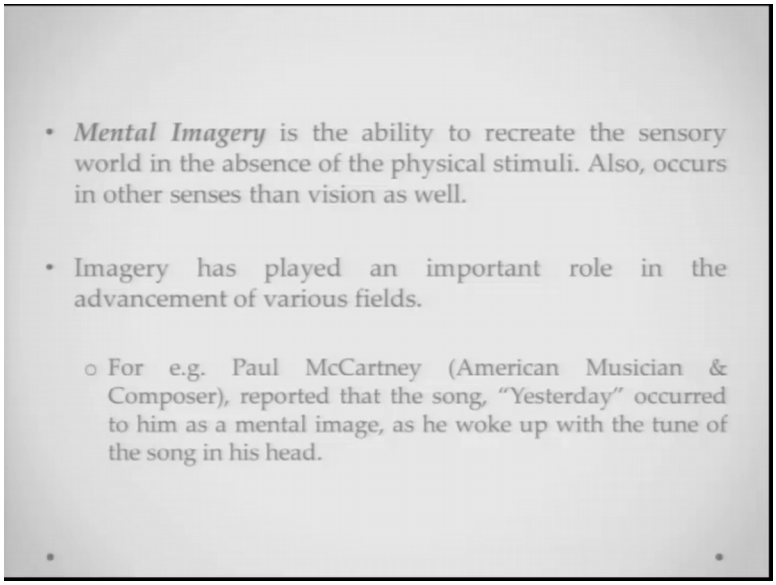

But we can take a slightly broader sense we can talk about mental imagery. So, then we can be talking about visual you know the scenes that you are looking, but we can also talk about the smells that came across or the sounds that you heard. So, then it is you know auditory imagery or it could be motor imagery or it could be gustatory or haptic and anything for that matter.

But mental imagery that is basically going to be our topic for the week, and mental imagery is most simply defined as your ability to recreate the sensory world in the absence of the physical stimuli, when you are describing your vacation to me or your if you are describing your vacation to somebody else, you are not able to produce that entire; you are not able to produce the a beach right there or you are not able to produce how tasty or how delicious that particular dish was, but you kind of simulating or recreating that sensory world in the absence of the physical stimulus.

Now, that is something which people have been doing for you know all along, that is something which people usually you know term as thought is that is a thought process. But again this is just one aspect of thought. Thoughts actually are composed of so many other things, will talk about in this course about thoughts in much more detail when you are talking about reasoning and decision making and judgment, but mental imagery is also one of the very important aspects of thought, that kind of reminds me that knowledge in the last week we have talked about knowledge. So, much is also again one of the very important aspects of thought.

So, mental imagery in that sense has been very important, it has played a very important role in the advancement of human knowledge in the advancement of how people think and experience the world in a variety of ways. And a very interesting example Paul McCartney you might all have heard of him, if you not use a American musician and composer he reported once that you know the song one of the his most famous songs yesterday, basically just occurred to him as a mental image; it is like he could just see something some kind of vision was there and he woke up already humming the tune of the song in his head. So, that is this one example you know you might think of think of this as a bit of a dream thing.

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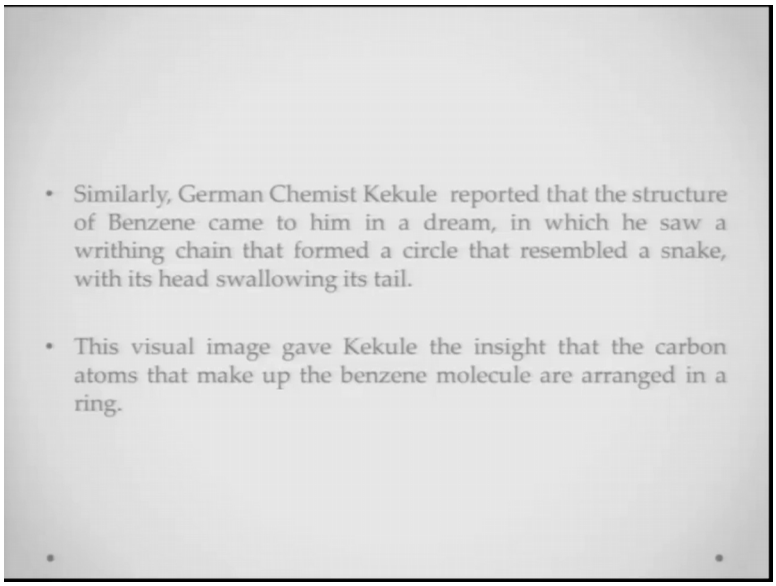

The German chemist kekule basically reported that the structure of benzene. So, he is credited with discovering the structure of the benzene, if you remember the diamond shaped a carbon in hydrogen a structure. Now basically the structure of benzene came to him in a dream in which he saw a writhing chain formed a circle that resembled a snake with the head saw. So, if you remember the structure of benzene it is basically connected, now I think it is a hexagon which is you know that all of these ends are connected.

So, a this visual image gives kekule the inside that the carbon atoms that make up the benzene ring, are make up the benzene molecule might be arranged up in form offering. There could be countless other examples that I could give you, there could be countless other instances that if you really recall, if you try and you know push yourself you will recall about yourself as well. Now this is what visual imagery or mental imagery is about and it can be visual it can be auditory or otherwise. So, this is going to be the topic of the week, now imagery has a very distinct use as a very unique use in our lives.

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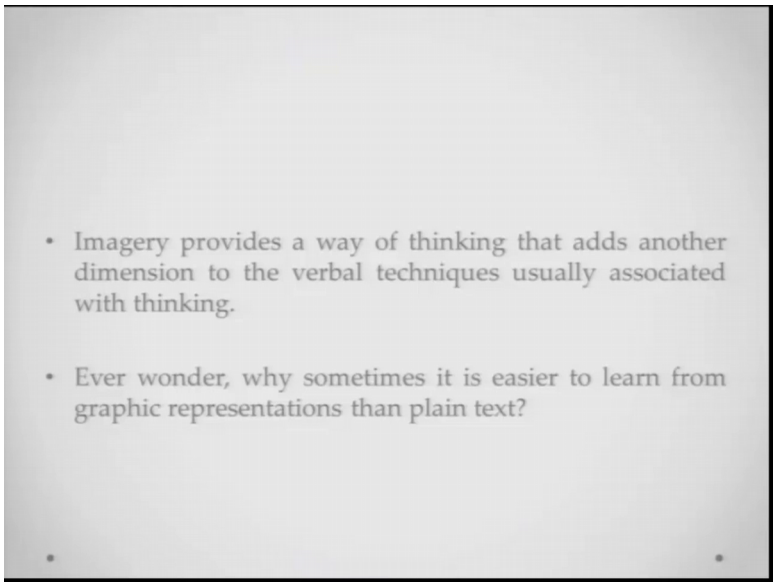

In cognition for that matter, it provides us a way of thinking that is basically adding another dimension to the verbal techniques that are usually associated.

So, generally when your thinking about thoughts we are mostly thought you know thinking of thoughts in a very verbal sense, you know I thought x y z. So, the whole idea is that our thoughts basically might be constructing of stories and you know verbal things he went there and then he met him and then they went for a movie, but do our thoughts actually have all of these verbal tags so, discreetly. Or our thoughts might be having the visual representation of that maybe auditory representation maybe, you know gustatory representations as well and because we are we want to communicate those things we are using the language.

So, imagery in that sense is adding this extra dimension to what the thought processes are, so were actually at this moment talking about the content of what thoughts are and is the content purely verbal or is the content in my imagined in a different sort of way, is it scenic or visual or is it auditory based or is it smell based or is it sound a different kind of things.

So, for example, is this a good addition say for example, if you want to ask yourself this question you should probably ask yourself why is it that sometimes it is much easier to learn from graphic representations than plain text. Sometimes if you know even as children if you give them books with only you know black and white letters and you

know thick books, do they prefer that mode or the would they prefer books which have you know larger pictures and stories which are illustrated and those kind of things.

So obviously, there is this extradition which makes things slightly easier as well, can you say for example recall a map which basically says that you know madrassas is to the left of this state or something like that. You know you probably would much rather prefer looking at the map and see where Chennai or is situated or where Mumbai is situated or where you know Delhi situated and then what are the adjacent cities or what are the adjacent states, some things are much better recalled in a graphical representation.

So, this is an interesting area which has been around a since very old days in psychology, and people have been asking questions about what mental imagery is and what mental imagery does a for human cognition.

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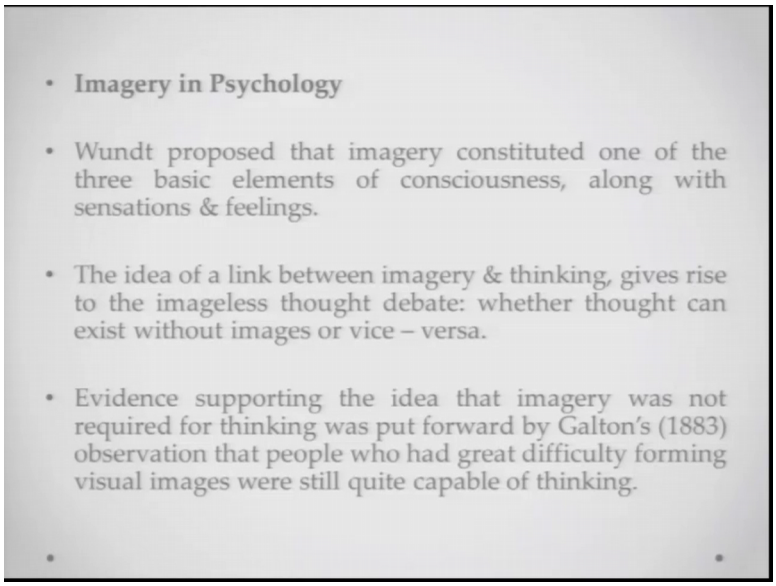

So, I think this seems like seems to be a good point, when we can actually you know take 2 steps back and see how imagery has actually been in psychology. Now will him wont who is always you know credited with the forming of the first experimental laboratory in psychology, he proposed that immediately basically constituted one of the 3 basic elements of consciousness along with sensations and feelings. So, one idea was that consciousness consists of 3 things sensations, feelings and images and in that sense imagery is actually a very important aspect of your being aware and your being conscious.

Now, that this idea between of the link between imagery and thinking, actually a gives rise to a particular debate I mean all of us have engaged in this debate at some point or the other is that where a thought can exist without images or whether images can exist without thought; I mean it is almost like a chicken and egg problem and we talked a little bit about this in this lecture and in the remaining week as well.

So, there is this evidence, there have been evidence supporting that imagery was not required for thinking and this evidence was basically put forward by galtons as long back as in 1883, he observed that people who had great difficulty forming visual images was still quite capable of thinking or you know vice versa; people who had who could speak very well or think very well might you know in some sense not be very good with images.

So, this dissociation kind of thing you know Galton forward is this and say that certainly imagery and thinking are different processes they might work together for most of the time, but obviously they can be dissociated from each other.

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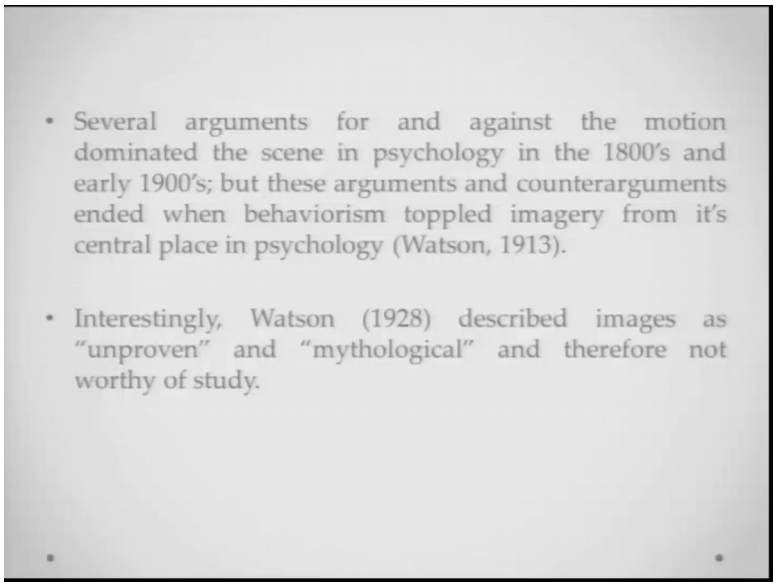

Several arguments have actually been put forward for and against the motion and this these different arguments dominated the scene in psychology this used to be one of the hot topics of research around that time in the 1800 in early 1900; but his arguments and counter arguments have you know ended sort of there was a break when behaviourism kind of toppled the imagery from it is central place in psychology.

So, when behaviourism came and for that you might want to you know go back to the earlier course and basically look at when I am talking about behaviourism in much more detail. So, people like Watson and people like skinner basically came to the fore and they said because, there is no way to measure imagery because there is no way to demonstrate imagery a probably imagery a should not be studied within psychology at all.

So, the idea was a and Watson famously says these described images as unproven and methodological and therefore, they are not worthy of study, see it is very difficult to show somebody what you are imagining granted; it is very difficult to show measure exactly what your image say for example, you know is the apple that I am imagining in my head right now is it you know 2 centimetres or 3 centimetres or something like, you know you cannot you can ask these arbitrary questions and I am sure I will not be able to demonstrate to you in any which way. So, taking this as an argument Watson says that this is unproven this is methlogic and my almost methodological and hence should not acquire the centre place in psychology.

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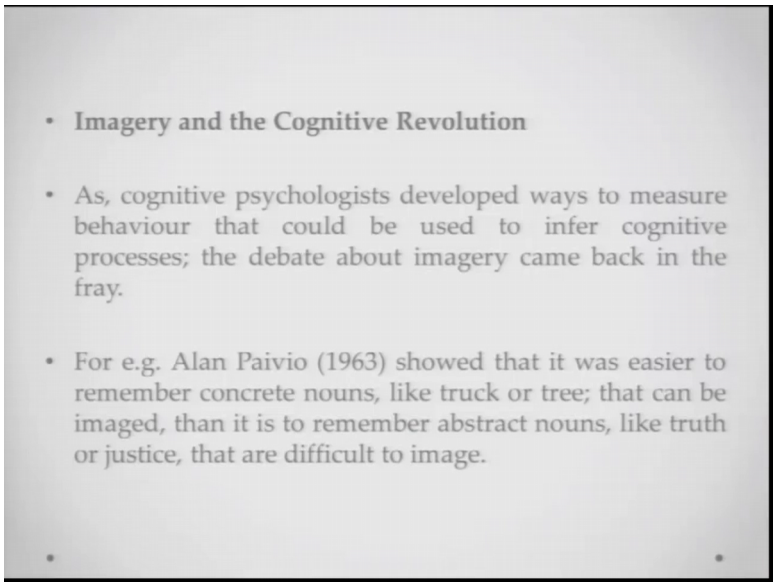

But obviously behaviourism had it is days and behaviourism by the time it kind of was going out in 1950 and 60s, people cognitive psychologies, basically you know they were trying to they were basically developing ways to measure behaviours and developing ways to infer cognitive processes. The debate about imagery started coming back around then, you know now people could actually measure what was going on in somebody's

head in some indirect ways, but now people thought that they can is they can measure other behaviour they can probably measure imagery as well and then the imagery debate you know a kind of resurfaces comes back into the fore in psychology.

Say for example Alan Paivio in 1963 showed that it was easier to remember concrete nouns things like truck tree apple etc; that can be imaged you can make an image of them than it is to remember abstract nouns like through truth, kindness, violence etc those kind of things.

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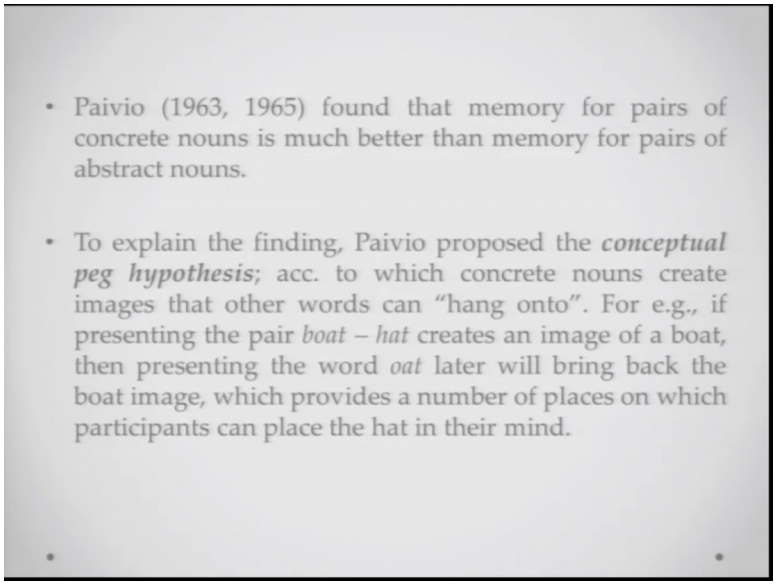

So, paivio basically found that you know memory for pairs of concrete, now says much better than memories for pairs of abstract nouns and to explain this finding paivio proposed what is called a conceptual peg hypothesis and the conceptual hypothesis is nothing, it basically says that these concrete nouns you know truck bad ball etc; they create (Refer Time: 16:06) they create some kind of images they you know to which the other words can hang onto, one of the words that they present it was boat had now; boat had basically creates image of a boat to which a hat is attached in that sense, because both of these things are concrete you can really you know remember these kind of pairs better, than the other way around then with concrete.

So, if I am just talking about kindness and something else, because there is no concrete images associated with them it is probably that much harder to remember them; if you

are talking about less recall and other kind of experiments. So, again this kind of shows that there is there is probably some way.

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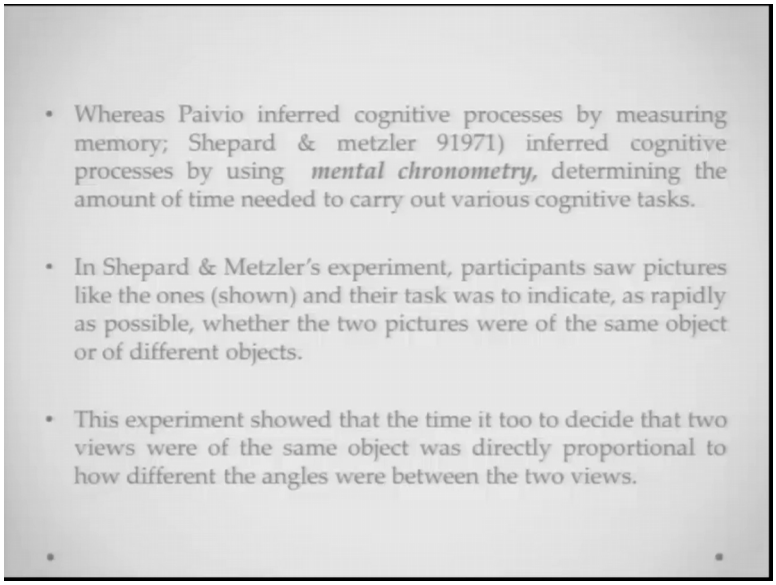

In which you can really talk about these kind of things, now whereas paivio was basically inferring cognitive processes by measuring memory shepard and metzler in 1971 they started inferring cognitive process by a particular method called mental chronometry, again we talked about this in the reaction time methodology section.

But mental chronometry is basically it is about determining the amount of time that is needed to carry out different cognitive tasks. So, Shepard metzler we talk about their experiments in much more detail in, so the later lectures; but the point here is that they in their experiment they showed participants pictures like pictures of particular kinds of objects which could be rotated and they were to be matched with other objects and the idea was that participants would need to match these 2 pictures, one of them needed to be rotated in order to match this one.

So, the idea was participant will be able to match this, only if they can rotate this and this rotation could be ten degrees 20 degrees 30 degrees 40 degrees etc and what they found was the result basically of these experiments showed, will talk about this in more detail the result of these experiments showed that, the time it took participants to decide the 2 views of the same object were same or different was directly proportional to how different were the angles between to use. If you have to rotate it 40 degrees to mash them

versus have to rotate it is 80 degrees to mash this, basically was it is almost a linear relationship.

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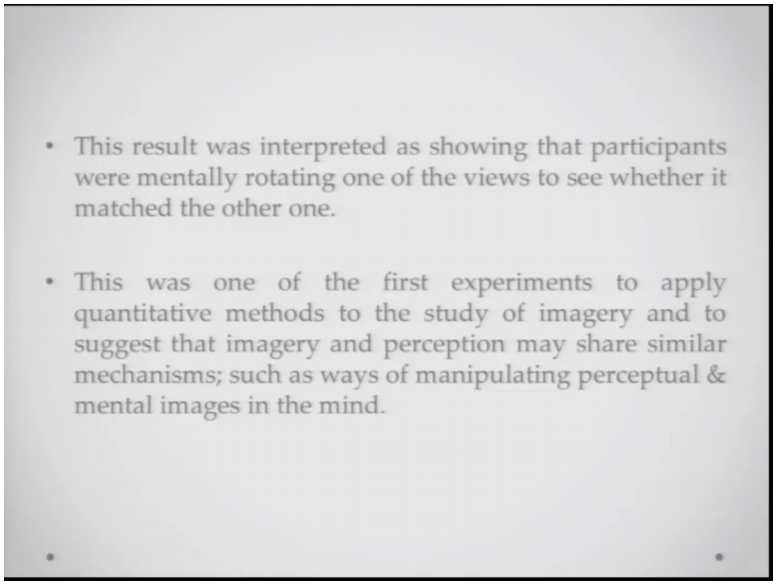

So, that is pretty much what they found and then they kind of inferred they interpreted that participants were actually mentally rotating this, you know they are doing this in their heads, they are rotating one of the views to see whether it is matching the other view; but this was very interesting it was one of the first experiments to apply quantitative methods to something that is going on in somebody's head, you know it is the first methodology which is using quantitative methods to study imagery and to suggest that imagery and perception might work in very similar ways, might be having very similar basic mechanisms such as ways of manipulating perceptual and mental images in mind.

So, this is again one of the beginnings of how research in mental imagery would have started, let us talk a little bit about characteristics of different mental images.

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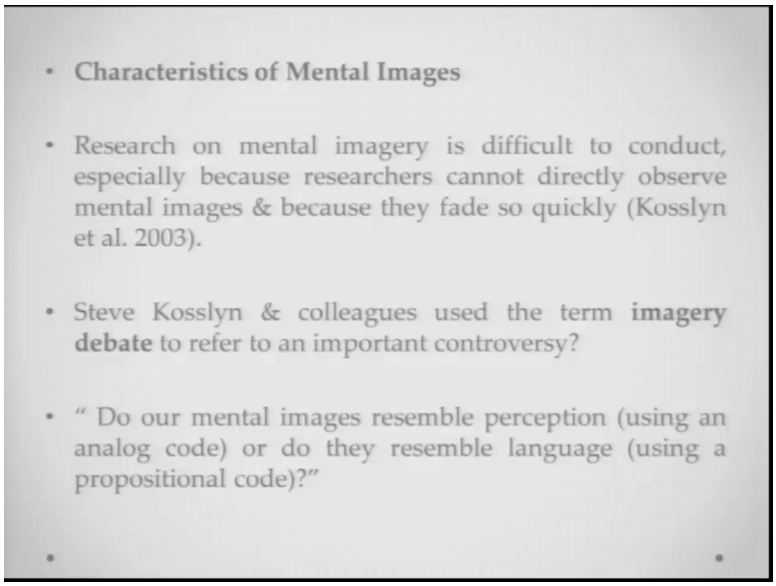

So, research and mental imaging is basically again, as I said it is slightly difficult to conduct especially because researchers cannot directly observe mental images and also because these mental images come and go very quickly they do not stay for you to be you know thinking about them or talking about them too much. So, Steve kosslyn basically talks about this debate as the imagery debate, you know he refers to this as one of the important controversies in cognitive psychology and the imagery debate I can just sum this up in this question and the question is that do our mental images resemble perception, that is are they using an analog code or do they resemble language are they representing a propositional code, I will talk about what these different things mean.

But the thing that you have to grasp is that, is it basically verbal descriptions that we are working with or is it sensory or visual or auditory or other kinds of description that we are working with; when talking about hearing about sounds am I representing it as a sound or I am representing at a written thing, if I am wondering about my vacation at a particular beach some point am I noting it down that I was at a beach in this city and these were the people around me and they saw what they were doing or pretty much I am just having a snapshot of that image, this is pretty much what the debate is about and in this week we will actually try and see what are the various evidences for and against this motion.

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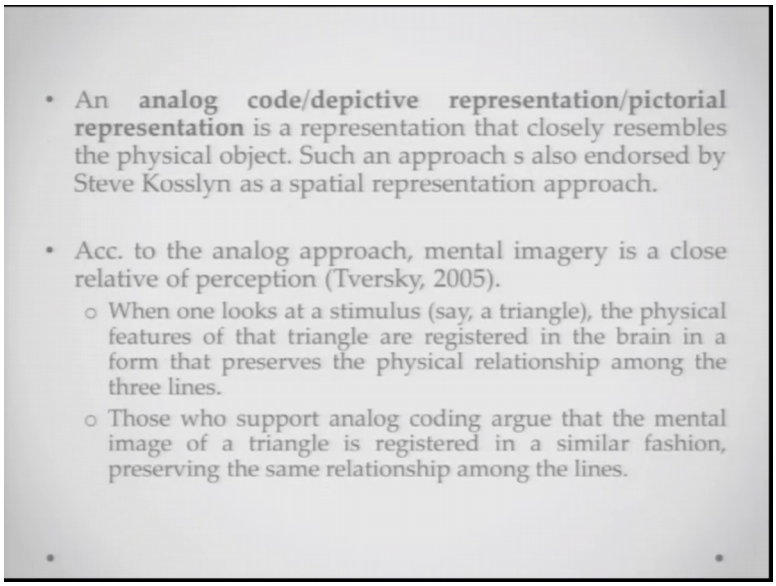

So, just to give you a brief input into this just to try and describe this, now the analog code or the pictorial code or the depictive representation and there are different words different kinds of terminologies that you will come across when you are talking about these things.

So, these different codes basically are talking about a representation form that actually and very closely resemble the physical object; if I am talking about the beach holiday I am actually depicting it in a picture, the picture resembles the beach much more than just writing b e a c h, so that is pretty much what I am trying to say. So, such an approach has also been endorsed by Steve kosslyn as the spatial representation of also I am probably spatially representing it.

You know where are the objects in a visual field, how close or how far they are from each other, such a code I am talking about. Now according to the analog approach mental imagery is a very close representative a very close relative of perception, what does it say when one looks at the stimulus say for example, a triangle the physical features of the triangle are registered in the brain in a form that preserves the physical relationship among the 3 lines.

If I am talking about a triangle I am actually having that mental image of 3 lines intersecting at these particular angles, those who support the analog coding or depictive coding, pictorial coding or spatial coding hypothesis, they argue that a mental image of a

triangle is registered in similar fashion as and it would kind of preserve the relationship among these lines, it will not say 3 lines in 3 angles it will probably represent what this angle looks like and what this angle looks like. So, we talking about a picture code it is almost like a snapshot; it is actually a bit more sophisticated than just a snapshot, we will talk about those things in you know in the rest of the week .

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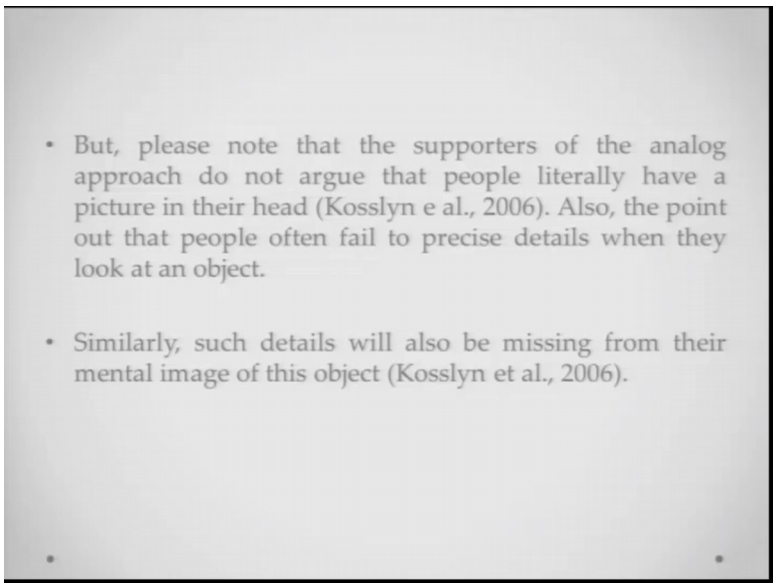

So, a again something that one needs to remember here that the supporters of the analog approach are not really, you know talking about that people literally have a picture in their head; I am using these examples just to kind of you know convey, what I am talking about to you in a slightly simpler term.

But they do not really have that we have snapshots per say we have much more sophisticated representation, the point that you know people often fail to provide precise deep details when they look at an object. So, if you are asking about I was in what was exactly that that tree there.

So, maybe people are not going to be able to tell that. So, it is its almost a representation that pictorially or in some way represents that thing, but it is not really a hardbound you know snapshot that or a photograph that somebody has also. So, if because people are deficient and again the evidence source this is that because, say things that people do not generally pay attention to even if you start asking them in you know by asking them by imagining this, they will probably not be able to tell you that ok.

So, the same details will also be missing in the mental image of such objects, if you have not really paid attention to what were the different vendors and a particular you know beach, you will probably not have that detail in your mental images well.

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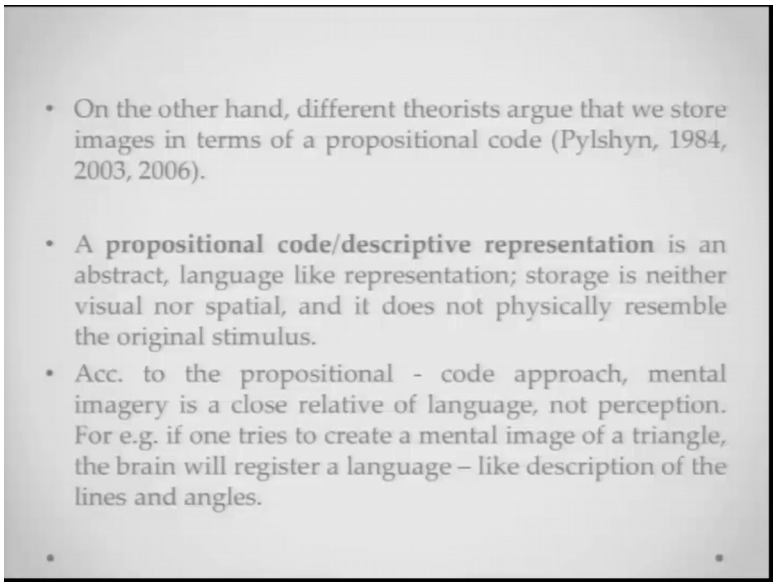

On the other hand theorists argue that we store. So, xenon patient basically the Russian psychologist has also talked about this in a lot more detail and they basically argue in terms of people having you know mental imagery in form of a propositional code.

So, they are saying a mentally we are representing the world in a propositional code, that is a descriptive representation will talk about the difference very slightly; but a descriptive representation basically it is an abstract language like representation, the storage is neither visual it is not spatial and it is not physically it does not need to physically resemble the original stimulation.

According to the propositional code approach mental imagery is a close relative of language, it is not a relative of perception it is a very close relative of language; because language is how we describe the world. Well if 1 tries to create a mental image of a triangle, the brain will register a language like description 3 lines 3 angles and nothing ok.

So, you have to try and appreciate basically the idea of this lecture, they will try to appreciate the difference between these 2 representations, I have an example here.

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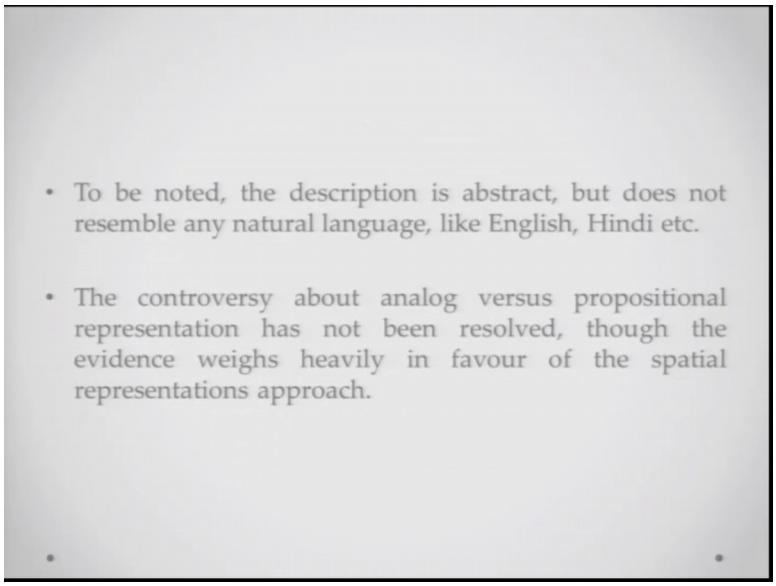

I will talk about that very quickly, the description is abstract you know the description it is not really resembling a language like Hindi or English for that matter, it is kind of abstract it has to give the symbolic representation here. So, the controversy between the propositional code and the spatial code is not really solved. So, much it is not really resolved, but most of the evidence recent evidence and most of the evidence that came out in the last decade or so 2 decades or so basically talks slightly heavy you know weighs more heavily in favour of the spatial code or the pictorial let us talk more about this with reference to an example and I will grab this one up.

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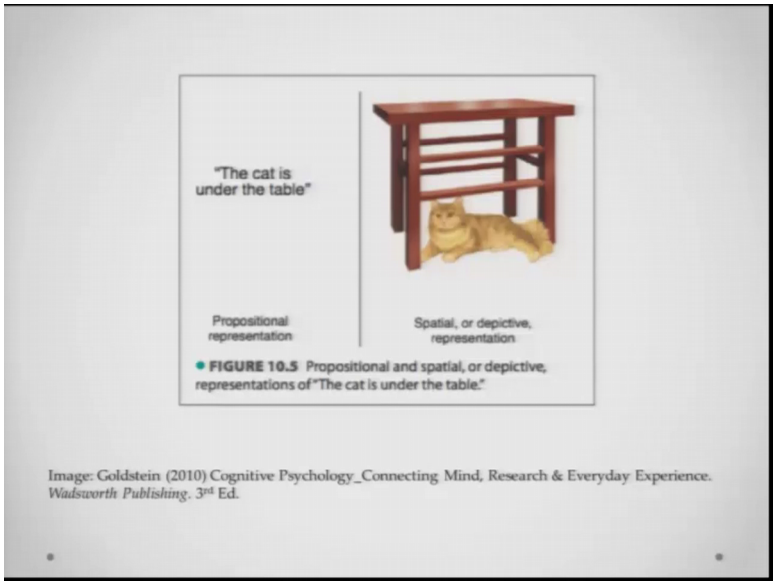

So, you are seeing pictured here and the picture describes an event,. the event is that the cat is under the table; now if you see to my right is the spatial or depictive or pictorial or representation and you can see that very easily you picture a table and you picture the cat under it, you do not need to talk about more details you just have an idea that there is a table and there is a cat somewhere under it just that. The propositional code on the other hand is the cat is under the table. So, it is kind of these words you have to understand at least 3 things cat under and table ok.

So, again the example seems that it is basically you know drawn from English, with the idea is you have the understanding of 3 things cat under and table and these 3 things will help you under help you describe the event unity. So, these are 2 ways of depicting whatever you know you have to talk about this world, these are 2 ways of talking about the mental imagery; you know how we are talking about mental imagery or how we are representing the outside world in our heads.

These are 2 ways also to using which you can talk about what thought is and what the content of thought might be like. So, I know if this has made you curious enough you should diligently follow the next lectures on a mental imagery or on visual imagery and I will kind of stop here and we will talk about different aspects of mental imagery in the next lectures.

Thank you.