

**Principles and Parameters in Natural Language**  
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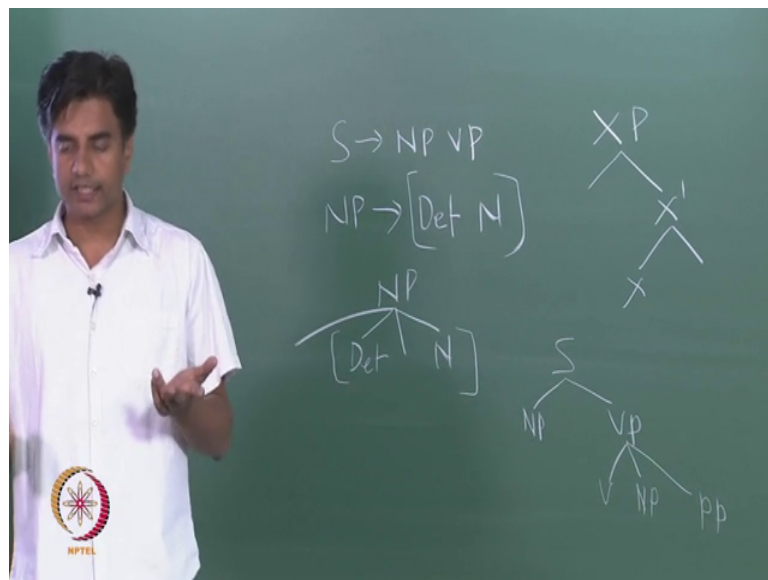
**Lecture – 20**  
**X-Bar Theory**

We started looking at structure of a phrase right. First we looked at what is the phrase? How do we make a phrase? How do words grouped together to make a constituent and which in turn becomes a phrase. How do we name a phrase and then now we are looking at what is the structure of a phrase. How do we name a phrase? Why do we name a group of word a noun phrase?

Student: Most important everything relates to the noun.

Everything relates to noun the most important part of that phrase is noun and everything a determiner and some other components are directed towards noun therefore a noun phrase and likewise for everything else.

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Then we started looking at structure of a phrase and in which we saw that the structure is such that we have this, this is going to be a structure of a phrase. Now I want to take you a little bit back into to put the whole thing into historical perspective, first we looked at what we said phrase a structure rule right understand this we looked at this thing and we

said this is phrase structure rule, this gives us this is a blueprint of a sentence this is how we get a sentence in every language right

Student: (Refer Time: 02:15).

So this was nice, but in merely in a statement of a sentence. Then the next step was when it was looked at as so for example, if we have an NP and this had let us say a determiner and N, so structurally this was represented as determiner and N ok.

Student: (Refer Time: 02:51).

The point here was.

Student: (Refer Time: 02:55).

Or what was missing from here was both of them were equally; both of them were equal, they had equal status. So the criticism of this was why do we why do we need to make it so fancy stuff like structure and trees, we can do it with a bracket and we still know this is a phrase so what is the need of this thing.

Because if they were 3 constituents in a phrase then they will go for 3, if they were 4 they will go 4. So, there was no restriction on branches see the point. So a sentence was given like you have a sentence it was given like an NP and VP and then again VP was V, NP, PP ok.

So, the problem was it was capturing some of the things, but again for many things it was putting in such a way and which sounded more or less like in a statement therefore, little later it became like this one, where the idea was we are going to have only multi only binary branching and then we came up the this notion came up and this is why this whole thing is known as X-Bar Theory.

As you can see we have a phrase and then we have head of that phrase, there is no such category as x bar, it is just a hypothetical node for giving us binary branch alright.

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And this is the place for which is called a Specifier place in which we put things like determiner and some other stuff whatever qualifies to be a specifier and this place is going to be a place which is called compliment.

Let me show you once more a sentence before I talk about a specifier and compliment. So, everything making sense on the slide we have a sentence and then we are just giving it is categorical description in terms of what we have seen right a sentence is students of physics like pizza with their friends.

Student: (Refer Time: 06:34).

Sorry.

Student: (Refer Time: 06:36).


We I have removed to eat from here is that a good sentence still they like pizza.

Student: (Refer Time: 06:44) second part of the language (Refer Time: 06:46).

(Refer Slide Time: 06:47)

## Sentence

- [Students of physics like pizza with their friends in the evening.]
  - Subject: Students of physics
  - Predicate: likes pizza with their friends in the evening
  - Verb: like
  - Object: pizza



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Take this sentence as can you write this the sentence I think I intended some modification in this I did not do students of physics like pizza in the evening.

Student: (Refer Time: 07:10).

(Refer Slide Time: 07:15)

## Phrase structure Rules

- Students of physics likes pizza in the evening.
  - S = NP VP
  - NP = N PP
  - VP = V NP PP
  - NP = N PP
  - PP = P NP



Recursion

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This one like this one students of phrase the ideas is I mean we can add students of physics like to eat pizza with their friends in the evening that is not a problem. The idea is I wanted to simplify the sentence for you to see some other stuff is this phrase structure can you quickly check for this sentence.

The sentence is NP and VP, NP is N and PP and then VP is V, NP and PP right and then NP is again N N PP and PP is a P and NP is that are these rules of phrase structure describing the sentence before pay attention to this carefully and if you have any doubts or question please let me know. Do you agree and understand that students of physics is the subject of the sentence the whole thing not the students, but the students of physics is the subject of the sentence right which is an NP, but this NP has a PP in it right this is why the first NP is N and PP.

When you see the VP you have V and NP which is like an pizza is NP and then in the evening is PP can I move is this ok.

Student: Sir.

Yeah.

Student: In VP equal to V NP and PP.

Huh Huh.

Student: The V is for like.

Right.

Student: The pizza is NP.

Right.

Student: And in the evening is PP.

Right.

Student: So, we should have one more that NP is just equal to N, because there the noun phrase does not have two parts. Noun is just a single pizza.

Yes you can do that is also possible but how about to you are in a way right. But I am trying to put it as pizza in the evening as NP.

Student: Sir may be should have been V and NP alone.

V and NP alone.

Student: The third line we heard of PP trying to breaking into 3 parts.

There is a reason why I am putting an NP there and this is why I said you are right when you are saying that NP should be just N you are right, but the reason why I was putting here as NP as N and PP is because I am putting pizza in the evening together, but again you are right that in that case it should be just V and NP you are absolutely right I am glad that you are following this.

But I want to make it this thing I the reason why I am putting NP and PP both there is because I want you to see and in the following few minutes that there is a distinction between pizza and NP and in the evening which is to say now yes let us backtrack little bit the verb like let us look at the nature of the verb like is this a transitive verb or intransitive verb.

Student: Transitive verb.

Sure should not be any nobody should have any confusion it is a transitive verb right the moment we say it is a transitive verb is it going to have an object?

Student: Yes.

Right most of the time objects are NP's. So therefore that NP pizza is the object of this

Student: Verb.

This verb phrase this verb in the evening is not the object it is an additional component in the verb phrase it is part of the verb phrase, but it is not the object of the verb it getting this point it is not the object of the verb. What we are saying again is subject verb and object, where verb decides about it is object, these are the required things in a sentence.

We could have more parts of a sentence more components in a sentence, but they are going to be merely additional information. Therefore, in the evening in order to retain simplicity of this sentence I could have just dropped in the evening and given you a pure bare sentence but I want to make this point that pizza is the object of this verb like which is a required element in the sentence whereas, in the evening is not a required element in the sentence ok.


That that does not negate what you were saying what you get my point you are right, but the reason why I am putting this PP here is for that reason now see I had put a term here called recursion you understand the meaning of recursion. I will talk about recursion why I put recursion here little later let me go back to the recursion is a let me briefly mention it recursion is a property of phrases and phrases I have this recursive nature and recursion is also one of the properties of a phrase or a sentence which can give you infinitely long sentences and again we will come back to this and talk about them later. Also there is a reason why I wanted to put a bigger a subject of the sentence as the bigger phrase and I am going to show you that part also in a moment.

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Phrase Structure Rule

[S/IP/TP/AgrP [NP Students [PP of physics]]  
[VP likes [NP pizza [PP in [NP the evening]]]]]

**S = IP = TP = AgrP**



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So, let us look at this is what I was trying to do here, now look at this again the questions that both of you were raising is not taken care of in this sentence, this is exactly what you have seen before it is just giving you phrases making sense.

Now, it is just one additional point that I want to make through this is when we say sentence and this is going to be more significant when we discuss a little bit more about phrase structure sorry little bit about x bar theory, that what we said sentence here this is also a phrase by itself and some people call it IP, some people call it TP, and some people will call it AgrP, do these terms make sense to you? AgrP is agreement phrase, TP is tense phrase, and IP means inflectional phrase can you if you are taking notes which I sincerely encourage you to do can you please take a note of these things these are

important terms, IP is inflectional phrase, TP means tense phrase and AgrP means agreement phrase. At the same point I can also tell you that in the second chapter of the book that I have sent you this phrase structure rules are described.

So, you can take a look at chapter 2 of the textbook, again a brief note on IP, TP and AgrP I think they should follow from the discussions that we have done so far right. What is the let put it this way remember 2 types of things we have seen lexical categories and functional categories words like, student, physics, pizza like evening these are lexical categories and then we saw functional categories like agreement, tense,

Student: Aspect.

Aspect the part of agreement was number person gender all such sometimes together are individually are functional categories.

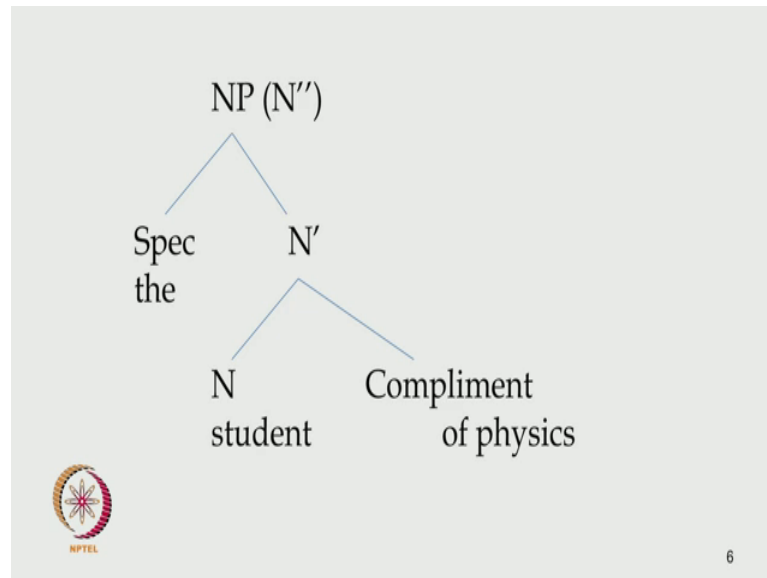
So, the reason why a sentence is called an IP is all these functional categories together is called inflection. These are they represent themselves in terms of inflection on different components in a sentence. So, the idea is some people consider agreement as the most important part of the sentence, that is without agreement you do not have a sentence therefore, sentence equals to an agreement phrase. At the same time some people consider tense as an important part of the sentence that there are 2 types of sentences one could tense less sentence and the other is sentences with it with tense and that is an important part.

Some third group came up and combine the two, they both tense and agreement are part of inflection they are functional categories, they are part of inflection. So, there is an much of an advantage of calling one over the other let us put them together and call it an inflectional phrase. In other words sentence is the whole idea of a sentence is not about a lexical item or it is different lexical items like students, physics, like, pizza or evening. The idea of a sentence is about it is underlying hidden characteristics, hidden features such as functional properties and therefore, these names clear ok.

So and we will reach |IP, TP all these things when we are done with a x bar it is all taken care of in to x bar and I will show you that when we reach the sentence level.



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Now this is what we have been looking at. So when we see when we look at this part. So, I can get rid of this also it is the point that I discussed here is this clear to you that this was a phrase structure rule in historical context around 65, little later this was not adequate. People started talking about the structures of a phrase, but the structural description was not adequate enough to capture everything that people wanted to say or they came up with more stuff.

So, these things became historically little bit in significant where we stay know is this so here we have specifier and head and a compliment the thing is this what do you see here this gives us we have already talked about this part and I think I have repeated this enough of times so that you understand the requirement and functional function of this part. Look at this structurally specifier is higher than it is head and compliment both making sense structurally specifier is higher than it is head and compliment which means whatever is going to be a specifier or determiner has a scope over this whole thing.

So, a specifier does not simply belong to noun, in a phrase it is a specifying everything that is under it is scope and this thing is nicely captured by this hierarchical configuration. Second part which is important is compliments are always going to have sister relationship with it is head so if something is a compliment to the head it is always going to be in close relationship which is this is called sister relationship by sister relationship it simply means both of them have equal status.

So, what we have been looking at so far is an object right I come to that when we are talking about a VP, but since we have been looking at transitive verb, and object of a verb.

So, let us let me give you an example from there and then I come back to NP, the complement of a verb sorry the object of the verb is called the complement of a verb. If there is a complement it is going to come here if this is a VP, then this is V and this is where you are going to have the NP, if there is no object in the verb so in a sentence like and pizza are going to be in this configuration.

Imagine you have a verb which does not have a complement and has something else for example; let us say can you give an example of a verb which does not have an object.

Student: Excuse me.

Yeah go ahead.

Student: (Refer Time: 23:00).

No that is true this the verb sleep is an intransitive verb and it will not have a complement right, but I want something more it has something else.

Student: (Refer Time: 23:13).

Take the verb sleep and put it as sleeping in the evening. John was sleeping in the evening is there an object in the sentence no so in that case sleep is the head of this phrase and there is no complement.

Now, the PP in the evening is not the complement of that verb, the PP in the evening is not the complement of the world therefore you do not get a PP here. Are you agree with me did you see this thing, now the point I am saying the making is, it is not that the PP cannot be a complement, in some cases where a PP will be the object of the verb or the complement of the verb, then only it can come in this place. In the cases where a PP is not the complement of a verb like this one it is not going to come in this place then it has to go somewhere else right now I am not showing you where, but it has to go somewhere else. This is the significance of this position in a x bar configuration I am trying to show you the significance of this position complement. In this position either you will have

only a compliment or nothing this position can stay vacant, but it does not allow anything else.

Therefore the head and its complement are going to be in equal sister relationship this must make sense to everybody and specifier and rest of the two the specifier I mean head and complement are in hierarchical relationships. This notion is captured nicely this fact is nicely captured with binary branching. Any question any difficulty?

Student: Sir because the VPP was VPP and that will (Refer Time: 25:48).

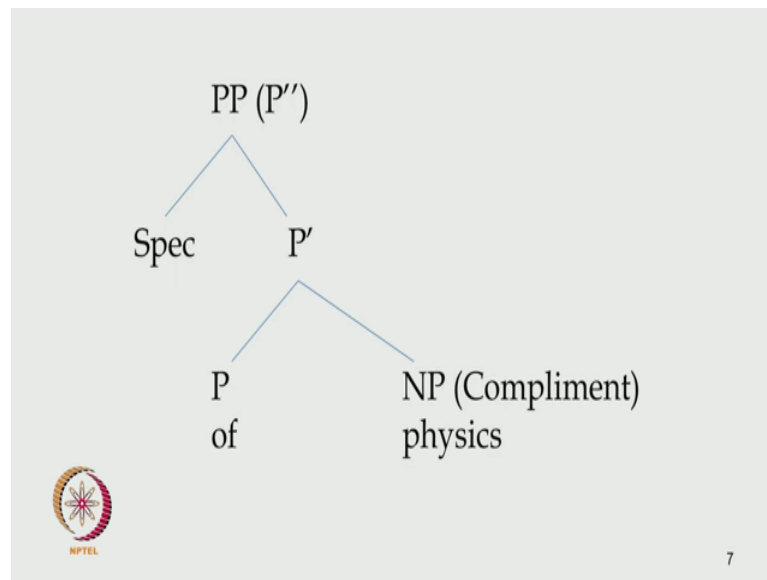
The sentence will be was sleeping right we right now yes we can put was sleeping but the reason why I put only sleep here because was those somewhere else. Let me come to that that level and then you say it goes somewhere else, but for the time being we can say yes this whole thing is the verb so it is stage here alright very nice.

Now, so let us look at this is one the subject that we had in this sentence and then we go to the sentence level this is the subject that we have right students of physics like pizza in the evening this is the subject we have, this is the subject is an NP and this is how that NP is represented. Please pay attention to this to the fact that of physics is the complement of the noun student. Why is it a complement is what I will show you is what I will discuss with you and how do we know that this is a complement why just now we saw in the previous example I do not have everything on the slide in the previous example that John was sleeping in the evening, in the evening which is also a PP is this a PP in the evening which is also a PP is not a complement.

In this case of physics which is also a PP we are saying this is a complement so there has to be a logical grounding on the basis of which we can say some PP's are compliments and some PP's are not this decision cannot be arbitrary. Let us consider this PP is complement, let us consider certain PP's are not complement the things that are not complement in this a structural configuration are called adjuncts ok.

So, some PP's are compliments and some PP's are adjuncts there has to be a reason why some PP's are compliments and some PP's are adjuncts I will show you that as well. Now this is a PP of physics this is how we get in this configuration of is the head of this phrase being a preposition and physics is an NP complement of this preposition of clear and there is no specifier.

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So, from these two structures you can see we have precisions of in every phrase we have precision for 3 things specifier, head and a compliment. Head is a required thing only then you have a phrase but sometimes you may have a compliment, sometimes you may not have a compliment. Sometimes you will have a specifier, sometimes you will not have any specifier, in this case you have both specifier and compliment both are available in this phrase the student of physics.

When we talk about PP of physics there is no specifier, how if we go in recursive fashion and break down this P, NP compliment in this structural configuration. What do we have and what do we not have quickly.

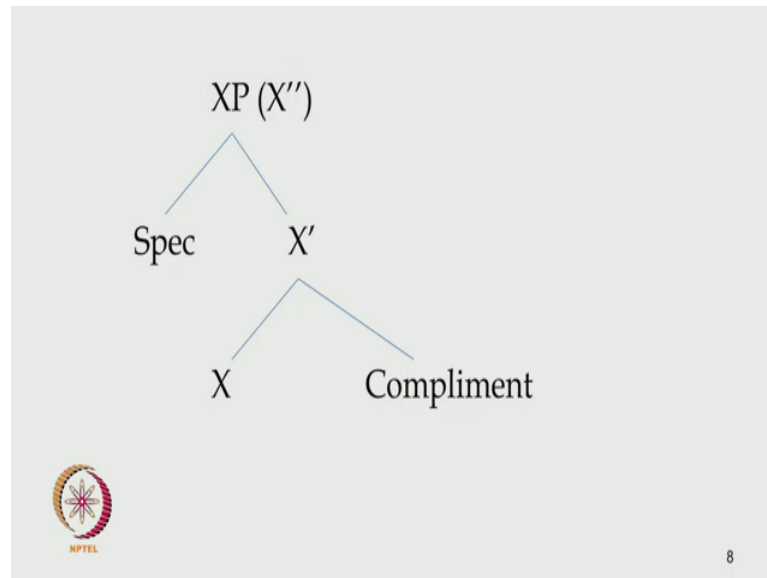
Student: (Refer Time: 29:41) no compliment.

We have no compliment and.

Student: (Refer Time: 29:47) specifiers.

Do you have a specifier? No specifier. Do you understand this question and answer everybody? Yes, no, do not be shy please tell me if the answer is correct, but I am just trying to make sure that everybody and follows the question and answer both alright.

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This is what we call and this is why we call them x bar, this is how we get the whole phrase.

Student: Sir Physics has no specifier and no compliment in the example you just shown.

Yes the.

Student: Why (Refer Time: 30:32).

What I am saying is if you break this down further see the in this phrase what is the head of and the compliment is an a which is an NP right if we give it full configuration

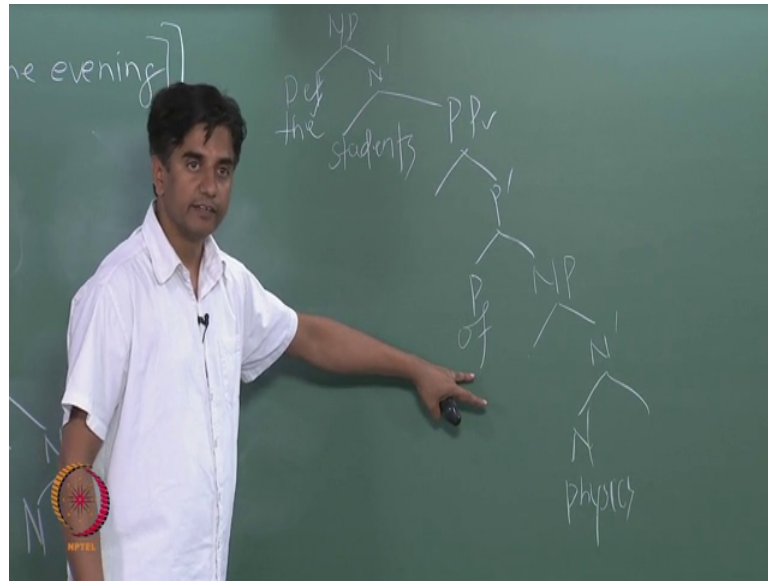
Student: Of that NP.

Of that NP, then in this specifier position you have nothing and in the compliment position also you have nothing.

Student; Sir why do not we just (Refer Time: 30:57).

That is what we are trying to say and N can also be the full NP. This is precisely what we were trying to show you and in the phrases structure rule even so this possibility was not available in phrase structure rule. Here we can show clearly that through recursive fashion that see we have a PP we have P and then we have another NP which will have an N alright.

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Now, of physics this is how we actually get it we can put further things like get this thing. So, we have an NP students of physics this is how we get the whole structure the students of physics. If you want to say the student of physics then this is how we get. The point is and now I am putting everything together the point is sometimes in a phrase you are going to have a specifier, sometimes in a phrase you are going to have compliment, sometimes you may have nothing neither a specifier nor a compliment.

Nonetheless that position is not killed, the position it is still active. So, what we do is when we are giving the structural representation instead of leaving several empty positions we put in the way you see it on the screen, it should not be complicated for you right this is why we end up there.


We do not even write compliment the whole point of putting the word compliment and the specifier is for you to understand that what those things are and since we are looking at them for the first time we are putting them, otherwise we are going to take it as an given thing that the is a specifier anything else here no.

Since we are talking about ah the structure I want to move little bit further in this structure and then come back to the whole notion of why some PP's are compliments, And why some are not that is some are adjunct we are going to I am going to come to that notion little later.

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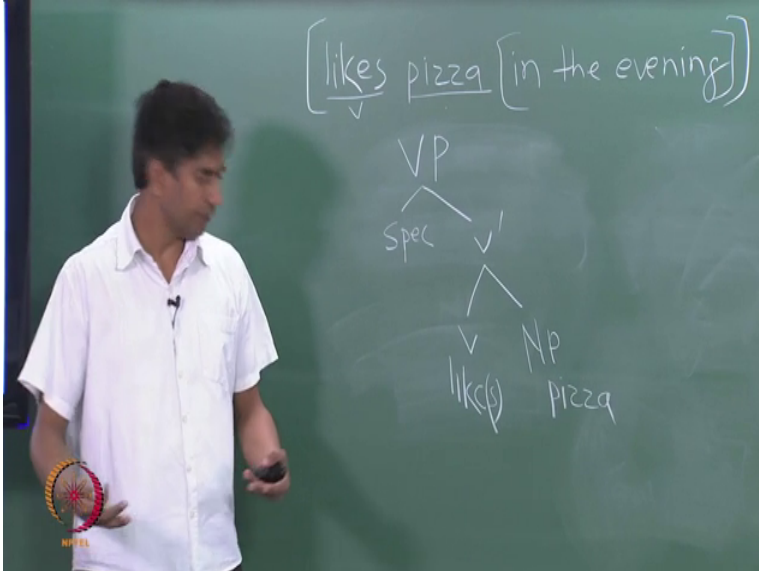
## NP (Noun Phrase)

- The king of England
- A student of physics
- A student with long hair
- A student of physics with long hair



So, we get this thing clarified any nobody has any question any or any doubt here right. Now I want you let me go back to my sentence I want you to draw the structure for P the whole VP likes pizza in the evening can you try drawing that.

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graph TD
    VP[VP] --- Spec[Spec]
    VP --- V[V]
    V --- V2[V]
    V --- NP[NP]
    V2 --- likes[likes]
    NP --- pizza[pizza]
```

Can I delete this part is this clear to everybody so that we have more room on that board then so how do I begin if I have to talk about VP how do I begin?

Student: Specifier.

We will have a specifier nice and then we have here v bar right and then we are going to have.

Student: Nothing.

V and.

Student: NP.

NP fine, So we get V is our it is only like, but for the time being I am putting here it as likes, and other NP is again it can be expanded further, but we only have here is pizza see this thing. Now go back to the preliminary ideas that we have discussed I think we are spent 3-4 at least 3 hours on that to talk about whole predicate the notion of predicate object verb and subject right. Can we call this whole thing predicate? This is part of predicate.

But we have saying in the predicate we have a verb, we have an object which is the compliment of this verb, but this is not part of the compliment of the verb. So, one way was to expand this further and see say that this N has the PP compliment and then we go from there are you agree with me?

But since we are saying this is not part of the object therefore, it does not become the compliment of this N. Now just a minute moment ago I told you what is the distinction between a compliment and adjunct I am going to talk about that in a more in I mean the following discussion is that.

But right now so we are not that simply tells us that we are not making an arbitrary decision that this is not part of the compliment there is a reason why we are making this decision that this is not a part of the compliment, but the question is if it is given that it is not part of the compliment. How do we represent this in a sentence?

Student: (Refer Time: 38:18).

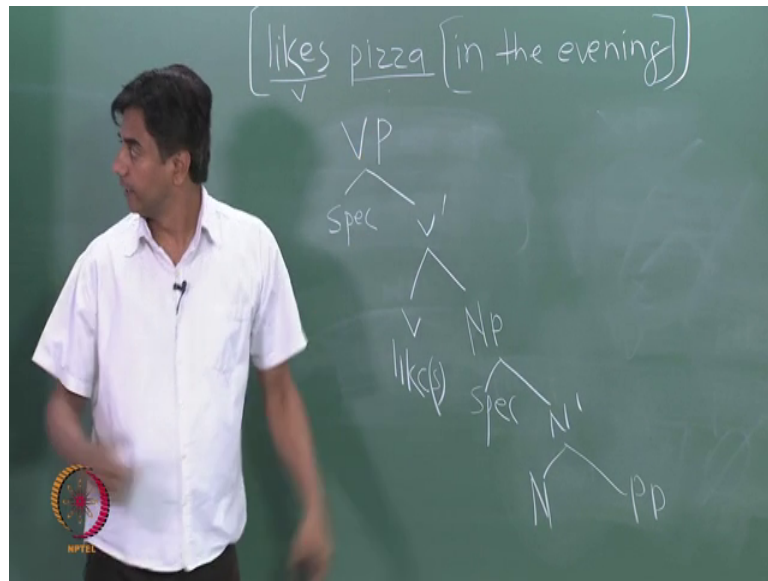
Sorry.

Student: So, the NPV is the compliment.

N so this is what I am telling you right.



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We have this option we can do this right. We can say, we can expand this and say a specifier this one hold on do not write this thing N and PP. Do you see this thing we can do that, but what we are saying is this is not part of the compliment this is what these people were saying at that remember the phrase structure.

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### Phrase structure Rules

- Students of physics likes pizza in the evening.
- S = NP VP
- NP = N PP
- VP = V NP PP
- NP = N PP
- PP = P NP



Recursion

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Where these people were saying that this V, if this PP is part of this compliment then it should only be V and NP and then NP can further be extended as N and PP that is exactly what their question was am I clarifying that.

So, and they are right I said it at that time and I am saying it now also they are right that this is not part of the compliment. So, if it is not part of the compliment then this expansion does not work and if we represent this PP like this then we are eventually saying this is part of the compliment get this thing; this distinction through whether something is part of the compliment or not has to be conceptually represented.

In other words these things are categorically clear in human mind therefore, their representations are different. How do we make that distinction? is the question I do not want to lose track of what we are actually doing here we are not just doing some fancy stuff, we are talking about we are still relating this and we want to retain the idea of acquisition.

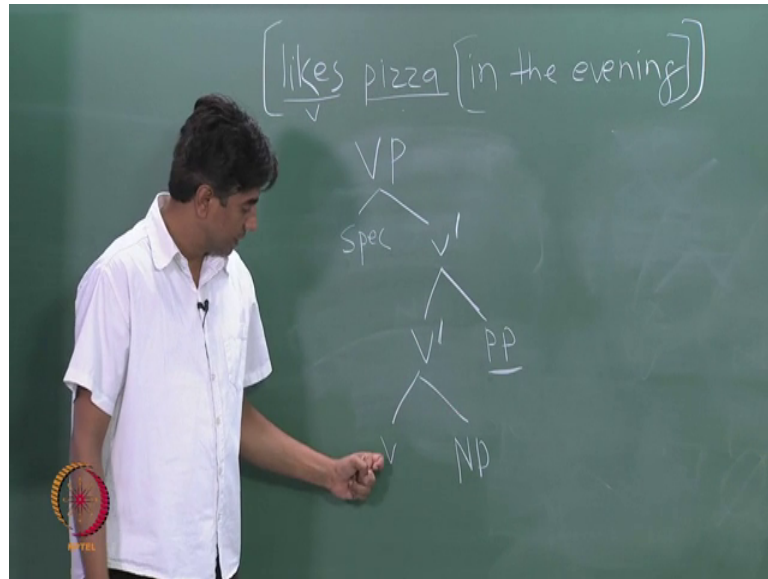
The idea of I language and what we said that how acquisition works at the level of human mind. How we have figured out the rules that is how a child has figured out the rule it is just a description of what is it that they have figured out and native speaking native English speaking child has figured out this rule that in the evening is not part of the compliment of this verb.

So, in that case how is it that it is represented and when it is part of the compliment like here when we say students of physics right so student and of physics is part of this is the compliment of this student if it is compliment of this noun then we represent it this way this one this PP is not the compliment of this verb this is what you see here.

Students of physics of physics as a PP is part of this, in the evening is not part of the NP, i it looks like that in the phrase structure because there is no other way to represent this in the very structure and these things where the problem in phrase structure.

So, here is how we represent this is not a big deal it is we only need to find a technical tweaking here. You see why what do you see what we want to distinguish yes or no I do not want to lose majority of the class. Are you agree with me? Do you see what the distinction that we are trying to make that distinction will be captured and if there is any confusion please raise your hands and let me know that distinction is captured also with the help of this intermediate category. The job of the intermediate category is to give us binary branching and also the job is to give us more position.

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So, what this does actually is it retains it gives us to represent an adjunct what we do is we create one more a space so with the help of this intermediate category we are not changing anything we are a still retaining the whole notion of compliment head and compliment say this thing we are a still retaining space spec, we are a still retaining the notion that spec is higher than the compliment then the head and compliment and we are retaining that the head and compliment are in close sister relationship. So, we are not breaking any principle we are only creating one more space and then we say this place is adjunct.

If this was a compliment then we get it this way equal relationship if this was not a compliment then we just create one more and get it additionally adjoint and not disrupting the adjacency between head and the compliment not disturbing the compliment itself. Are you with me? Do you see this point that likes pizza in the evening will be represented this way is this representation clear to everybody or do a do you want me to draw this thing you can draw this on your own in your note book right.


Before I conclude I want to tell you I told you I am going to talk about the distinction what makes and what makes the distinction between an adjunct and a compliment? How do we know which phrase is a compliment in a sentence and which phrase is an adjunct we are going to see?

In fact, we know half of the answer we know which phrase is a compliment right when it comes to a verb, the compliments are always the objects right and additional PP's are going to be adjuncts.

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## NP (Noun Phrase)

- The king of England
- A student of physics
- A student with long hair
- A student of physics with long hair



Can you look at these phrases the king of England student of physics, the next one is a student with long hair. Do you see any distinction between student of physics and a student with long hair? In terms of it is meaning do you see any distinction between that? Structurally both are same student of physics and a student with long hair what I mean by saying is both of them have an NP within a PP within an NP, but Do you see any distinction between that do you do you feel any distinction between the two? The reason why I am asking you this question is in one case PP is a compliment, in the other case the PP is an adjunct.

Student of physics with long hair that is also an NP, the reason why I am giving you these 4 phrases is before I talk about the distinction between compliment and adjunct do you please think about these 4 phrases. When you are thinking about these 4 phrases please leave the everything that you know about the language English aside, I want to convince you that I am not talking about English. The idea is not to teach you English grammar or for that matter Hindi, Hindi rules or grammar or anything else.

The idea is to see what is the compliment and what is an adjunct in any language? The reason that you are going to find behind these two sentences, the difference between

these two sentences is going to apply to all the languages of the world. So, please think about these 4 sentences like you have seen what I said about likes pizza in the evening.

So, next time we are going to discuss two things: We are going to discuss the distinction between complement and adjunct and then we are going to see further up. How do we combine subject in the VP to get a sentence what we called IP not a complicated thing again you can see IP will be drawn right under the x bar we only have to see how were does VP come and what is the VP complement of in an IP that is all we are we are going to say and it is going to be very simple thing and once you realize it is simple it is going to be fun.