Lecture- 17
Language Comprehension – II

Hello and welcome to the course introduction to advanced cognitive processes. I am Ark Verma from IIT Kanpur and we have been talking about comprehension of language in this last lecture and in the last lecture I talked to you a little bit about, how words are comprehended, how words are understood, we talked about how form is activated visual form or auditory form and I also towards the end, talked about how meaning is generated.

So, I talked about introspection, I talked about types and tokens, I talked a little bit about semantic networks and I also talked about the embodied semantics approach. Again, I am not really going into a lot of detail, into all of these processes that can be actually dealt with in a different course, but I am just trying to give you a bit of a flavor about comprehension of language in these two lectures.

So, today I will talk to you a little bit about how people understand or how people make sense of sentences.
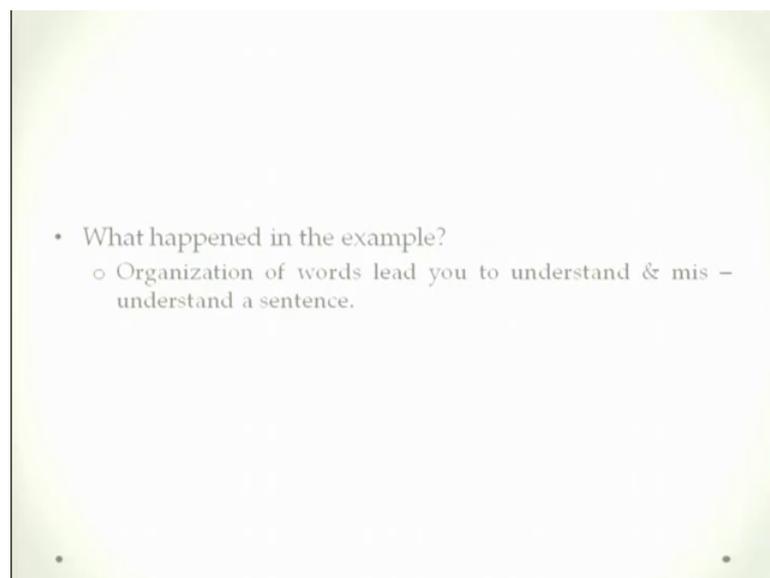
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Time flies like an arrow. Fruit flies like a banana.

MARX

So, let us say there is, I have this example again something, I have borrowed from Traxler's book. So, it is just time flies like arrow, fruit flies like a banana. What, what is happening here? Time flies like an arrow, fruit flies like a banana does not. The second part kind of seem out of place does not, it really seem that you know it is, it is, it is not really ungrammatical, but there is a bit of an incongruence in meaning. Fruit flies like a banana does, fruit fly like a banana or if you, kind of you know take a step back put a punctuation mark there and then you can see fruit flies like a banana.
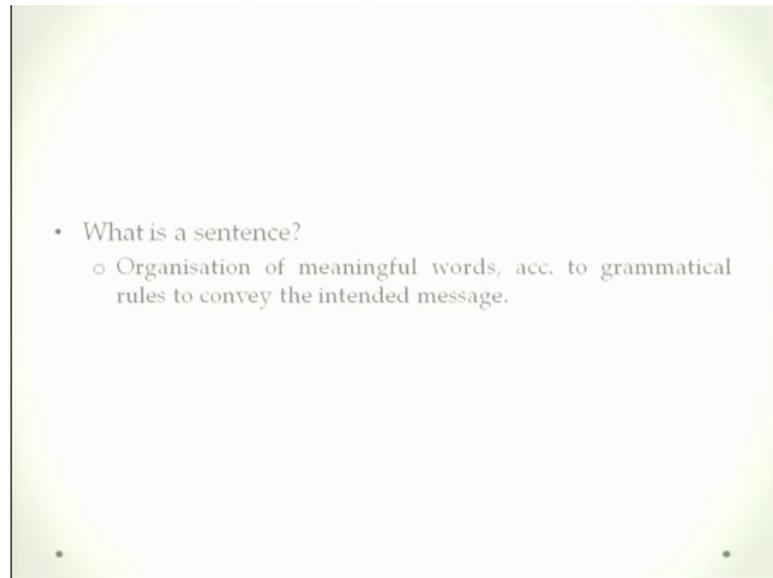
So, I am talking about flies which sit on fruits and yes, they like a banana, because you will see a lot of flies on wherever you will find bananas. In the earlier part you had time flies like an arrow, which is a more of a metaphorical statement. You do not really, think that there is time and it flies like an arrow, it is just like a metaphorical reference to how an arrow moves and maybe time also moves just like that.

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- What happened in the example?
  o Organization of words lead you to understand & mis – understand a sentence.

So, what is happening here organization of words or the way I have arranged the words in the two or rather Traxlers example has arranged. The words is basically, led you to understand the correct one in the first case, but misunderstand the sentence in the second case. How do people understand sentences? How is this organization of words, in a sentence leading to meaning? We will try and do a very brief survey of this in today's lecture.
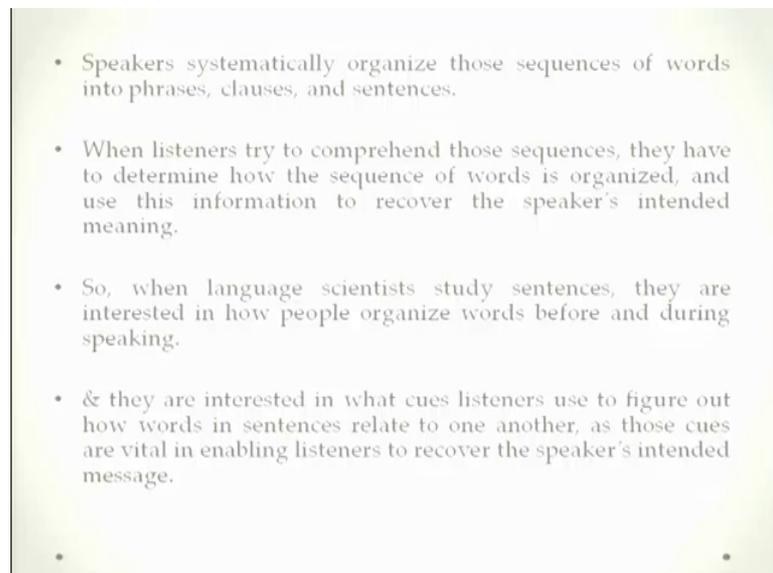
- What is a sentence?
  o Organisation of meaningful words, acc. to grammatical rules to convey the intended message.

Before we move, let us talk a little bit about what a sentence is? A sentence is an organization of meaningful words and this organization has to be according to the grammatical rules of the language A and B. It has to be able to convey the intended message, whatever was intended by creating that organization. The meaning should be conveyed.

So, two things a sentence is an organization of meaningful words should be according to rules of grammar. Third is, should convey the intended message.

- Speakers systematically organize those sequences of words into phrases, clauses, and sentences.

- When listeners try to comprehend those sequences, they have to determine how the sequence of words is organized, and use this information to recover the speaker's intended meaning.

- So, when language scientists study sentences, they are interested in how people organize words before and during speaking.

- & they are interested in what cues listeners use to figure out how words in sentences relate to one another, as those cues are vital in enabling listeners to recover the speaker's intended message.

So, these are the three things you should keep in mind speakers systematically organize these sequences of words into phrases, clauses and sentences and kind of not really getting into the, you know differences in details between what a phrase is and what a clause is and those kinds of things. I am just talking about sentences, you can just kind of you know apply all of this to across the board.

Now, when listeners are trying to comprehend this, what they have to do is they have to determine, what was the sequence of the word that the speaker intended ok? What was the sequence of word that is organized and use this information to actually, discover or unfurl the intended meaning of the speaker. So, I am as a speaker, saying something, the listener has to or suppose you have to, because you are listening to this. Now, you have to really kind of parse this in a way that, this is how the organization would have mean, this is what, you know this person would have meant by saying this. So, I kind of give you a couple of demonstrations very quickly, about this in a moment.

So, you have to understand first is that, speakers anyways do this organization and the listeners are, you know continuously trying to decipher this organization. It becomes a little bit easier in written, sentence or written, language, because there are punctuation marks, which help you to decipher this now. So, when language scientists have to study sentences.

They are interested in two things, they are interested in how people organize the words before and during speaking and they are also interested in what are the cues that these listeners are using to figure out how words in these sentences are related to each other and as those cues are vital in enabling the listeners to understand the speakers intended meaning. So, two things, language scientists really would look for is how am I as a speaker organizing the words and the second thing is how are you as a listener, you know figuring this out.

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- The study of *syntax* involves discovering the cues that languages provide that show how words in sentences relate to one another.

- The study of *syntactic parsing* involves discovering how comprehenders use those cues to determine how words in sentences relate to one another during the process of interpreting a sentence.

- Take an example:

So, this is pretty much, what we will be doing in this lecture? Now, there are two things, here the study of syntax slash grammar involves discovering the cues that language provides, as to how you know and as to demonstrate. How these words in sentences are relating to one another. We will see some examples very soon and then there is aspect of syntactic parsing, what is syntactic parsing? Syntactic parsing is basically, it involves discovering how comprehenders are using these cues, how are they, you know how are they parsing or organizing words, together and they are relating them to each other during the process of meaning making, during the process of interpreting a sentence. Now, let us now, start, a little bit with some examples.
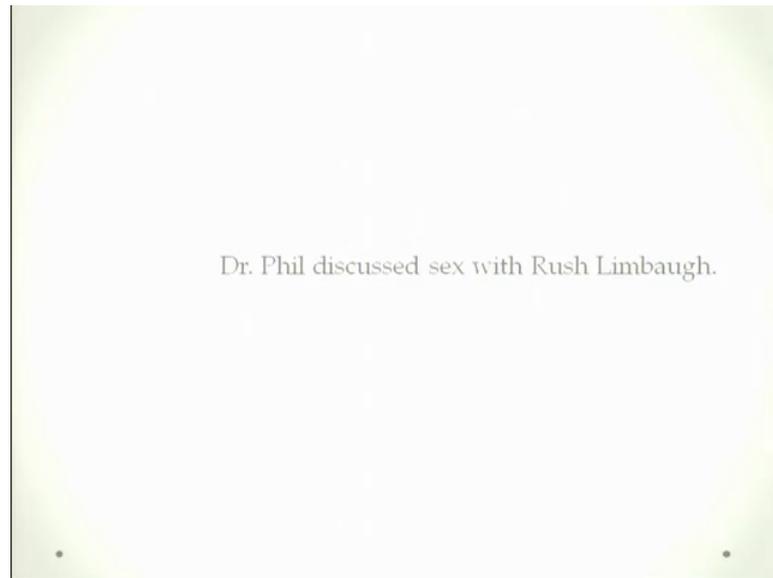
So, I had I have two sentences here or I have just one sentence here. It says Dr Phil discussed sex with Rush Limbaugh again. This is an example I have borrowed from Traxlers book, the sentence says Dr Phil discussed sex with, Rush Limbaugh. Now, again how am I as a reader or how are you as a listener going to parse this. There are two possible ways.
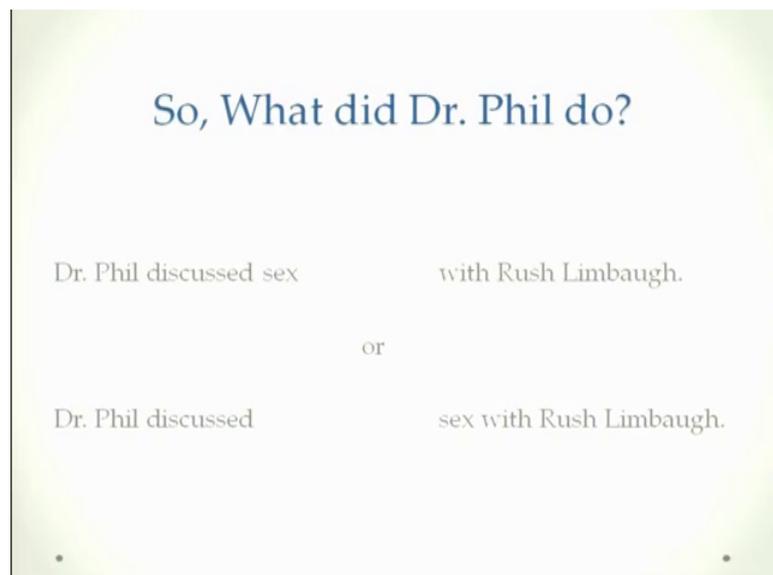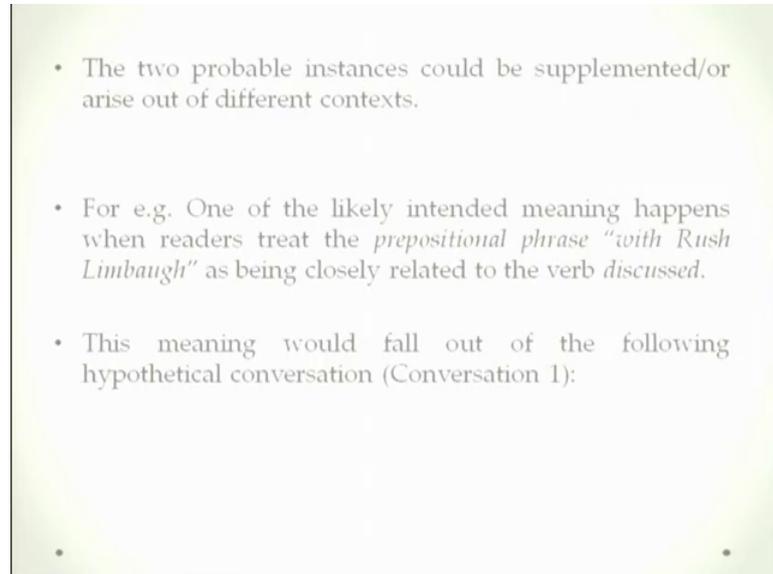
Either you can put it like this; Dr Phil discussed sex with Rush Limbaugh. So, some discussion of sex is happening or a Phil discussed sex with Rush Limbaugh. So, the idea

is that the, that the act of sex, with Rush Limbaugh has been discussed with somebody else.
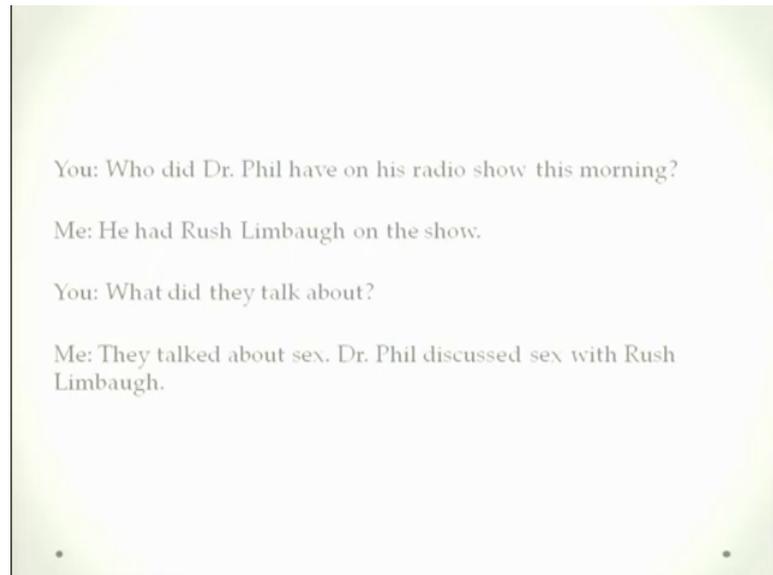
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- The two probable instances could be supplemented/or arise out of different contexts.

- For e.g. One of the likely intended meaning happens when readers treat the *prepositional phrase "with Rush Limbaugh"* as being closely related to the verb *discussed*.

- This meaning would fall out of the following hypothetical conversation (Conversation 1):

Now, there is two kind of work, you through this solutions, the two probable instances could be either supplemented or could arise out of different kinds of context. Suppose, one of the likely intended meaning happens, when the reader kind of you know puts the prepositional phrase with Rush Limbaugh as being closely related to the verb discussed.
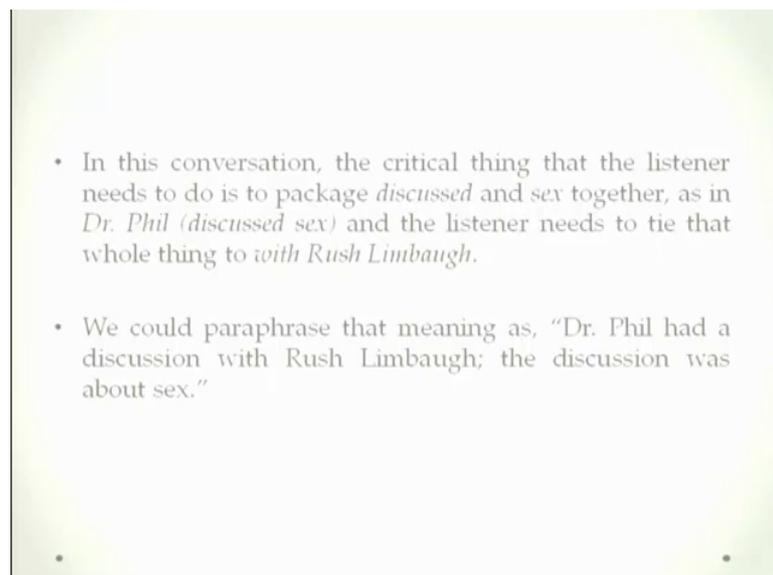
So, you are putting here, with Rush Limbaugh in, you know in one of the boundaries here. In the second part or this meaning would fall out of the conversation.

You: Who did Dr. Phil have on his radio show this morning?

Me: He had Rush Limbaugh on the show.

You: What did they talk about?

Me: They talked about sex. Dr. Phil discussed sex with Rush Limbaugh.

Let us see, how this really hear you? Who did Dr Phil have on his radio show, this morning and somebody is saying he had Rush Limbaugh on the show and then you would ask, you know what did they talk about? So, you know I would say that you know, they talked about sex, Dr Phil discussed sex with Rush Limbaugh. So, I guess from this conversation, what the meaning that you will generate is that the listener.

• In this conversation, the critical thing that the listener needs to do is to package *discussed* and *sex* together, as in *Dr. Phil (discussed sex)* and the listener needs to tie that whole thing to *with Rush Limbaugh*.

• We could paraphrase that meaning as, "Dr. Phil had a discussion with Rush Limbaugh; the discussion was about sex."
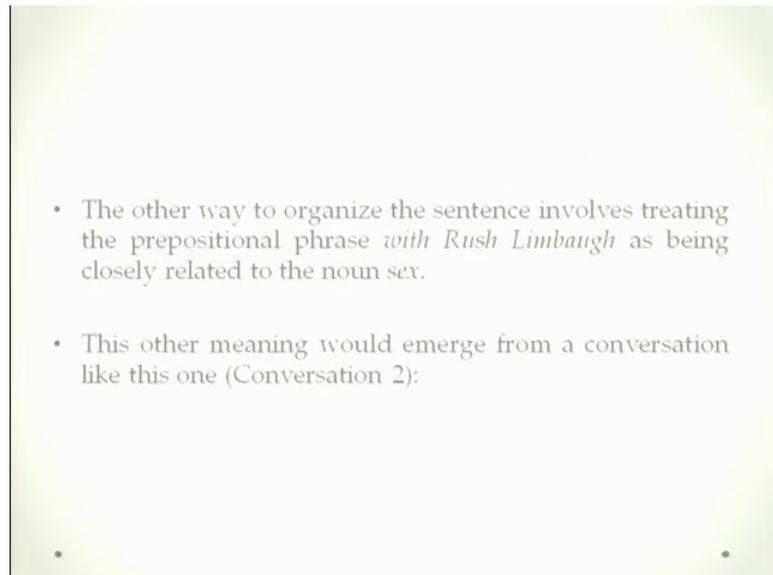
And the critical thing will be that the listener will need to package discussed and sex together in one thing, because they are discussing sex and the listener needs to tie the

whole thing with Rush Limbaugh. So, discussed sex with Rush Limbaugh. So, all of this will come together. Now, we could then paraphrase this entire meaning, what am I understanding out of this sentence in this conversation given? The context that I was just discussing, Dr Phil had a discussion with Rush Limbaugh and this discussion was about sex. So, this is one of the meanings, I can come up with.

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- The other way to organize the sentence involves treating the prepositional phrase *with Rush Limbaugh* as being closely related to the noun *sex.*

- This other meaning would emerge from a conversation like this one (Conversation 2):

The other thing could be or the other way to organize this will be suppose, say for example, I, kind of attach sex with this person Rush Limbaugh, I kind of putting these two things together. Now, how will this kind of conversation emerge; let me give you a bit of a context.
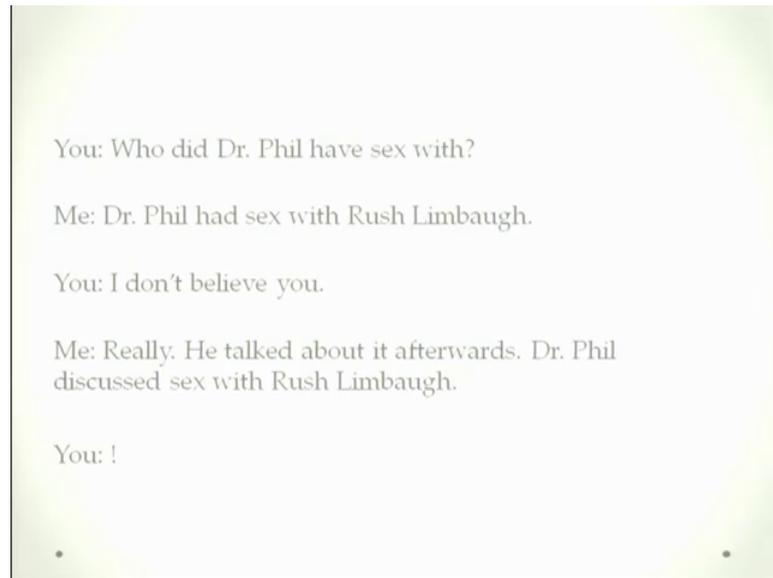
Suppose, the question is who did Dr Phil have sex with then? Is Dr Phil had sex with Rush Limbaugh? You will say I do not believe you and then somebody says really, he talked about it afterwards Dr Phil discussed sex with Rush Limbaugh and then ok.

So, the idea is based on what the preceding context is the speaker is, kind of going to attach the prepositional phrase with, to either you know one set of words or their prepositional, phrase sex or the phrase sex with one set of person and depending upon, how I am putting these two organizations together then meaning will be generated ok.

Sometimes this explicit arrangement or organization of words is not really needed. It is probably not needed most of the time, because the preceding context is there and the preceding context kind of helps you figure out, what the meaning exactly is going to be?

So, let us get a little bit more into detail about this particular concept this concept of chunking words together. Now, there is a better way of saying this, this is referred to as parsing and parsing is basically grouping of words into constituent phrases and analyzing the grammatical structure of the sentences in order to understand the meaning.

So, you have to know, which words will go with which words. So, that you can make the correct meaning out of a particular sentence. Again an example could be and again, if you are talking about spoken, language, this has to be rather incremental, because anyways words are sentences are unfolding in time. So, you will hear the first word, then you hear the second word then you hear the third word and each incoming word, you have to attach to a particular group.

So, that you can make this meaning. So, suppose for example, I have this thing, Amanda believes the senator during his speech. Now, I am talking about Amanda believing, the senator during his speech. So, Amanda is probably till here you will make a meaning and Amanda is believing the senator, whatever he is saying in his speech, but I can actually give you some further information. I can say Amanda believes the senator during his speech was lying to the committee.

Now, what happens is when you add the remaining part, you are kind of getting a completely different meaning. Now, you are getting the meaning that the senator was lying in his speech and that is what Amanda believes. So, this is again a demonstration of

how comprehension of sentences is something that is fairly incremental in nature, something that is kind of unfolding in time and with the time you have to be prepared to really put certain words together and certain words separately.

So, that you make the correct meaning out of it grammar or rules of syntax are going to be your cues in order to, how to arrange this, but again one of the things is we are not really actively or probably, in a very informed way using rules of grammar, but again that is for a different discussion.

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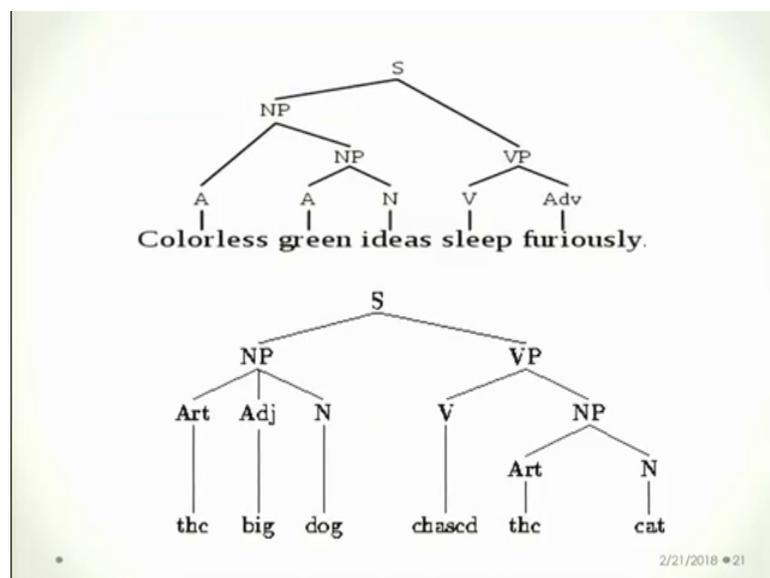
Now, these are the kind of groupings, I have been talking about. So, suppose you have a sentence yeah, you will have generally a noun phrase in the sentence and in the noun phrase. You will have a noun and you know something else with it and you can have a verb phrase, where in the verb is there and some noun is there and so on and so forth. Suppose, I have a particular sentence colorless green ideas sleep furiously.

Now, this is again you know a very chomskyan example, something that is been used. So, many times before, but here I am just demonstrating that you can actually have these structures. So, you have colorless green ideas as one noun phrase in that. You have colorless as an adjective and they have green ideas in which green is the adjective ideas is the noun phrase. So, this is your first grouping and then you have sleep furiously, which is the verb phrase, because verb is at the head of this place and furiously is the adverbs.

So, you have verb and adverb. So, the idea is the sentence has a noun phrase and a verb phrase; noun phrase can be further broken down into having a noun adjective so on and so forth. Verb phrase can be broken down into having a verb and then other things say suppose, sometimes verbs will have objects, sometimes verb will have adverbs. This is one of the guiding principles or one of the ways people organize words.

Suppose, I take a different example the big dog chase the cat, I have the big dog and have chased the cat, the big dog is the noun phrase, the is a determiner article, whatever you call it big dog may big is the adjective and dog is the noun phrase. So, this is one. The second is, in the verb phrase chase, the cat you have chased as the verb and you have the cat as a noun phrase the is your determiner or article or whatever you may call it and cat is the noun. So, again this is one of the ways.

Now, if somebody is reading it from this end, after you have organized it, they will most likely make the correct meaning out of it, but again this organization or parsing into chunks of words is something that is rather tricky and again I am not really going into a lot of detail about, how tricky is this I will probably give you an example very quickly, but idea is, this is something which is very interesting and linguists and you know psychology, psycholinguists have been dealing with how people are making meaning of sentences using these kind of organizational principles.

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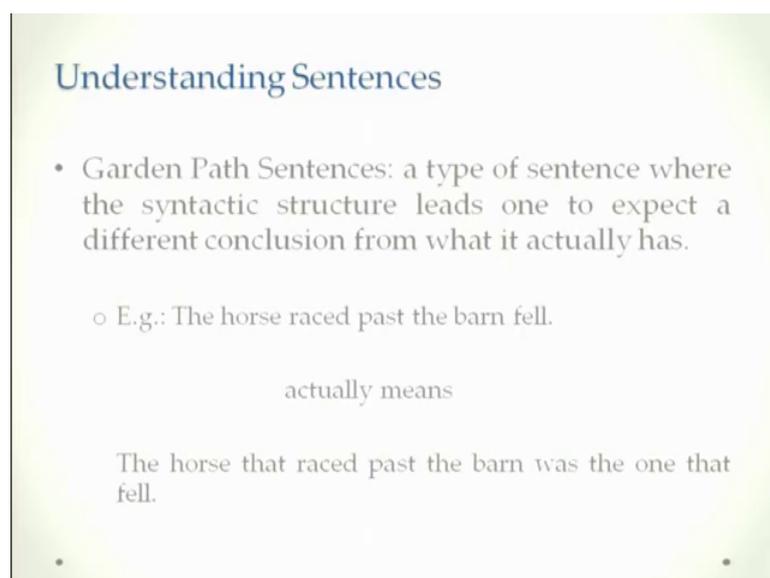
Understanding Sentences

- Garden Path Sentences: a type of sentence where the syntactic structure leads one to expect a different conclusion from what it actually has.

  o E.g.: The horse raced past the barn fell.

  actually means

  The horse that raced past the barn was the one that fell.

So, this is, something very interesting. Let us kind of give you a bit of an example of what is called garden path sentences. Now, a garden path sentence, garden path sentences are kind of sentences, which people have traditionally used to demonstrate. How the process of parsing may run into troubles or how the process of parsing may kind of run into a particular problem at, but different times. Suppose, you have a sentence called the horse raced past the barn fell.

Now, again in general speech if there is context, you will probably get the correct meaning out of it, but what is, but if you not really have any, if you do not really have any context preceding then you will kind of probably ask yourself that what really fell down? Did the horse fell down or the barn fell down or what is really happening here? The meaning; however, is the horse that raced past, the barn was the horse that fell or was the one that fell down.

Now, these kinds of sentences, which are slightly difficult to understand, which are slightly difficult to interpret even using the syntactic, cues are referred to as the garden path sentences. Now, the problem here is that this is a type of a sentence, where the syntactic structure would lead you to expect one meaning, but the actual meaning or the actual conclusion could be something else or there might be multiple conclusions possible. So, these are the garden path sentences.

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Approaches to Parsing

- **Autonomous Models/Syntax-First**: at initial stages the parsing mechanism makes use of structural/grammatical principles.

- Principle of *late closure*: *"when a person hears a new word, the person's parsing mechanism assumes that this word is part of the current phrase, so each new word is added to the current phrase for as long as possible (Frazier, 1987).*

Now, there are two approaches to how sentences are parsed or organized and the first approach that I am going to talk to you about is called a autonomous models approach or the syntax first approach and this is very important. The syntax first approach believes that the, at the initial stages of when you are hearing a sentence or when you are encountering a sentence.

The parsing mechanism will take hold of the grammatical principle. So, the parsing mechanism will actually follow the syntax or the grammar of the language and it will use grammar as a guide you to parse a words into you know into constituents and make meaning out of it. I will take this one of such examples; one of the principles here is the principle of late closure.

Now, the principle of late closure basically says that when a person is hearing a new word, the persons parsing mechanism is going to assume that this word is a part of the ongoing current phrase ok. So, suppose I am, starting a particular word I listen to the first word and then I listen to the second word. Second word is grouped with the first one, third word is grouped with the second one, similarly ok. Let us work with an example. What am I talking about? I am talking about cast iron, cast iron sinks. So, I must be talking about that cast iron does not float it sinks. I must now be talking about cast iron sinks quickly.
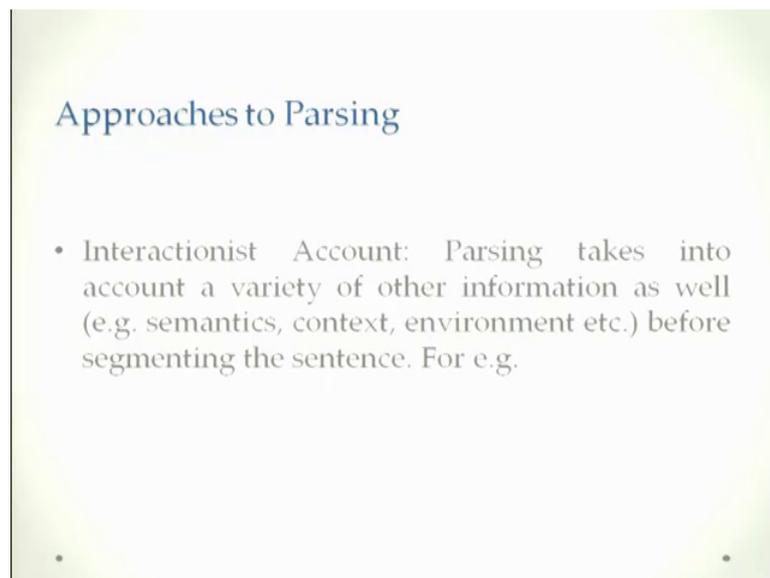
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Cast iron sinks quickly rust.
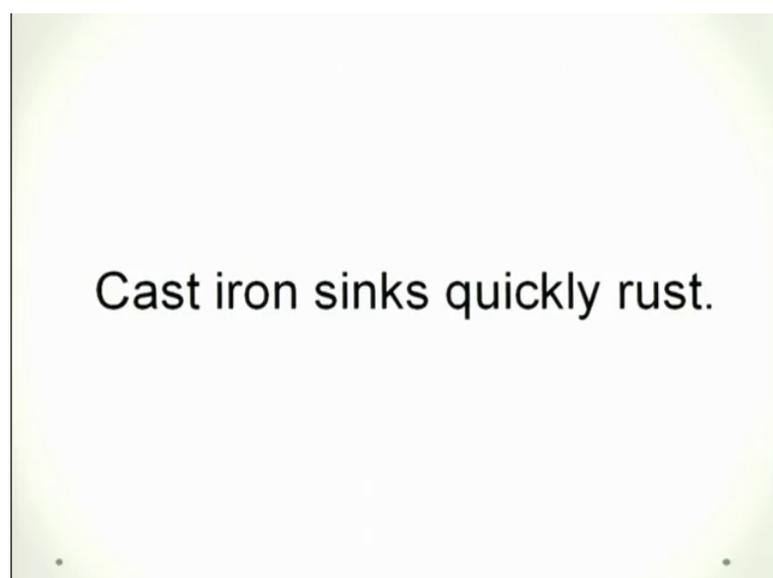
So, I am just talking about yes, cast iron really sinks rather quickly. Now, I am talking about cast iron sinks quickly rust. Now, what am I talking about, I am talking about kitchen sinks probably made of cast iron, which get rusted very quickly.

So, the idea is if you look at what is happening here, if you begin with you know putting everything just to the first phrase following the principle of late closure. You might be led to expect something else, but the incoming information might change the meaning completely. Now, you know we all have the sense of that, we understand language. So, effortlessly the combination of language is so flawless and so on and so forth. If you are actually following this kind of principle completely you are based on grammar, you might be led to make mistakes, more mistakes then people are actually observed to make.

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Approaches to Parsing

- Interactionist Account: Parsing takes into account a variety of other information as well (e.g. semantics, context, environment etc.) before segmenting the sentence. For e.g.

So, this is one of the problems with the syntax first approach. So, again an alternative is offered, the alternative is the interactionist account. The interactionist account says that parsing not only takes grammar, into account, but parsing takes a lot of other kinds of information into account as well it takes into account semantics context environment so on and so forth. Before starting to segment a sentence and all of these information contribute equally to you know for somebody making a meaning out of that sentence.

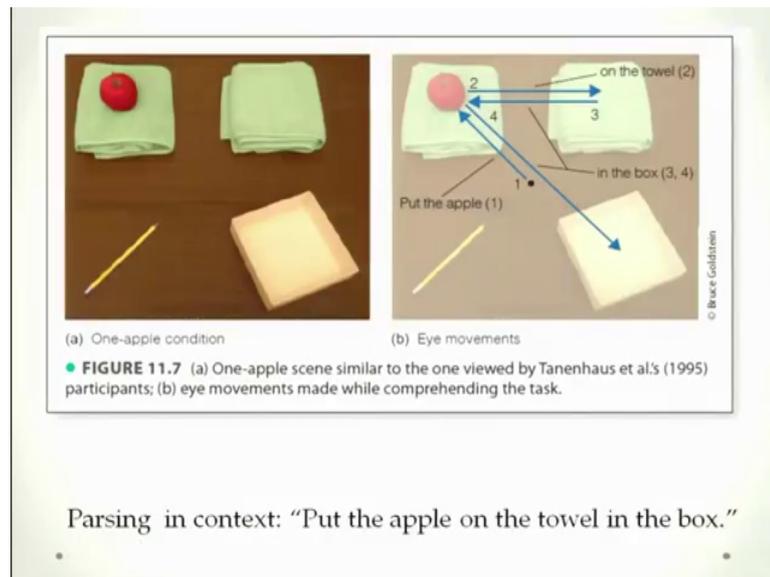Parsing by meaning: "The spy saw the man with the binoculars."
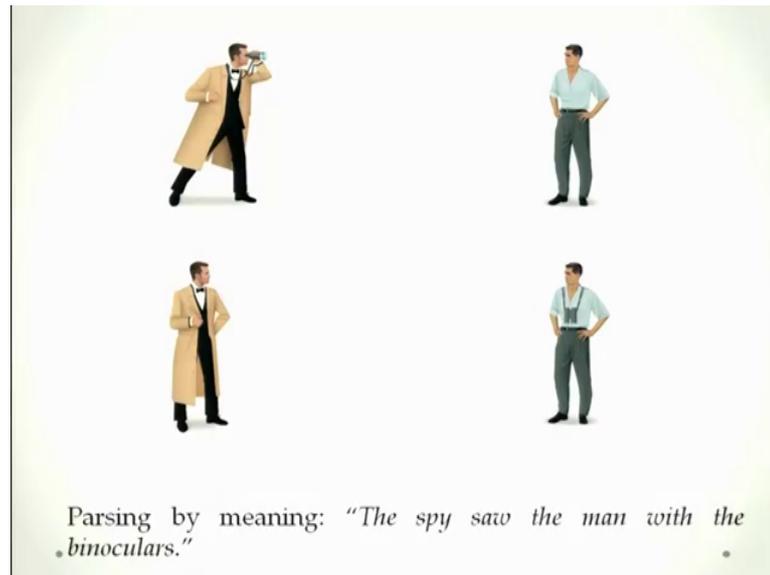
Let us take an example; now you see two scenarios. Here this is and again borrowed from Goldsteins book on cognitive psychology. Now, the idea is the spy saw the man with the binoculars in the first thing. You are seeing that the spy is using the binoculars to see a man. In the second case you see that the spy is seeing, a man who is having the binoculars.

Now, if either of the two pictures were available to you while you are listening or reading the sentence, your task of making meaning will become easier, if neither of the two pictures are available to you, your task of understanding meaning will be that much more difficult. Again, punctuation may come in and those, those thing, but again I am talking more about, you know spoken language. So, the idea is, here is a good demonstration of the fact that you will be using, what is the visual scenario.

Suppose, I am saying this to you and you know that the scene is playing out right. Here, you are actually going to use your information of the environment. You probably, looking at these two people, the spy and the man and then understanding my sentence with the help of that visual thing, because you are using that visual event as an aid to parse whatever speech I am saying your understanding will be quicker, will make less errors and will be correct. So, this is, one of the demonstrations of the fact.
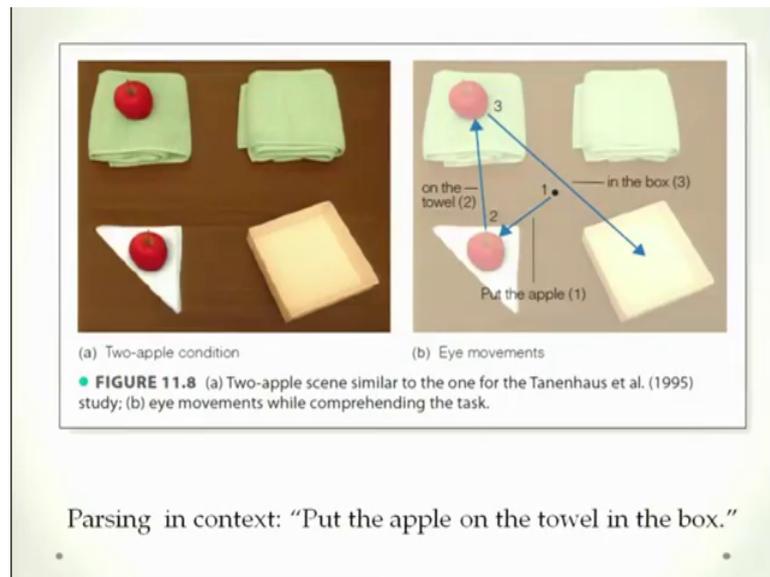
(a) One-apple condition   (b) Eye movements

● FIGURE 11.7 (a) One-apple scene similar to the one viewed by Tanenhaus et al's (1995) participants; (b) eye movements made while comprehending the task.

Parsing in context: "Put the apple on the towel in the box."

In fact, again is some experiments that Gerry Altmanns group did or Michael Tanenhaus did and, the idea was to demonstrate. How, are you using the visual, scenario to understand a particular sentence? So, participants were shown. These kind of things, these kind of displays and they were basically, you know hearing two sentences like put the apple on the towel in the box. Now, as soon as the participant hears put the apple, you will see the eye movements go to the apple on the towel, you can see it in the right, box, on the towel.

So, then it goes to, on the towel in the box. So, then you come back, you look at the apple on the towel and you try and bring it to the box, again completely visually. So, this is again also an evidence of the fact that the human mind or the human brain is using more information, than just grammar or than just syntax to comprehend meaning.

FIGURE 11.8 (a) Two-apple scene similar to the one for the Tanenhaus et al. (1995) study; (b) eye movements while comprehending the task.

Parsing in context: "Put the apple on the towel in the box."

So, again this is one of the things, you can do it is, in a, in a different scenario as well. Now, we have two apples; one on the napkin, one, one on the towel. Now, if you see, put the apple on the towel in the box, you very quickly, will go to the apple then you have actually go on, the apple on the towel and you will put it in the box again, visually just your eyes are moving here.

So, these are some of the examples of the evidences of the fact that people are using the visual information, the context information and some other semantic information in order to understand meaning, in order to make meaning out of the sentences. Not only grammar, but something more than that now, these are again 2 very important prominent approaches in understanding meaning of sentences.
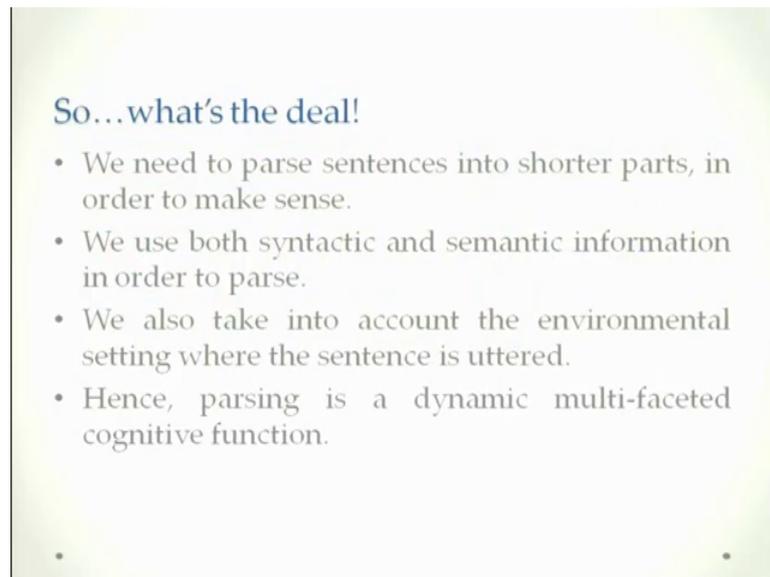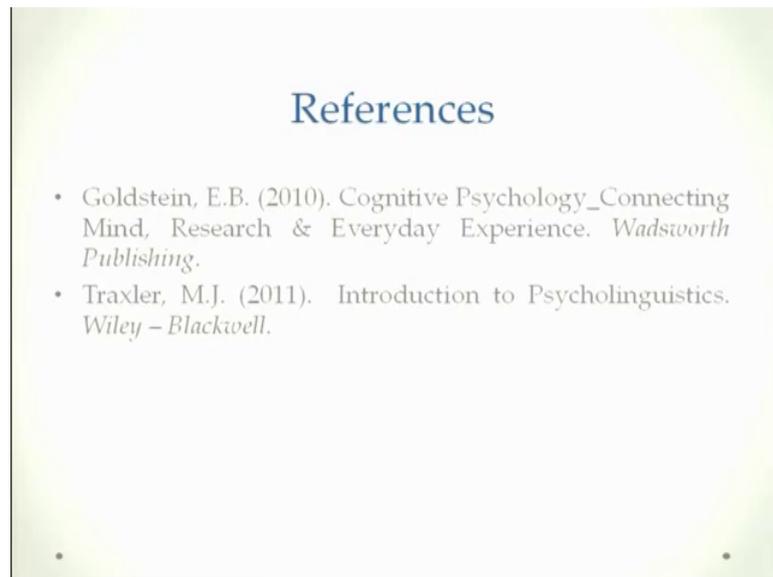
So, what is the deal? How do you understand this entire thing, the deal is that we need to parse sentences into shorter parts, in order to understand the meaning, in order to make sense that much is given. Second is, we must be using both syntactic and semantic information, whatever the rules of the grammar are, whatever the word meanings are and we take into also, we also take into account the environmental setting.

Suppose, I am saying something to you in a cafeteria, a lot of events are playing out, you will certainly look around and if I am talking about current scenario, you look around and you will see, you will use whatever, the event description is in order to understand whatever, I am saying. So, the idea is to you, at least syntax is available. Semantics is available and environmental information is also available.

So, you will use all of these three kinds of varied information, in order to understand the sentence. Now, if you, kind of again take a step back, look at whatever I have been talking about, you must wonder to yourself that you know parsing is not something that is so easy. Parsing is something that takes a lot of time; it is a dynamic cognitive function. It is a multifaceted function, because it is drawing upon information from various sources.

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References

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- Traxler, M.J. (2011). Introduction to Psycholinguistics. *Wiley – Blackwell*.

So, that was probably all from talking about comprehension or sentences. We will talk about something else in the next class.

Thank you.