

Advanced Cognitive Processes
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Lecture - 11
Language : Introduction

Hello and welcome to the course Introduction to Advanced Cognitive Processes. I am Dr. Ark Verma from IIT Kanpur. In this week we will start talking about Language. Now language as I have stress in one of my earlier lectures as well or also probably; in the introduction part language is one of the more important cognitive functions that we are actually you know using almost all the time you know from thinking about the worlds to describing the world to you know talking about the world, also in some senses understanding the world.

One of the major tools that we are using is language so unless you were basically for you know only thinking in images and we have probably had this discussion when you are talking about knowledge as well but language is one of the more basic things, one of the most peculiar aspects of human behaviour.

So, in this week we will try and learn about various aspects of language in today's lecture I will probably give you some basic introduction about what language is? What are the relevant questions to ask about language and how have people started looking at language how what is the; you know scientific study of language called? What does it look like? What are the various components?

Moving ahead in the week we will talk about language in terms of at least 3 or 4 different processes. There is actually a lot to talk about language you know if you come to the study of language there is you know there is a lot of information that needs to be talked about or discussed, but again this course is not really on language and we have to cover languages one of the basic cognitive functions.

So, that I will try and do here is that I will try and divide this structurally into those particular topics and we will see if we can give 1 or 2 lectures to each of these topics and in some sense cover language in some depth. One of the reasons for doing this also is that language is slightly closer to the kind of work I do.

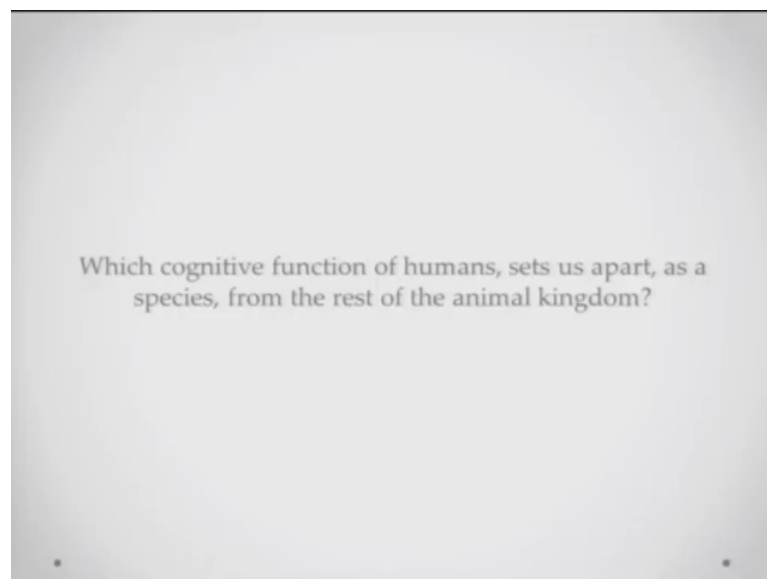
So, I will probably try and have different lectures on language things like introduction to language properties of language or let us say language acquisition and language comprehension and things about reading or bilingualism in different topics spread throughout the next and this week and the next one.

So, it will be slightly a bit more lectures on language, but then that is what is needed to really convey the different amount of the huge amount of information there is to be talked about. Also because language is one of the most important cognitive processes that we deal with and we in a you know we talk about we use on daily basis..

So, let us begin today's lecture and one of the first questions that you know that kind of brings us to the study of language is this question and again one of the scientists asked it and I have probably quoted it from somewhere and the question is that if you think of different cognitive functions.

And you know we have talked about attention, perception, and memory in the earlier course and we are going to talk about things like knowledge and visual imagery and you know language problem solving decision making creativity all those different kinds of things and a in these cognitive functions one of the things that kind of most basically sets apart the human race from the rest of the animal kingdom.

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So, is you know this is the question that you would want to ask and again the answer to this question is you know it is it is probably language.

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Let us try and see why it is nowadays it if you look around if you look at the newspapers or if you go to any of the social media websites you can actually have a look at this cartoon which you have drawn from the web. And you know nowadays it is kind of interesting that even very sensitive pieces of information even very important pieces of information that you are you might want to you know sometimes share very selectively or sometimes you might want to be reserved about sharing those things are kind of a discovered through you know things like social media and a lot of people are by the way consciously and voluntarily coming and sharing all lot of stuff about their personal lives.

So, most of that a lot of that is through language a lot of that is through things like Tweets, and status messages, and whatnot, Whatsapp messages for that matter. So, language in that sense is helping us interact with the world.

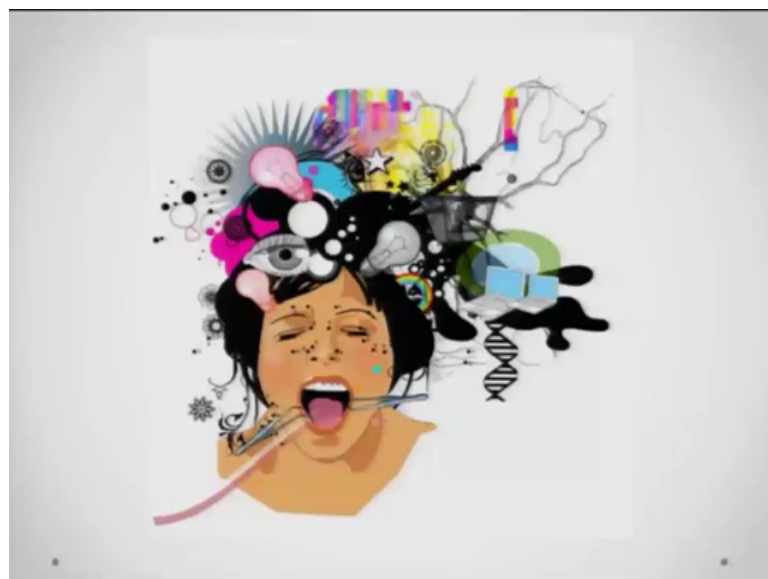
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There is almost what is referred to as the total last of social media and there is so much importance in this so much discussion that is you know going around nowadays with the amount of you know information that is floating around on different social media platforms you can see facebook, youtube, twitter.

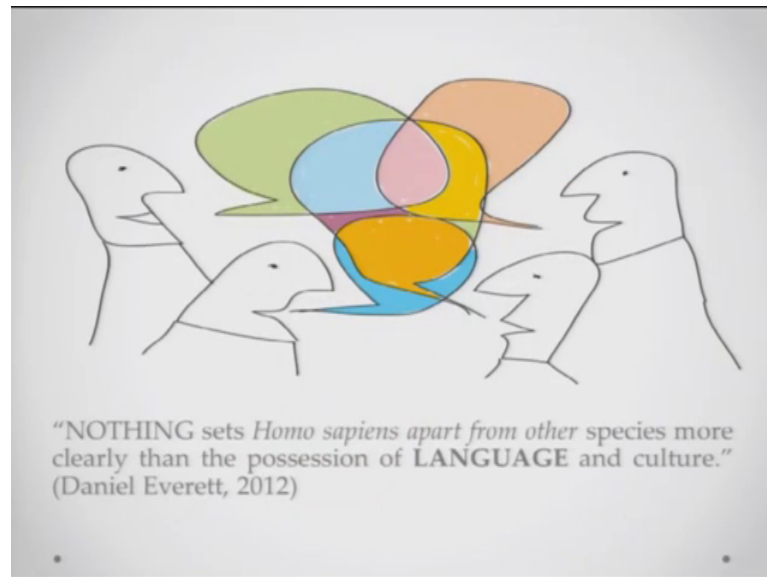
Wherever you look at youtube by the way is a medium where you have probably less of language with more of images and videos, but again there is a lot of language you know you when you look around and it is it is almost like an information overload.

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And this is probably what will make you wonder.

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And this is what Daniel Everett says in response to this that “NOTHING sets *Homo sapiens* humans apart from other species more clearly than the possession of language. So, for example, it might be possible that you know the perceptual processes or the attentional process or this or some decision making processes you know are there in other you know species as well.

And obviously, maybe not towards the not to the kind of extent that humans have and not to do that kind of sophistication that humans have, but something that very clearly you know sets us apart you know is this possession of language and it is also the position of culture and those kind of things.

So, Daniel Everett lays a lot of emphasis on the fact that humans have language and which is again a social entity I mean language is basically part of our culture and there is a lot of crosstalk between what languages and what cultures what different cultures are and how you know languages affect cultures or cultures effect particular languages.

We will talk about, we will try and see they are in a series of lectures on language, how these kind of you know things are inter playing so, just to cut the story short language is one of the most unique, one of them most differentiating aspects of the human species and we will in the course of the next few lectures try and understand what are the

different aspects of language and how are they important for a you know understanding human cognition how do they fit the bill for so many other cognitive abilities that humans have.

So let us try and move ahead here we actually refer to an average quote that you know language is something that sets apart the human species, but you know some of us might wonder; why is it that we are saying languages unique to humans?

Because probably animals also talk they can communicate between each other and they can warn each other of you know by using alarm calls they can call each other by you know you are having mating calls in different kind of things. So, why is that not language and why is this that we are saying that humans have uniquely have language so that is one of the thoughts that people might have.

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And one of the things we are really probably doing in this first lecture is look at whether animals use language? I mean do they use communication or do they use language and is; there a difference between communication and language.

Now, just to describe this fact communication is considered to be a much broader set ok. So, communication can be through you know different kind of vocal gestures different kind of manual gestures you know moving your hands, making different kinds of shapes with your hands or say for example, making different kinds of sounds from your mouth which might not be words which might not be language, but again and animals seem to be doing something very similar.

So, I have here borrowed again from the internet some of these examples of animal communication say for example, cobras you know snakes basically cobras inflate their hoods in order to scare out other creatures they are sending out a message and some of us might ask is that not what language is supposed to do send out messages you can also look at different other examples say for example, elephants use their trunks to talk to other hertz over long distances.

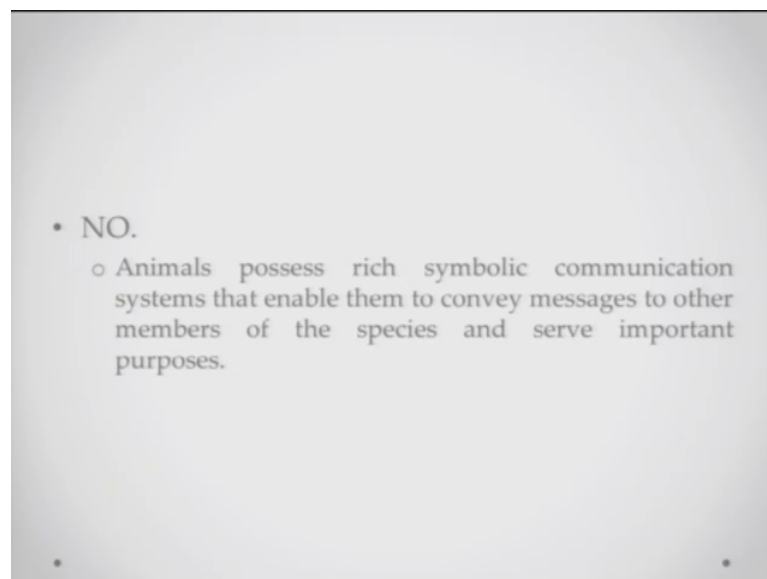
So, in some sense they are communicating you know they are using some of some way to be able to talk to hertz which are far apart again is that not what language is supposed to do you know maybe talk over a phone nowadays, but again transmit a message from here to the other person and the other person listens and responds.

So, again there are so many examples and if you look up the internet and you know you try and read about different kinds of animals you will realize that almost all animal species are using some or the other ways of communicating whether it could be chemical or whether it could be visual or it could be tactile or it would be auditory, but there are different modes of communication that animals are following.

so let us try and make this the difference between why are these communication systems not referred to as language and what is so special and what is so unique about language that we ascribe it or we you know say that language belongs to humans only.

So, let us movead so the answer to this question is that know these different communication systems that I have just referred to what I am just talking about do not you know qualify to be called language. They might at best be called very rich symbolic communication systems.

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So, for example, a particular kind of a vocal noise made by you know particular lines of monkeys a verb it monkeys, when they see a tiger or when they see a snake on the ground or whether when they see evil and you know roaming around and hunting that is basically just a very rich symbolic system ok.

when we movead in the same lecture or probably in the series of other lectures you will appreciate this a bit more, but what I am trying to say here is those are very good

symbolic communication systems. Language is also a symbolic communication system, but there is a degree of sophistication that is unmatched here.

Human languages or the symbolic communication system that humans use have peculiar characteristics which are not there in the symbolic communication system that animals use. So, that is one of the basic differentiating features between animals using communication and humans using language one of the things I you know sometimes say in class is that it is we who have decided what language is.

So, you know it kind of gives us that right to exclude everything else and tell that you know these species they do not have language only we have them that is again that is just for the fun, but one of the criteria is that the kind of complexity that we are talking about in communication systems is completely unmatched between the kind of communication systems human use humans use or language that we have versus the different kind of communication systems that these other animals use that is one.

The second is that you know so that is probably one of the more important things. The other aspect is that this kind of communication that really happens using human language qualitatively I am not trilled of only about the symbols now but the content in human language is very different than the content in animal communication systems ok.

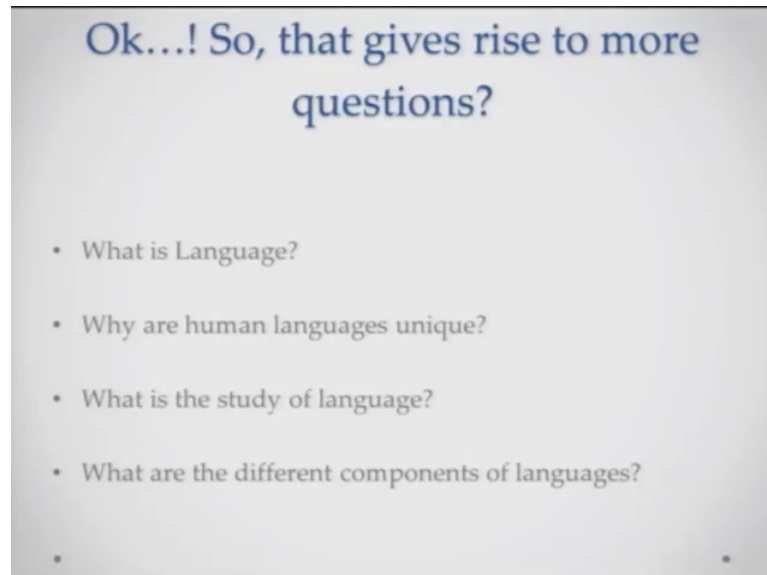
So, for example, again something that I sometimes use in class is that animals probably do not really gossip I mean humans gossip they gossip all the time we talk about different kind of stuff. They describe different kind of aspects of the world, but animal communication systems are mostly if you observe or you know if you look at it from outside seems that it is more purposive and only purposive and not discreet and not really gossip wise and other things.

So, again that is one aspect of the communication system that humans you know have, but probably the animals do not. Again these might not be really very hard boundaries and they might be you know some change and at some point in time we kind of come up with this and say no animals also language, but there is a very interesting set of characteristics that human languages have and which I am going to talk about right

Now, that will also probably help you it is you know appreciate the fact that why I am saying that humans have language whereas, other animals have very good

communication systems. So, leaving that debate right there and not really attempting to solve it for us, but what are the questions we can ask about language.

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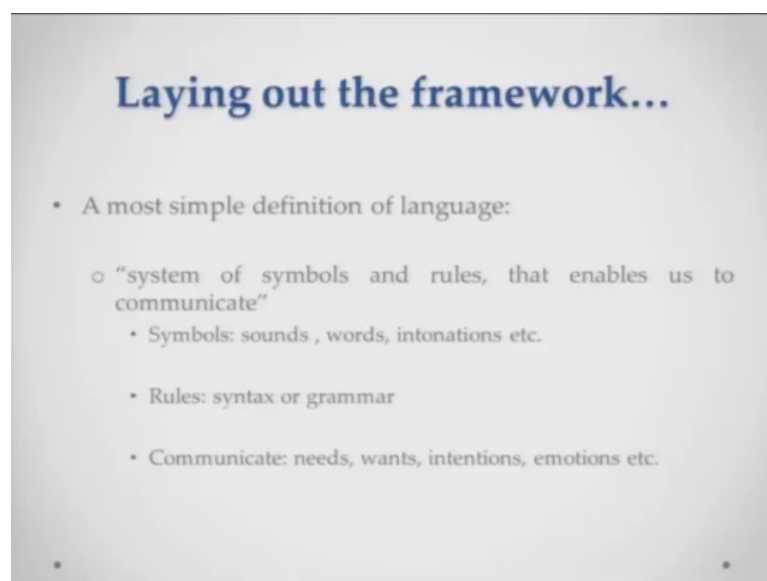
So, the first question because obviously, I have left you slightly confused in the last slide or so the first question to be asked here is what is language? When do we say that x has language or x does not have language? What are the defining features of language? So, we will talk about that and we will also talk, about the fact that why are human language is unique and they are not really very similar to animal communication systems.

Then we will also try and talk a little bit about what is the study of language called? So again this is not really a course on language, but I will tell you that you know there is a complete field a complete discipline that studies language; obviously, you know of linguistics, but where do psychologists come in.

So, when psychologists come in and they want to look at language and they want to see how language plays a role in overall cognition the field is referred to as psychology of language or in short psycho linguistics. So we will talk a little bit about what psycholinguistics is? And what are the; you know questions that psycholinguistics asks and so on and so forth.

And also once we start asking that kind of a question you can really you know look into language in a bit more detail. So, you can ask for that matter and what are the different components of language? What all does language include? Does language include manual gestures that language include you know say for example, gestures like winking or does languaging may include you know non verbal, sound making, and people making sense out of it. There are body language for that matter we will ask those kind of questions we will probably ask that you know what are the very significant aspects of language. Is it acquisition, production, comprehension those kind of things.

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So, let us begin with a very simple definition the most; simple definition of a language that you will come across and you will see this definition applies to some other kinds of languages as well. So, let me begin the language can be defined as a system of symbols and rules and that enables us to communicate.

So, there are only two things there are symbols and there are you know rules and the third is that there has to be something that needs to be communicated ok. So, the first is symbols what are these symbols there are different kinds of sounds, there are sounds combined to form words then you can have things like in donations and sentences those kind of things these are the symbols of a language those carry meaning and those carry it you know information to the other person.

Now, all of these symbols you will see are not arbitrarily put through in language. So, you will see you know the kind of sentences I am speaking right now they are not arbitrarily arranged. So, if I am saying a sentence there is a noun in the front there is probably a verb following it and there is an object later.

So, suppose I have to say you know Ram eats cake. This is a valid way of saying if I am seeing that Ram is eating a cake I am see Ram is eating a cake or I am is eating a cake Ram eating a cake is if I say then it is considered non grammatical does not mean that you do not understand the meaning of it.

But in more conventional description of language if I say Ram eating a cake is it will be considered ungrammatical. So, there is the issue of grammatical and ungrammatical and there is where the issue of rules come in. So, you might have so many of these symbols, but so, many of these symbols will need to be linked through particular sets of rules and those rules basically are defined in the grammar of the language. So, we also need to know about rules of the language.

The third thing which is very interesting about human communication is that there has to be things like needs and you know suppose you know humans were self sufficient organisms and they did not need others to talk to or to you know to procreate to have food and do other things.

Then there might be a case if there is no intention or if there is no need to communicate would there be any language at all that is again a slightly broader question, but it does tell us and if you kind of you know take a deep breath think again and try and describe language to yourself you might see that even though you might have all the symbols that are needed, even though you know how to work these symbols through particular set of rules.

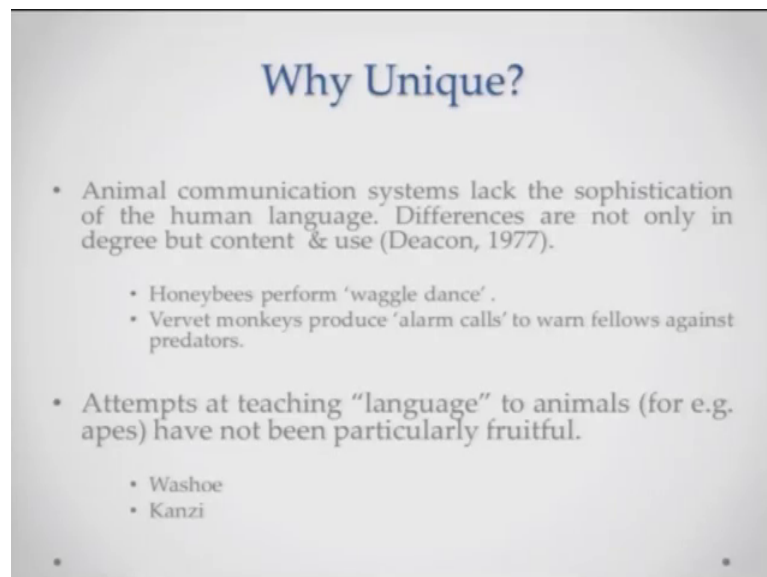
Unless you really want to talk unless you really want to communicate neither of these things can compel you to have a language again somebody might be thinking of thoughts, but the idea is thoughts are probably you know just they are I mean there is no this often no volition in thoughts, but the idea I am talking about is to communicate to the other person the second, or the third, or the fourth person. The this aspect of needs needing to communicate or wanting to say something wanting to you know say if

suppose I want a glass of water I will ask somebody to fetch me a glass of water that is also communication.

So, one of the very important aspect of this definition of language is that language has to have at least 3 things, it has to have it some symbols, it have has to combine those symbols not arbitrarily, but using a set of rules and there has to be something to communicate.

So, there has to be something you would need to talk about you would need to ask for, you would need to communicate. So, the simplest definition language says language is a system of symbols and rules that enables us to communicate. I hope that is clear and if that is clear let us try and move to the next question.

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And the next question is why are human language is considered unique, I was trying to explain that in one of the earlier slides, but let us look at this in a bit more detail. So, the idea is that in animal communication systems they lack the sophistication of human language.

Again I will really elaborate on the term sophistication in a while, but again it is basically trying to say that the differences in the way human languages are and versus animal communication are is not only in degree, but it is also in the kind of content that is talking about you know it is it is very hard for me to imagine that a particular animal

species might be creating poems or plays or other things in their you know symbolic communication, but humans do that and human languages allows you to you know express your emotions in that particular way it does not mean that other animals or other species do not have emotions, but human language kind of affords us the you know the possibility of talking about emotions in particular ways.

So, this degree of sophistication is completely unmatched with any others symbolic communication systems you know used by any of the animal species that you know come up with so that is one. And the third is use of language again I was taking a you know example of people gossiping, but in some sense that is interesting that people can really talk about, because they just want to talk you know there is no need to communicate you are not dying and that you need water or something.

But you just feel like talking to somebody you just feel like communicating to somebody and that is also valid reason to communicate and that is perfectly possible and allowed and permissible in our language. So, in this sense you can probably appreciate you know that there is so much of a difference between animal communication systems and human communications. So, the examples I can take is honeybees basically they perform a certain kind of a dance and that dance is considered is basically called the waggle dance.

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And one of the things that you know these bees would do is that they would move in figures of 8 when they would come back to their hive and idea is that if you can draw a

perpendicular in the side this would in some sense you know indicate the direction of where the most food is you know where the flowers are there where most of the you know nectar can we set off.

So, again this is one way of communication honeybees are communicating to other bees in the hive that this is where you will find food, but is this communication as rich as the communication that one we would have. So, for example, if you have to describe a restaurant to your friend you are probably not only point, but you will share so many other things about that restaurant as well so that is one.

Vervet monkeys perform alarm calls to warn fellows against predators so avoid monkeys have they actually a very sophisticated alarm clock clocks because we are talking a sophistication and these alarm calls are when they see you know a airborne predator versus when they see a terrestrial predator the alarm calls are slightly different their alarm calls can be a specialized as say for example, if there is a leopard or you know panther versus if there is a snake the alarm calls will be different to indicate two kinds of predators as well.

So, there is this sophistication there in animal species as well, but again it is not in any sense matches the kind of sophistication that human communication system will have. So, these things put together kind of you know; help us to qualify that human languages are unique and very different from the kind of communication systems that animals are using.

Also interestingly people have had you know people have been occupied with this idea of teaching language to animals you know people have had have been you know in trying for decades now to teach language to animals and there have been different attempts people have tried to teach language to birds, different kinds of you know parrots etcetera you might have heard of people have tried to teach you know human language should dogs probably you know chimpanzees and to buy you know Bonobo monkeys.

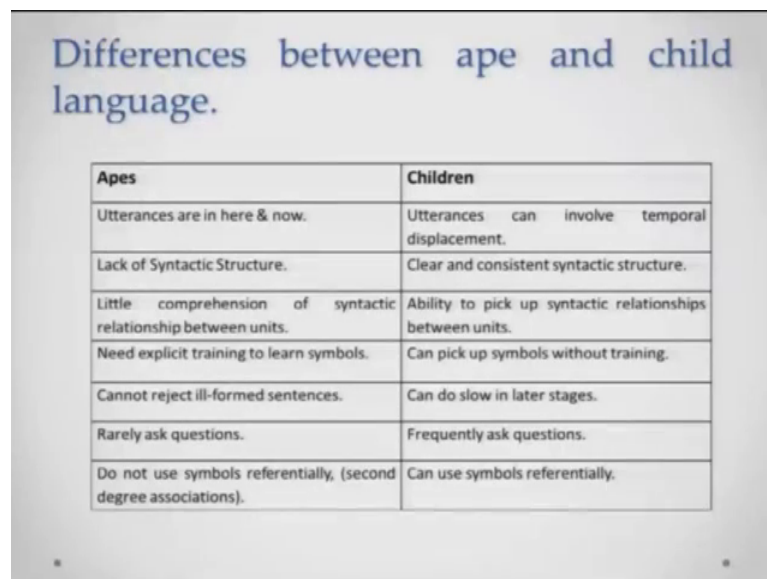
And, if really you know one has to bet that who will be the closest you know species to humans that can probably master the kind of language we have and it will probably be you know bet one of the more closest you know genetic neighbours or genetic you know relatives of ours and that is you know chimpanzees. So, a number of scientists say version number and so many others have spent a lot of time they have spent decades and

decades of done research in trying to teach you know these human language to these chimpanzees and these attempts have not really been very successful.

So, I will like to request you to you know go to youtube and type these names Washoe and Kenzie and Koko and these kind these were the chimps that people have been trying to teach language for a long time 10 years, 20 years, 15 years, and you see that the maximum language these chimps seem to have acquired is not more than 2 to 300 words.

Now, that is not the kind of language you know if one really expects even human children of 3, three and a half, 4 years of age have a vocabulary of more than this much. So, the idea is these effects these efforts have also been you know completely unsuccessful and they are also kind of you know makes a case for human languages being rather unique as compared to other symbolic communication systems. If we kind of take the same argument slightly further.

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Apes	Children
Utterances are in here & now.	Utterances can involve temporal displacement.
Lack of Syntactic Structure.	Clear and consistent syntactic structure.
Little comprehension of syntactic relationship between units.	Ability to pick up syntactic relationships between units.
Need explicit training to learn symbols.	Can pick up symbols without training.
Cannot reject ill-formed sentences.	Can do so in later stages.
Rarely ask questions.	Frequently ask questions.
Do not use symbols referentially, (second degree associations).	Can use symbols referentially.

I have here differential I have here you know a chart of differences between how apes communicate and how human children communicate. So, I just pick up some of these things just and again you can pause and replay and look at this figure in more detail at some point. But suppose one of the basic things is that young children's 3 years, 4 years, 2 years children's language does not does involve things like displacement, temporal displacement, and special displacement.

What is temporal displacement human children can talk about here and now and they are here and now you know they can talk about yesterday and we can talk about tomorrow and can talk about today. Human like a human children they also talk about here this space and there that space most of the efforts that have been spent on teaching this kind of language teaching human language to animals has kind of you know still shown that even these apes, even these closest relatives to humans have not been able to master the idea of displacement either spatial or temporal.

So, that is one of the things that they language does not have you know their utterances do not have a sense of you know here and there versus you know today and tomorrow and that is one of the you know aspects of sophistication that I was talking about earlier. Also this seems to be lack of a consistent syntactic or rule based structure in animal utterances as compared to human utterances.

Human utterances even in a very young children start producing sentences in a much more coherent way in a way that is consistent with the grammar of the language that child is learning. Suppose a child is born in English speaking family when the child starts to make sentences 3, 4 year old children quite often they will actually you know it is not that they do not make errors, but quite often and mostly they will make sentences which are consistent with the syntactic structure of the language that is not the case with animal utterances, apes utterances event.

One of the other things is apes do need explicit training to learn symbols you know so they will not really pick up symbols just by themselves such as human children would the entire vocabulary of the if you will have to spend some time and teach that one by one symbol by symbol to the ape or you know extended period of time before they can actually master this that is not that is that is not the case with the human children.

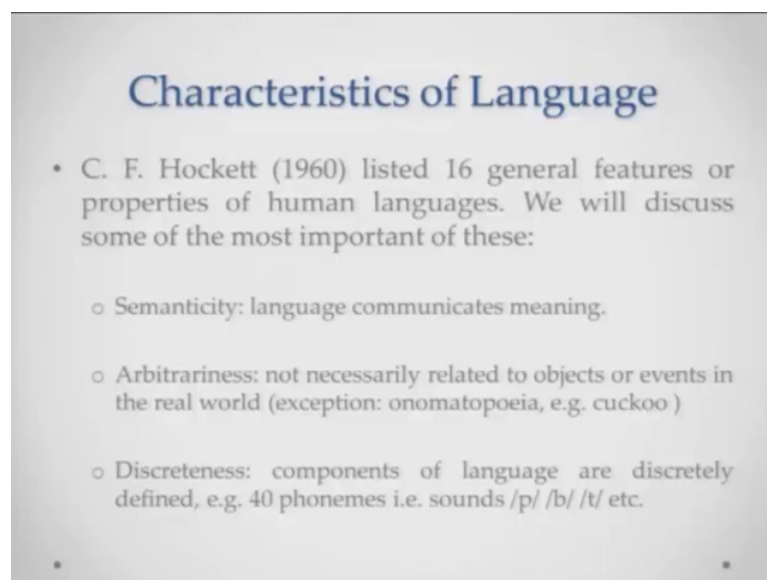
Obviously, you initially tell them that this is this you know this is an apple, is a coward this is a bird and so on and so forth. When you say human children kind of start picking up these symbols spontaneously almost a lot of times without really any training, also one of the things is apes or these apes are basically not really able to reject ill form sentences.

If you speak to an ape like I was saying Ram eating a cake is, the ape will not be able to reject that this is ungrammatical sentence, but children even young children will be able

to tell you that this is not the right way of saying is again this might be happening a slightly you know at a later age. Also ape utterances again I am kind of drawing from the efforts of these people to teach language to apes one of the things they also observed is that apes would rarely ask questions there is no spontaneous language production in apes.

But human children they a lot of times come up with questions they ask a lot of questions they are creating spontaneously new language this one and there are some others are very major differences between ape language and child language and this is something that also sets apart the human languages as rather unique.

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So, let us move ahead let us talk about characteristics of language we have talked about the fact that human languages are unique. We have talked about the fact that what is language. Now we do have some background about this. Now let me go into a bit more detail and try and explain to you what is it that we consider language? What are the properties of language and again this and you know; how do you check that something is language or not.

Or say for example, how do you describe human languages now C. F. Hockett in 1960. He listed around 16 general features or properties of a human languages and he is basically trying to say communication systems, but some of them kind of apply really to

human languages and I present a subset of those thing of those design features and these papers refer to as design features of language C.F. Hockett during find it at someplace.

Let us discuss some of the very important aspects of these that apply to human languages. One of the first things is Semanticity. So, human language basically has this aspect of semanticity one of the things is anything that you say in your language has to have a meaning you do not say gibberish, you do not say things that do not make sense and in that sense every symbol in every word in your language has to have some meaning only then it will be considered part of your language.

So, most words and all words in your language will happen that is the aspect of semanticity. Now when I am talking about words having meaning also I like to point out this aspect of arbitrariness it does not necessarily mean that the form of the word, the form of the symbol that you using will have a direct correlation with the form of the reference.

Suppose for example, I am referring to a ship. Now a ship is a small word, but you know a ship is a large animal a crocodile is a bigger word, but in comparison to the ship it is a much smaller object. So, it does not mean that if you have to you know signify a ship the word should be as large in form so that it kind of signifies the largeness of ship these relations are almost arbitrary ok.

So the idea is arbitrariness basically says that it is not necessary you know the words or the form of the words are not necessarily related to objects or events in the real worlds this is a different world altogether and that is a different world altogether and we are kind of connecting this symbolic world to the world the real world where the reference are. Another very important thing is any languages most languages are basically composed of discrete symbols say for example, English has around 40 to 48 different phonemes, these are different sounds. So, the entire English language which might consist of infinite sentences that have been spoken and some of them that will come up out of us so this infinite set can be broken down into these smaller segments which are phonemes, 40 phonemes combined in various ways can actually explain the entire infinite language that there is ok.

So there is this discrete symbol; that are there in the language. So, this is the third very important characteristic of languages.

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- Duality of patterning: often we receive signals in dual form: for e.g. both as sounds (i.e. phonemes) and words.
- Displacement: we talk of things remote in space & time.
 - Spatial Displacement: e.g. there, that, them etc.
 - Temporal displacement: events that have occurred, are occurring or will occur in a different time, e.g. will, was, were, then etc.
- Generativity: from a fixed number of symbols (40 phonemes) we can generate infinite number of messages (words, sentences etc.)

The fourth characteristic is duality of patterning. What is duality of patterning? Often if you really look at a human language you will see that there is a sense of double layering in this. Suppose for example, I am speaking a sentences and these sentences are made up of words so at one level these are words which have meaning at the other levels at a slightly lower level these are phonemes which do not have a meaning.

So, there is one level that is meaningful, but there is a level which constructs this level just below this one which has no meaning at all. So, these phonemes are meaningless units kind of combined with each other and then you have or with the combination of these meaningful units in words so this is duality of patterning.

Another thing another characteristic of language that we have been talking about or I was referring to any of the any of the earlier slides is called displacement. When a very important features of human languages is that it affords us to talk about spatial displacement that is here and there and also it forces to talk about temporal displacement yesterday, today, and tomorrow. So, this is one of the unique features of human languages that affords us to talk about yesterday and tomorrow.

One of the most important characteristics now coming to the most important characteristics of human language is generativity. Now generativity is basically as I was telling you just now that there are only 40 phonemes or 48 phonemes in English language and you can combine all of these 40 phonemes into so many different ways that

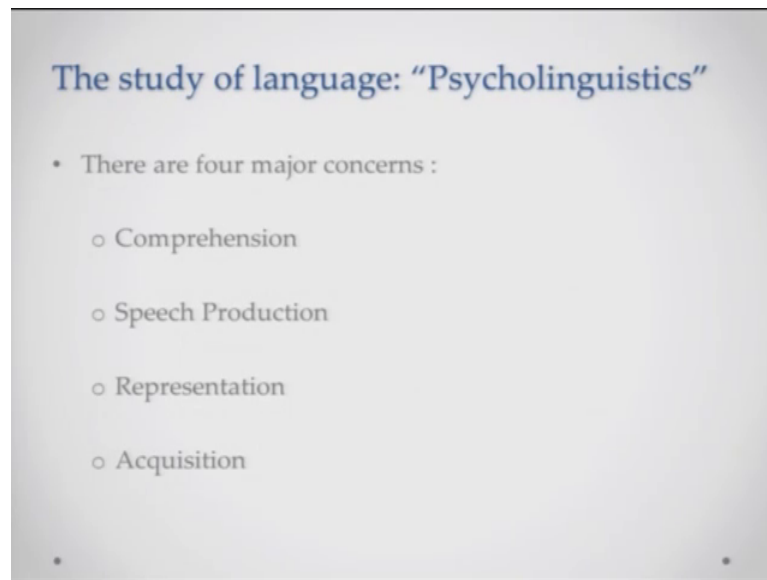
just these 40 phonemes which is again a limited you know number of symbols can really lead to the formation of an infinite language you know there is some English language some amount of English language that has already spoken.

But there is always you know new people being born and speaking creating more language all of that; however, is just being created from this limited set of symbols from a fixed number of symbols you can run it in finite number of messages that is basically what is referred to as recursively or generativity ok. So these are the 6 characteristics of language that are very important let me just repeat them for you to you know get a revision.

Semanticity the aspect that language has to communicate meaning that is very important, the second is arbitrariness the form of the language does not necessarily have to be related to the form of objects in the real world that is two, third is discreteness any language is composed of discrete symbols that is very important that is the third, fourth is duality of patterning there is a meaningful level and there is a meaningless level dual layers, fourth is displacement there is an aspect of spatial displacement and temporal displacement.

Then there is fifth that from a limited set of symbols using particular kinds of rules you can create an infinite amount of language. So, these are the 6 very important characteristics language again this is not the entire set put forth by C. F. Hockett, but I just put you know carved out a small sub sample from there which is going to be important in our understanding of language.

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Now, coming to the study of language the study of language as I was mentioning earlier is referred to as psycholinguistics, psychology of language, and its major concerns can be summed up under these four broad areas.

So, comprehension of language, production of speech, a representation of language in the head, knowledge, concepts, and those kind of things we have talked about these things in some way earlier as well and things like acquisition of language reading those kind of things.

So, we are going to talk about in the; this week and the next one the under these three four headings how what are the important processes that come under language for comprehension? What are the important processes that come under and come under language production and so on and so forth? So, this is all from me about introduction to language I will from the next class onwards start talking about some of the more important aspects of language.

Thank you.