

# Introduction to Syntax

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How do formal linguists spend their day?

Basically, we try to understand what is going on in your heads right now when you hear me speak and understand what I say.

Somehow, as a speaker, you do this.

You “know” how to take the auditory signal (the sound) and transform it into meaning.

But you are not conscious of this knowledge. You can’t say what is going on in your head right now.

That is, you have “knowledge” that you manipulate but you don’t know what it is, nor how you manipulate it. This is “tacit knowledge”.

It is not like knowing chess!

Since you are not conscious of this knowledge, you did not internalize it consciously.

It is what it is, mostly because it is a function of the human brain.

And since the human brain is the same no matter what language one speaks, it follows that this tacit knowledge will be the same for speakers of all languages.

In other words, it can be detected and studied in all languages.

So how we spend our day:

We look for and explore...

-similarities between languages

-but similarities that were never taught

-nor are due to historical reasons

We try to find such crosslinguistic similarities, model them as best we can and ideally explain them.

But remember: this is a natural science. Our theory will have to be amended every time we discover new data about the world.

# If you study syntax, you study tacit knowledge about the formation of sentences.

Here are some examples from Russian. The subscripts indicate the referential possibilities of the pronoun. If the pronoun carries the same index as the name, the two can refer to the same person. If they carry different indices, they do not. An indication like 'k/m', as for example in A, means that the pronoun can refer to the same person as the name (which is 'k') or a different person. The star symbol ('\*') on a subscript means that that index is not possible. That is, that referential option is not permitted.

What we see is that in A, the pronoun can, though does not have to, refer to Mary. In B, the pronoun cannot refer to Mary and must refer to a different person. In C, the same referential options exist as in A: the pronoun (but again does not have to) refer to Mary.

A. Maša<sub>k</sub> думае, што она<sub>k/m</sub> очен' умнаја.  
M. thinks that she<sub>k/m</sub> very smart  
'Mary<sub>k</sub> thinks that she<sub>k/m</sub> is very smart.'

B. Она<sub>m/\*k</sub> думае, што Маša<sub>k</sub> очен' умнаја.  
she thinks that M. very smart  
'She<sub>m/\*k</sub> thinks that Mary<sub>k</sub> is very smart'

What is the rule for when a pronoun and a name can refer to the same person?

C. [Ee<sub>m/k</sub> družja]<sub>j</sub> dumajut, што Маša<sub>k</sub> очен' умнаја.  
Her friends think that M. very smart  
'[Her<sub>m/k</sub> friends]<sub>j</sub> think that Mary<sub>k</sub> is very smart'

D. (To,) што она<sub>m/k</sub> не sdala ekzamen, Maš-u<sub>k</sub> razdražает.  
that that she not passed exam, Mary-ACC bothers  
'That she<sub>m/k</sub> failed the exam really bothers Mary<sub>k</sub>'

As you can see, this phenomenon is the same in Russian and English.

And it is the same in all the other languages in which it has been investigated.

You were never taught about it by your parents or teachers.

Yet, you obey this restriction.

Tacit knowledge!

Neither can you put into verbs what rule you are actually obeying!

The rule that is operative cannot be defined on a string.

You need a two-dimensional representation of the sentence that linguists call a “tree”.

(That mental computations of language are not performed on a linear string of words but on a hierarchically organized structure was an important discovery.)

And drawing syntactic trees is what we will start with in this class.

## Requirements:

-Studying the posted slides after *every* presentation.

-Completing homework assignments.

(and completing them on time!)

-Asking questions if you do not understand something.

(very important!)

-Asking questions if you are skeptical about something I tell you.

(equally important!)

-Trying to be as skeptical as possible about everything I tell you.

(I am not here to tell you THE TRUTH. I am here to help you develop a particular way of exploring the natural world. That is, Linguistics is an empirical science: what we try to do is look at data and find the best theory that fits them, until we find data that do not fit, at which point we have to revise some of our conclusions, and so on. As a theory about the natural world, our theory is, and should be, always under scrutiny and always developing. So argue with me!)

So, let's start at the beginning.

but...

...before we get to exciting facts and ideas, we need to establish certain foundational notions and definitions.

This will not be terribly entertaining, but it is necessary.

Please make sure you study these definitions at home because they will be necessary throughout the course.

# The hierarchical organization of language

(presentation after Preminger)

- How are words organized into a sentence?  
Hypothesis 1: A sentence is a collection of words
- What would falsify H1?  
There is no place for the significance of word order in H1.  
Yet, we know that word order is extremely significant:
- It can change the meaning of a sentence entirely:
  1. The cheetah killed the gazelle
  2. The gazelle killed the cheetah
- It can cause ungrammaticality:
  3. \*The killed cheetah gazelle the

Since (1-3) all have the same words but different meanings or grammaticality status, H1 cannot be correct.

What about trying an H2?

- H2: A sentence is an *ordered* collection of words.
- H2 can capture the fact that (1) and (2) differ:
  1. The cheetah killed the gazelle  $\neq$
  2. The gazelle killed the cheetahIt also captures the fact that (1) and (3) differ:
  3. \*The killed cheetah gazelle the

But what H2 cannot do is tell us why (1) is good and (3) is bad.

This is one argument against H2.

- A second argument against H2:

H2 does not capture the intuition/fact that not all substrings of a sentence are “created equal”:

1. The cheetah killed the gazelle

-the cheetah-

-killed the-

Some substrings consist of words that “belong” more together than others. We have pretty clear intuitions about this:

4. That author described his novel to the publisher yesterday

-that author-

-novel to -

-described his novel-

-to the publisher-

-publisher yesterday-

- Some substrings consist of words that “belong” more together than others.
- That is, some substrings are more “cohesive” than others.

And we don’t have to rely just on our intuitions about some substrings being more cohesive than others.

There are tests that distinguish the “cohesive” ones from the “non-cohesive” ones.

Among these tests (there are others):

- I. Substitution
- II. Movement
- III. Questions/Fragment answers

- Substitution

4. That author described his novel to the publisher yesterday

5a. That author described his novel to [him] yesterday

b. That author described [it] to the publisher yesterday

But this is not possible with non-cohesive substrings. Can you imagine substitutions for the underlined substrings?

6. That author described his novel to the publisher yesterday

- Movement

4. That author described his novel to the publisher yesterday →

7. His novel, that author described to the publisher yesterday

8. To the publisher, that author described his novel

Can you move the underlined substrings in (9):

9. That author described his novel to the publisher yesterday

- Substitution+Movement and Fragment answers
4. That author described his novel to the publisher yesterday
10. A: [What] did that author describe to the publisher yesterday?  
B: [his novel]
11. A: [Who] did the author describe his novel to yesterday?  
B: [the publisher]
12. A:.....?  
B: [novel to]

# “cohesive substrings” = “constituents”

Footnote:

- Constituency tests work fine but they are unidirectional:
- If they succeed, we know that the relevant substring is a constituent.
- If they fail, then either
  - The substring is not a constituent
  - The substring is a constituent but the test failed for a different reason.

(Can you think of examples of unidirectional tests outside linguistics?)

- So where are we?
- We have found evidence that grammar treats some substrings differently from others.
- Some substrings form “constituents”; others do not.
- H2 cannot capture this (H2: A sentence is an *ordered* collection of words.)
- We need something better than H2.

## How constituents are organized.

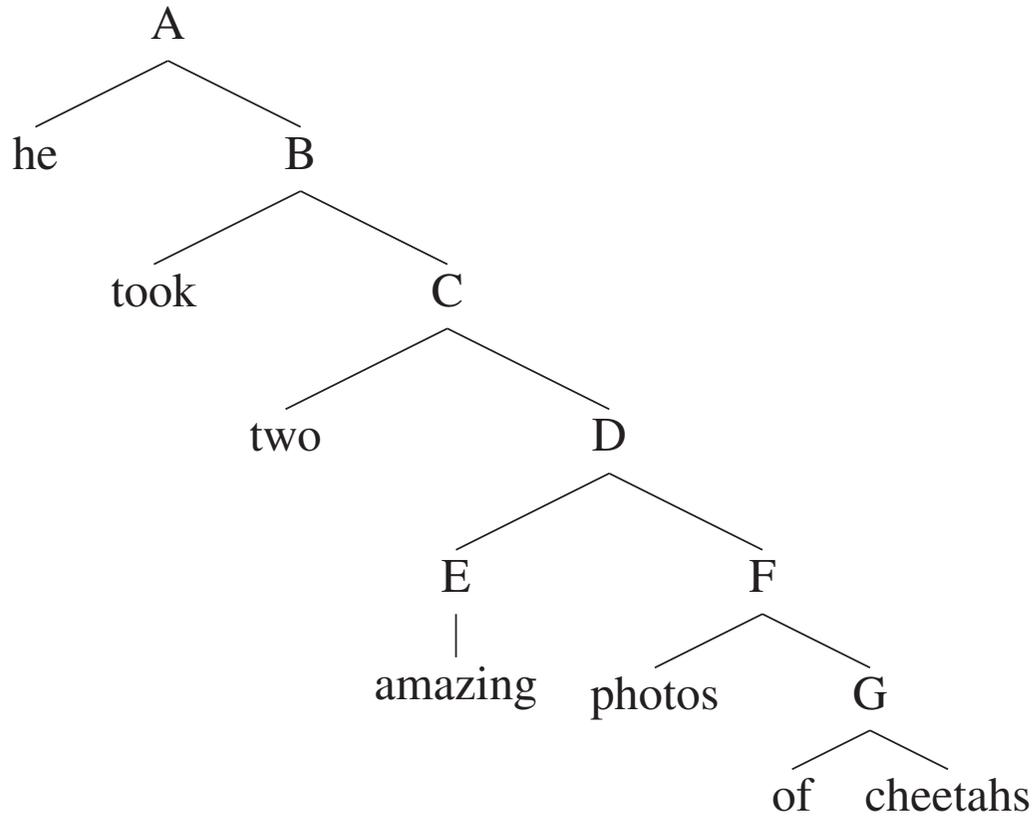
Constituents are always *nested*. That is, a constituent is fully contained in another constituent.

We never find partially overlapping constituents: \* [word 1 [ word 2] word 3]

When we apply constituency tests (the three that we have seen or others), there is always full containment:

13. [He took two amazing photos of cheetahs]  
[He] [took two amazing photos of cheetahs]  
[took] [two amazing photos of cheetahs]  
[two] [amazing photos of cheetahs]  
[amazing] [photos of cheetahs]  
[photos] [of cheetahs]  
[of] [cheetahs]

14.



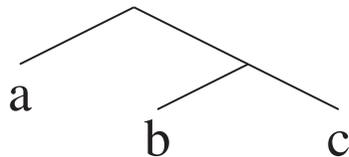
Every node (i.e. where there is a capital letter) corresponds to a constituent. Single words are trivially constituents as well.

# Some structural relations

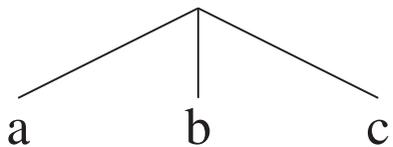
- Dominance: A node  $\alpha$  dominates a node  $\beta$  iff there is a descending path from  $\alpha$  to  $\beta$ .
- Mothers/Daughters/Sisters:
  - A node  $\alpha$  is the mother of a node  $\beta$  iff  $\alpha$  immediately dominates  $\beta$ .
  - $\beta$  is the daughter of  $\alpha$
  - $\alpha$  is the mother of  $\beta$
  - $\beta$  and  $\gamma$  are sisters iff  $\beta$  and  $\gamma$  have the same mother  $\alpha$ .
- Terminal nodes
  - A node  $\alpha$  is a terminal node iff  $\alpha$  has no daughters
- Exhaustive dominance
  - A node  $\alpha$  exhaustively dominates a string  $S$  iff
    - i.  $\alpha$  dominates every terminal  $t \in S$
    - ii. There is no terminal  $t' \notin S$  that  $\alpha$  dominates.
- Constituents
  - Constituents are strings that are exhaustively dominated by a single node.

- The trees we have seen so far are “binary branching”. This means that every mother has at most two daughters. We will adopt the hypothesis that branching is only binary.

That is, branching is always like this:



And never like this:



Question: Under which of these two trees is the string [b c] expected to behave like a constituent?

Answer: The top one because constituency is defined in terms of exhaustive domination.

So a syntactic tree is a binary branching tree. It is built by iteration of a structure-building operation which has been called “Merge”.

Merge takes two elements  $\alpha$  and  $\beta$ , and forms a single, binary branching constituent out of them.

$\alpha$  or  $\beta$  can be words, or themselves the output of an application of Merge.

In other words, Merge can form a single constituent out of

-two words

or

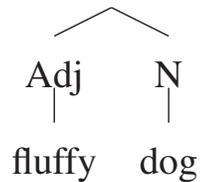
-a word and a constituent formed by a previous application of Merge

or

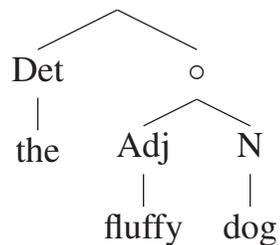
-two constituents formed by a previous application of Merge

# 15. The small cute cat played behind the fluffy dog

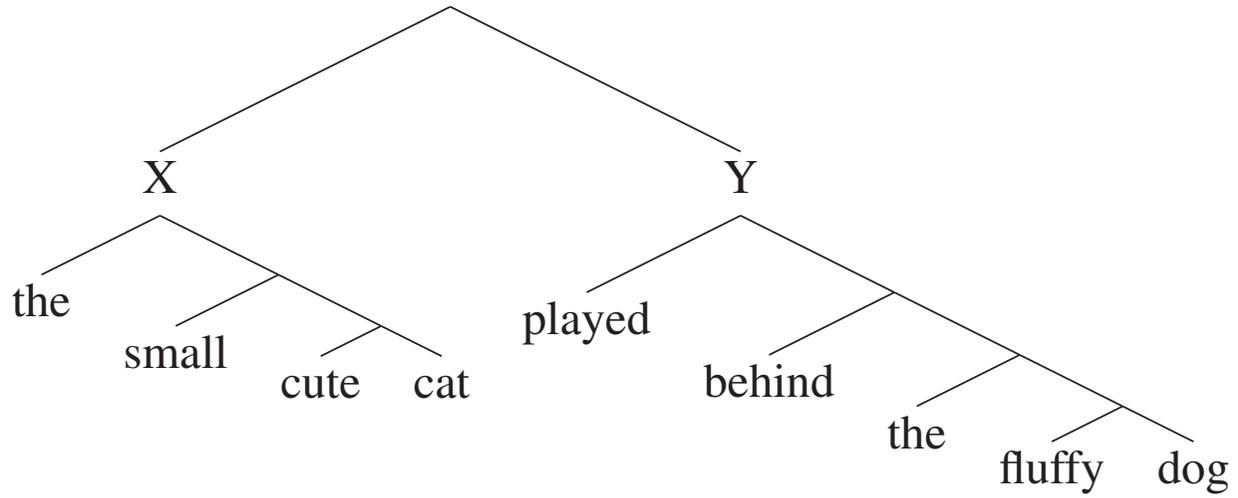
## a. Merge two words



## b. Merge a word with a constituent formed by a previous iteration of Merge

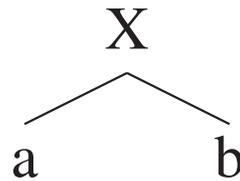


U . . . . . U



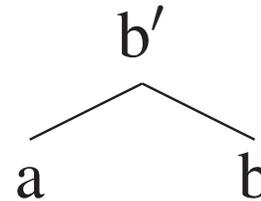
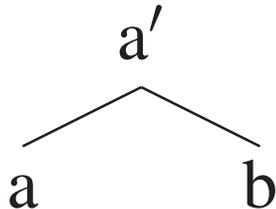
# And the names of the constituents formed by Merge?

Merge (a,b) →



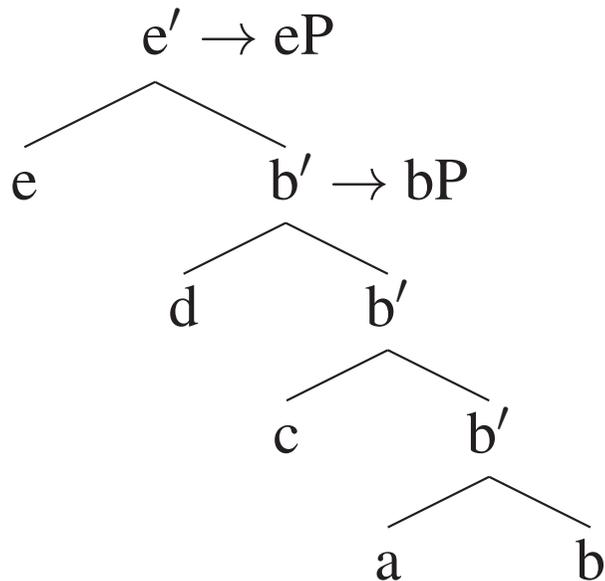
But what is X?

X will be a “projection” of either ‘a’ or ‘b’. That is, either ‘a’ or ‘b’ will pass on some of its properties (or features) to X.



Think of the x' notation as indicating that the “xness” of this constituent has been passed up to this node from somewhere else (lower, of course).

- So this is a possible tree:

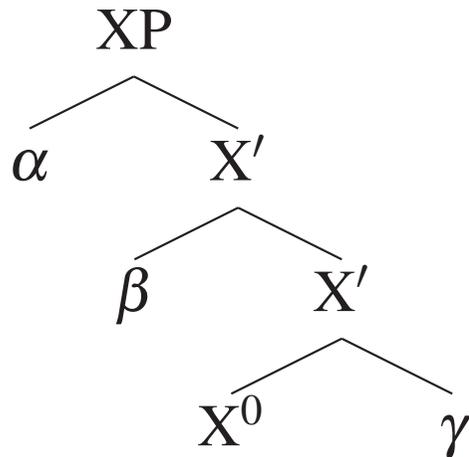


When the properties stop projecting to the next node up, we call the highest relevant projection “a maximal projection” or a “phrase”. So for example, when b stops projecting we have a ‘bP’ or a “b phrase”. Same for e: eP.

Ok, so what determines which node projects?

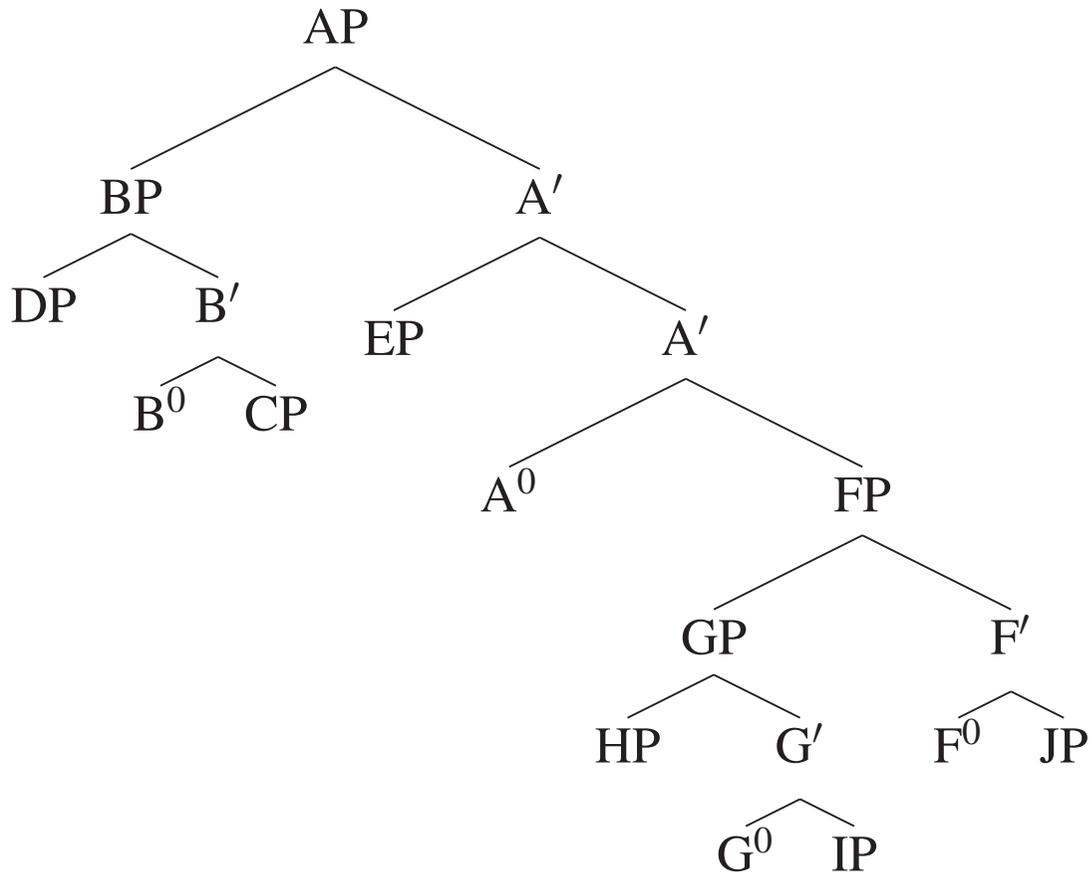
- Let's introduce the notion of 'head' of a phrase. First of all, a head is a terminal node (a word, or sometimes smaller than a word). That is, a set formed by the syntactic operation Merge cannot be a head.
- A constituent  $\alpha$  is headed by a terminal node  $x$  iff  $x$  determines the properties of  $\alpha$ .
- We will represent the head as  $X^0$ .  
The maximal projection as  $XP$ .  
All intermediate projections as  $X'$ .

# The X'-schema

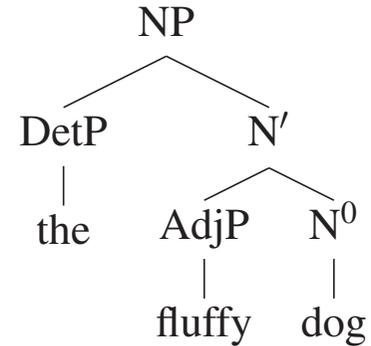
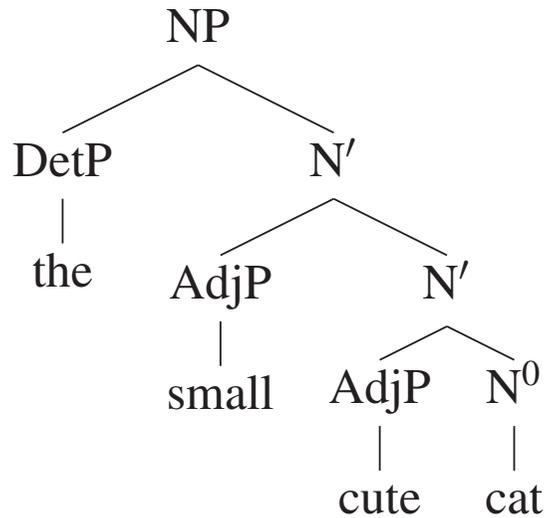


- $X^0$  is the head of the maximal projection XP.
- Ignore left/right: in principle,  $\alpha$  and/or  $\beta$  could just as well have been to the right of  $X'$ . Similarly,  $\gamma$  could have been to the left of  $X^0$ .
- There could in principle be many  $X'$ 's.
- What do we know about the status of  $\alpha$ ,  $\beta$  and  $\gamma$ ? They are maximal projections.
- We call the sister of  $X^0$  the “complement” of  $X^0$ . ( $\gamma$ )
- We call the sister of the highest  $X'$ , the specifier of the XP. ( $\alpha$ )
- If a merged constituent is neither the complement nor the specifier, it is an “adjunct”. ( $\beta$ )

# Let's practice...



- Here for example, are some NPs “noun phrases”



Why are the determiner and the adjectives represented as maximal projections? (DetP, AdjP)

Since they do not project further, they are definitionally XPs.

# Alert!!!

On the previous slide, I had the following representation:

|  
DetP  
|  
the

I could also  
have had  
this →

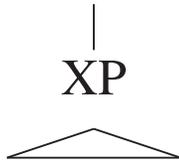
|  
DetP  
└───  
the

Both are sloppy and short  
ways of writing this:

|  
DetP  
|  
Det<sup>0</sup>  
|  
the

# Or for the general case:

a.



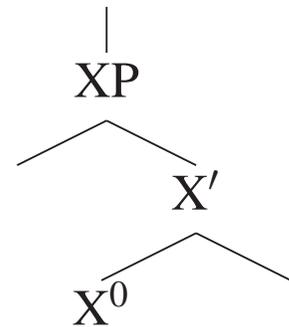
Instead of

b.



or

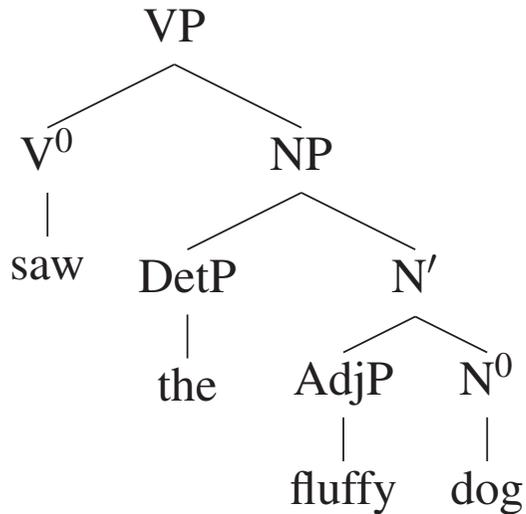
c.



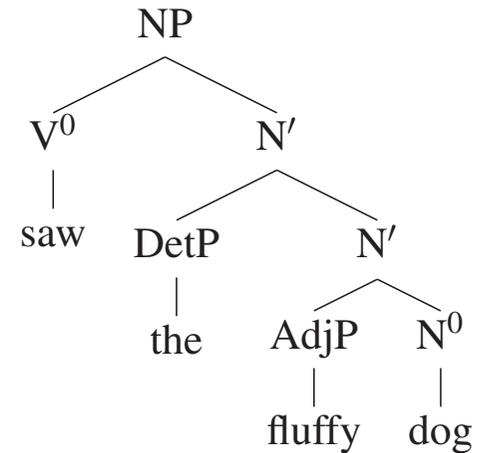
I am entitled to this practice but you are not!

You have to draw the full X' schema (b or c) so we know that you know it.

What happens when a verb merges with an NP?  
What projects? The verb? Or does the noun keep on projecting?



The verb projects



The noun projects

- Do you have an intuition?
- How can we make sure?  
Distributional tests.

The resulting constituent behaves like a VP, not like an NP.

For example, it cannot appear as a subject of a sentence, the way an NP can:

15a. [He] smiled

b. \*[Saw the fluffy dog] smiled

It cannot appear as an object either, the way an NP can:

16a. I like [him]

b. \* I like [saw the fluffy dog]

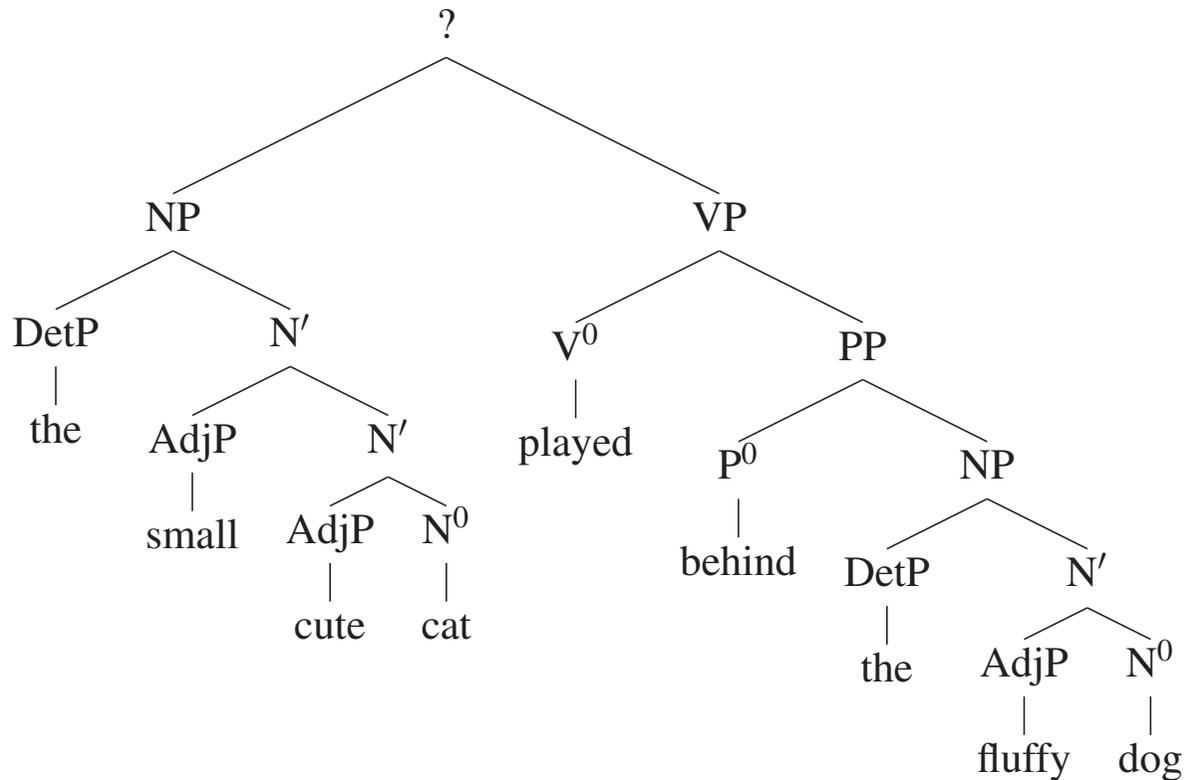
It can appear as a predicate, the way a verb (VP) can:

17a. He [left]

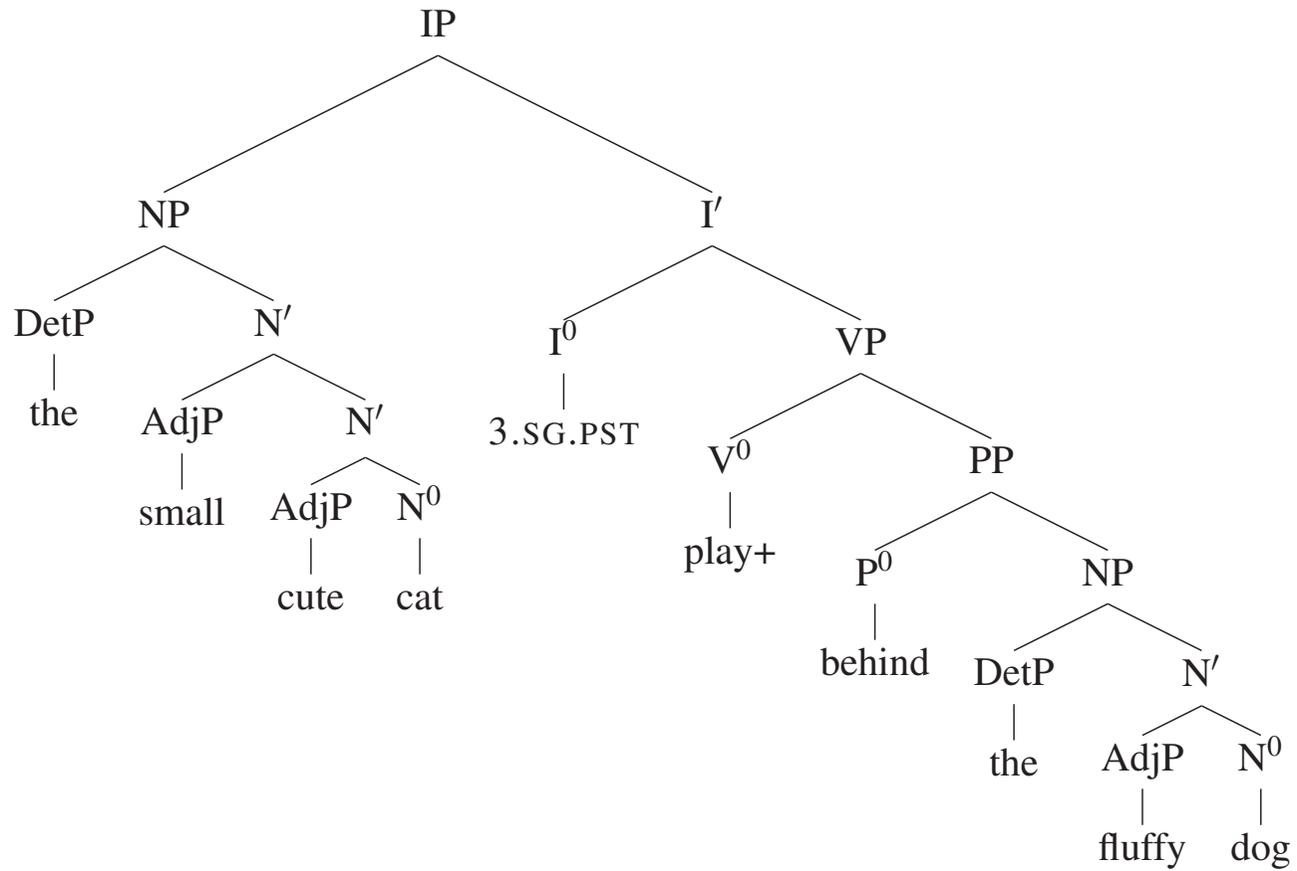
b. He [saw the fluffy dog]

Conclusion: the verb projects in the constituent [saw the fluffy dog].

- There are many distributional tests, of variable levels of sophistication, and they all point to the same conclusions. Our sentence is as follows:



- What about the topmost node, the node marked “?”?
- Another way of asking this question:
- What head is the sentence a maximal projection of?
- For the purposes of this class, you are asked to take it as a given that the sentence is the maximal projection of a head that carries the features for tense and subject agreement.
- We will call this head “I<sup>0</sup>” for “Inflection”
- In our sentence, we are dealing with
  - Past Tense
  - 3<sup>rd</sup> person singular



- The position that a sentence is the projection of an inflectional head  $I^0$  consists of two positions, in effect:
- A. Inflectional material like Tense and Agreement should be represented as a head separate from the verb, even though in all the sentences that we have seen so far, it appears with/on the verb:

18. The cat plays with the dog

19. \*The cat s play with the dog

- B. This (inflectional) head is the head of the entire sentence.

I have asked you to accept (B) as an axiom for this class.

But I *can* say a bit more about (A).

And I will.

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24.902 / 24.932 Language and its Structure II: Syntax  
Fall 2015

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