



# **Syntax & Semantics WiSe 2022/2023**

## Lecture 10: Government & Binding (GB) I

29/11/2022, Christian Bentz



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# Overview

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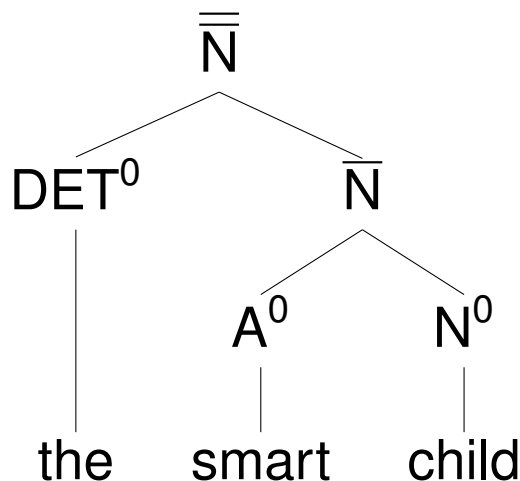
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## **Section 1: Recap of Lecture 9**



## The bar(s) in X-bar theory

The bar is simply a notational convention to indicate the **level or position of a symbol** in the phrase structure tree – in relation to the level of the symbol that it is dominated by.



### Equivalent Notations:

$\overline{\overline{N}} = NP$

$\overline{N} = NP \text{ or } N$

$N^0 = N \text{ (of terminal rewrite)}$

Note: The bars represent so-called *projection levels*. Level 0 (no bar), level 1 (one bar), level 2 (two bars).

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## Why do we need bars in the first place?

The solution to capture all the noun phrases discussed above is a set of rewrite rules using the bar notation:<sup>1</sup>

1.  $NP \rightarrow DET \bar{N}$
2.  $NP \rightarrow \bar{N}$ <sup>2</sup>
3.  $\bar{N} \rightarrow AP \bar{N}$ <sup>3</sup>
4.  $\bar{N} \rightarrow N$

Müller (2019). Grammatical theory, p. 64.

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<sup>1</sup>These rewrite rules also adhere to the binarization constraint but they wouldn't have to.

<sup>2</sup>This rule accounts for the fact that sometimes NPs don't have determiners, e.g. *smart children read books*.

<sup>3</sup>We have generalized A to AP here, since whole adjective phrases are also possible in these positions, e.g. *the very smart, very diligent child*.

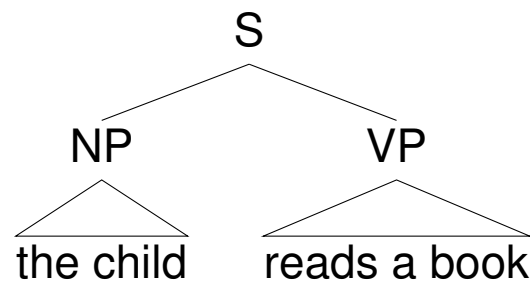


## The Sentence Level

In the early X-bar theoretic work by Chomsky in 1970 the highest level is represented by the *S* symbol as before in the phrase structure accounts of the 1950s and 60s. This symbol is later replaced by other symbols (see lecture on Government and Binding). We thus have the rule:

16.  $S \rightarrow NP VP$

Chomsky (1970), p. 211.



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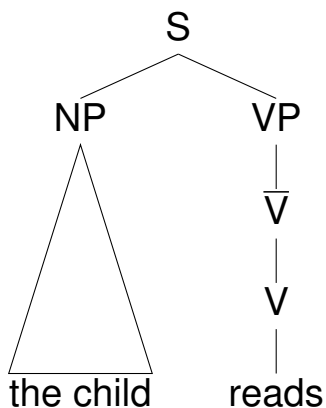
## The Verb Phrase: Intransitive

We might allow the VP to be rewritten simply into a  $\bar{V}$  at the *one-bar level*, and then into a head. This is the case of an *intransitive* usage. We would thus have the rules:

$$17. VP \rightarrow \bar{V}$$

$$18. \bar{V} \rightarrow V$$

See Carnie (2013), p. 173 rule 48.



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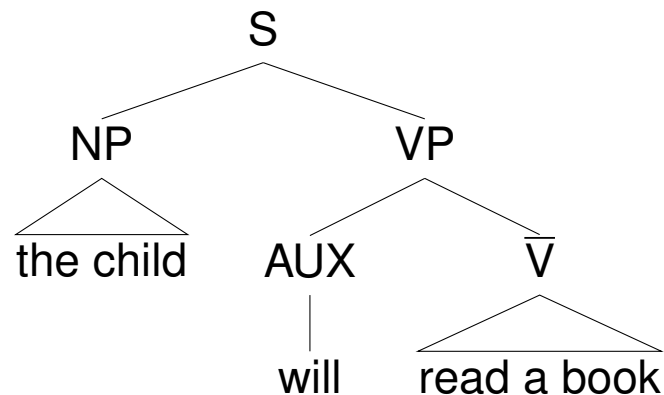


## The Verb Phrase: Auxiliary Verb

Within the VP, we might allow an auxiliary verb to occur (e.g. in English). We would thus have the rule:

$$19. VP \rightarrow AUX \bar{V}$$

Adopted from Chomsky (1970), p. 211.



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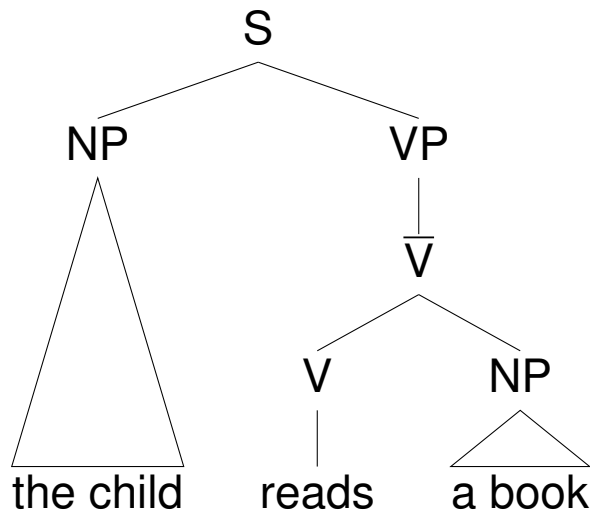


## The Verb Phrase: Transitives

We further assume that  $\bar{V}$  can be rewritten into a V-head with one NP, i.e. in the *transitive* usage:<sup>4</sup>

$$20. \bar{V} \rightarrow V NP$$

See Carnie (2013), p. 173 rule 50.



<sup>4</sup>How particular verbs select for one, two, or even three arguments is not accounted for in this simple framework. Also, Carnie (2013, p. 412) discusses the issue of ditransitives, and that this is not easily solved if we assume binary branching.

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## The Verb Phrase: Adjuncts

Finally, adjuncts can be added to the verb phrase *recursively* (at the level of  $\bar{V}$ ). These are mainly going to be adverbial (AdvP) or prepositional phrases (PP).

21.  $\bar{V} \rightarrow \bar{V} \text{ AdvP}$  (or  $\text{AdvP } \bar{V}$ )

22.  $\bar{V} \rightarrow \bar{V} \text{ PP}$

See Carnie (2013), p. 173 rule 49.

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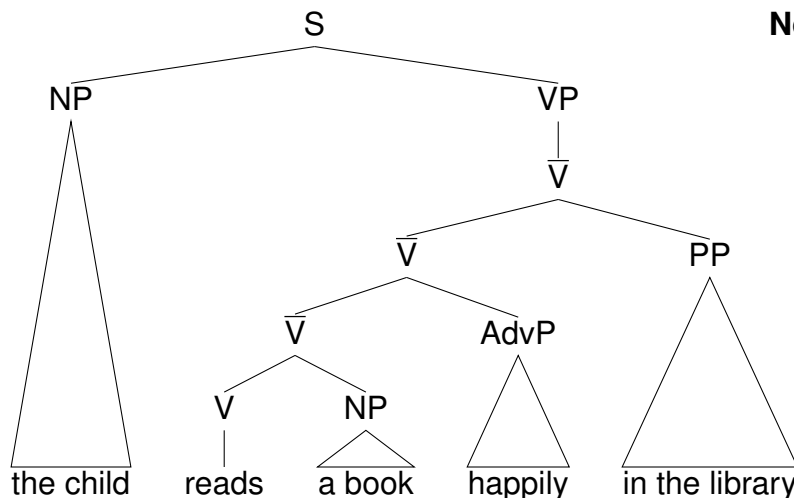
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### Notes:

- ▶ Arguably, recursiveness is justified in these rules since sentences of the type *the child reads a book happily, carefully, silently [...] in the library, on the top floor, at the desk to the right [...]* are grammatical (if maybe a bit odd).
- ▶ The order of AdvP and PP could be inverted according to the rules: *?the child reads a book in the library happily*.
- ▶ The AdvP could also precede the verb: *the child happily reads a book in the library*.



## Examples of $\bar{X}$ rules

### Rewrite Rules

1. **NP** → **DET**  $\bar{N}$
2. **NP** →  $\bar{N}$
3.  $\bar{N}$  → **AP**  $\bar{N}$
4.  $\bar{N}$  → **N**
5.  $\bar{N}$  →  $\bar{N}$  **PP**
6.  $\bar{N}$  → **N** **PP**
7.  $\bar{N}$  →  $\bar{N}$  **REL**
8. **PP** → **NP**  $\bar{P}$
9. **PP** → **AP**  $\bar{P}$
10. **PP** →  $\bar{P}$
11.  $\bar{P}$  → **P** **NP**
12. **AP** →  $\bar{A}$
13. **AP** → **AdvP**  $\bar{A}$
14.  $\bar{A}$  → **A** **PP**
15.  $\bar{A}$  → **A**

### Bar-notation:

1.  $\bar{\bar{N}} \rightarrow \overline{\overline{\text{DET}}}$ <sup>1</sup>  $\bar{N}$
8.  $\bar{\bar{P}} \rightarrow \bar{\bar{N}} \bar{\bar{P}}$
9.  $\bar{\bar{P}} \rightarrow \bar{\bar{A}} \bar{\bar{P}}$
13.  $\bar{\bar{A}} \rightarrow \overline{\overline{\text{Adv}}} \bar{\bar{A}}$

### X-bar rule:

$$\bar{\bar{X}} \rightarrow \overline{\overline{\text{specifier}}} \bar{\bar{X}}$$

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<sup>1</sup> Note that this means we need two more re-write rules, and hence have several unary branches for determiners: e.g.  $DP (\overline{\overline{\text{DET}}}) \rightarrow \overline{\overline{\text{DET}}} \rightarrow \text{DET} \rightarrow \text{the}$ .



## Examples of $\bar{X}$ rules

### Rewrite Rules

1.  $NP \rightarrow DET \bar{N}$
2.  $NP \rightarrow \bar{N}$
3.  $\bar{N} \rightarrow AP \bar{N}$
4.  $\bar{N} \rightarrow N$
5.  $\bar{N} \rightarrow \bar{N} PP$
6.  $\bar{N} \rightarrow N PP$
7.  $\bar{N} \rightarrow \bar{N} REL$
8.  $PP \rightarrow NP \bar{P}$
9.  $PP \rightarrow AP \bar{P}$
10.  $PP \rightarrow \bar{P}$
11.  $\bar{P} \rightarrow P NP$
12.  $AP \rightarrow \bar{A}$
13.  $AP \rightarrow AdvP \bar{A}$
14.  $\bar{A} \rightarrow A PP$
15.  $\bar{A} \rightarrow A$

### Bar-notation:

3.  $\bar{N} \rightarrow \bar{\bar{A}} \bar{N}$
5.  $\bar{N} \rightarrow \bar{N} \bar{\bar{P}}$
7.  $\bar{N} \rightarrow \bar{N} \bar{\bar{REL}}$

### X-bar rule:

- $$\bar{X} \rightarrow \overline{\text{adjunct } \bar{X}}$$
- or
- $$\bar{X} \rightarrow \bar{X} \overline{\text{adjunct}}$$

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# Examples of $\bar{X}$ rules

## Rewrite Rules

[...]

6.  $\bar{N} \rightarrow \mathbf{N PP}$

[...]

16.  $S \rightarrow NP VP$

17.  $VP \rightarrow \bar{V}$

18.  $\bar{V} \rightarrow V$

19.  $VP \rightarrow AUX \bar{V}$

20.  $\bar{V} \rightarrow \mathbf{V NP}$

21.  $\bar{V} \rightarrow \bar{V} AdvP$

22.  $\bar{V} \rightarrow \bar{V} PP$

etc.

## Bar-notation:

6.  $\bar{N} \rightarrow N \bar{\bar{P}}$

20.  $\bar{V} \rightarrow V \bar{\bar{N}}$

## X-bar rule:

$\bar{X} \rightarrow \mathbf{X \bar{\bar{complement}}}$

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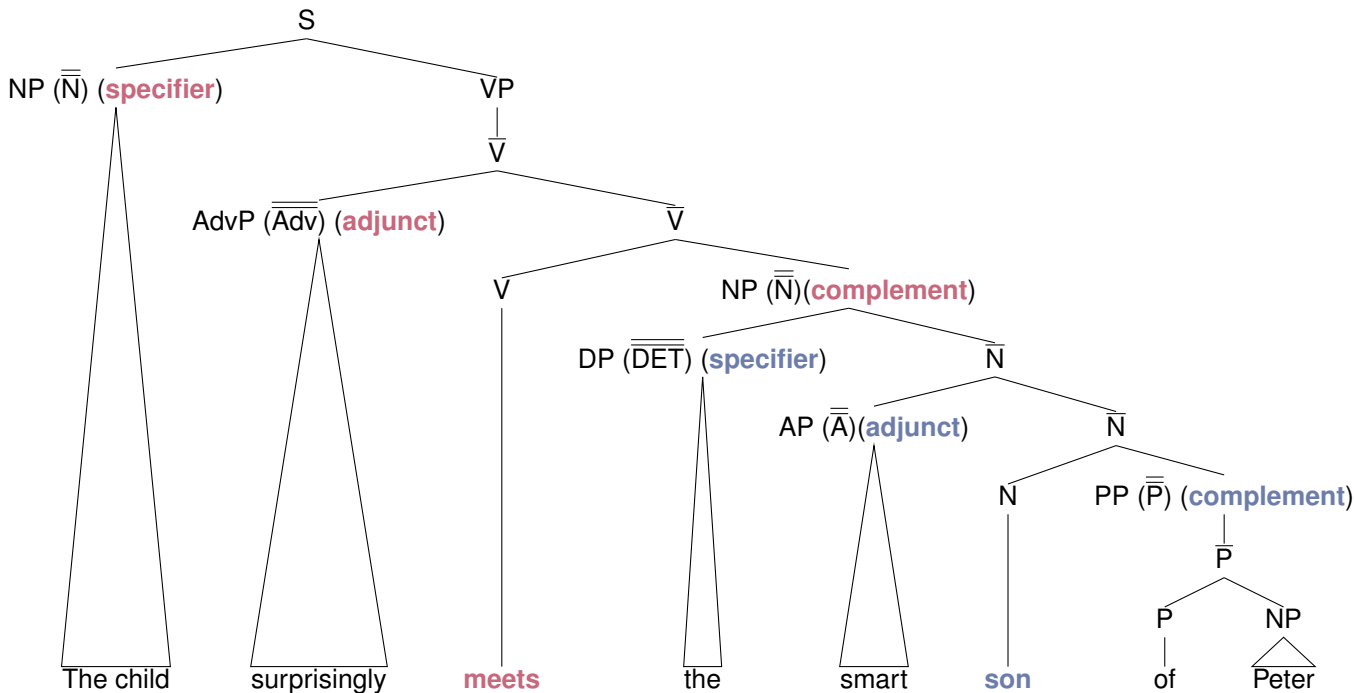
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## Example of Maximal $\bar{X}$ -Phrases



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Notice how the heads of these phrases (i.e. **meets** and **son**) can both have **specifiers**, **adjuncts**, and **complements**. So both full sentences and NPs can follow the same X-bar template. This only works here with a relational noun (*son of*) though. With other nouns (e.g. *book of*) we would consider the PP an adjunct.



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## **Section 2: Historical Notes**

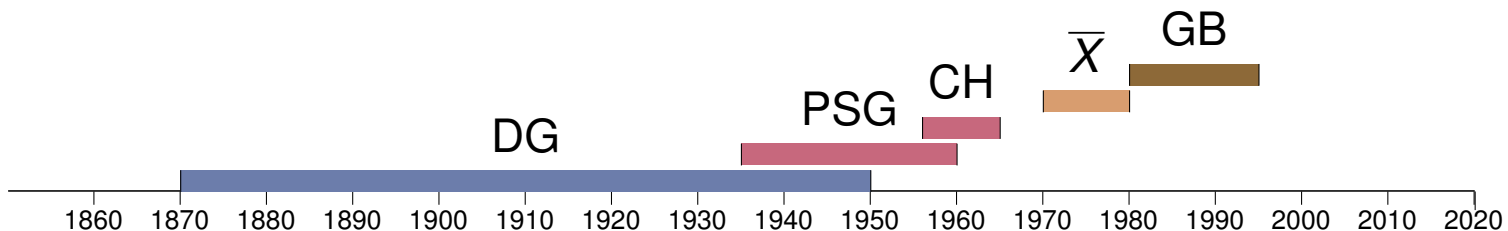




## Historical Perspective

“*Transformational Grammar* and its subsequent incarnations (such as Government and Binding Theory and Minimalism) were developed by Noam Chomsky at MIT in Boston (Chomsky 1957; 1965; 1975; 1981a; 1986a; 1995b). [...] The different implementations of Chomskyan theories are often grouped under the heading *Generative Grammar*. This term comes from the fact that phrase structure grammars and the augmented frameworks that were suggested by Chomsky can generate sets of well-formed expressions [...]”

Müller (2019). Grammatical theory, p. 83.



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“A more extensive discussion of certain of the more technical notions appears in my paper "On Binding" (Chomsky, 1980a; henceforth, OB). [...] I will consider a number of conceptual and empirical problems that arise in a theory of the OB type and will suggest a somewhat different approach that assigns a more central role to the notion of government; let us call the alternative approach that will be developed here a "government-binding (GB) theory" for expository purposes.”

Chomsky (1981). Lectures on government and binding, p. 1.

Noam Chomsky

# Lectures on Government and Binding

The Pisa Lectures

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## **Section 3: Basic Definitions**



## Additional Symbols in GB

Appart from the non-terminal symbols that we have introduced in the lectures on PSG and  $\bar{X}$  theory,<sup>5</sup> there are further symbols introduced within GB. These are in particular:

- ▶ *C*: *Complementizer* (subordinating conjunctions such as *that*)
- ▶ *I*: *Finiteness* (as well as Tense and Mood); also *Infl* for *Inflection* in earlier work, and *T* for *Tense* in more recent work.
- ▶ *D*: *Determiner* (article, demonstrative); though this is equivalent to the symbol DET that we used before.

Müller (2019). Grammatical theory, p. 95.

<sup>5</sup>Note that the transition from  $\bar{X}$  theory to GB is not clear cut, such that certain notational conventions can be found in both.

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## Projection Levels

“In  $\bar{X}$  theory, one normally assumes that there are at most two projection levels ( $X'$  and  $X''$ ). However, there are some versions of Mainstream Generative Grammar and other theories which allow three or more levels (Jackendoff 1977; Uszkoreit 1987).”

Müller (2019). Grammatical theory, p. 96.

- ▶  $X^0$ : same as before (symbol that leads to the terminal symbol).<sup>6</sup>
- ▶  $X'$ : intermediate projection (equivalent to  $\bar{X}$ )
- ▶  $XP$ : highest projection ( $X''$  or  $\bar{\bar{X}}$ )

<sup>6</sup>Müller calls this “head”. This is only true if we assume that each word by itself always constitutes a phrase that it is heading.

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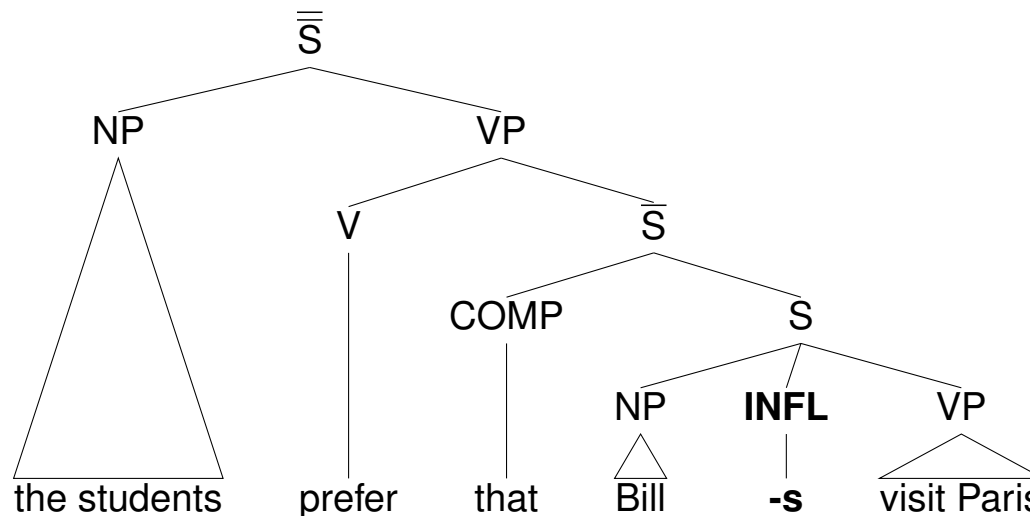


## The Inflection Symbol (I)

Chomsky introduces the inflectional symbol (as INFL) in the following sentence in bracket notation:

the students [<sub>VP</sub> prefer [<sub>S</sub> COMP [<sub>S</sub> Bill **INFL** [<sub>VP</sub> visit Paris]]]]

Chomsky (1981). Lectures on government and binding, p. 19.



Note: Don't worry about the tree notation here. For example,  $\bar{S}$  and COMP will later be replaced by  $\bar{C}$  and C.

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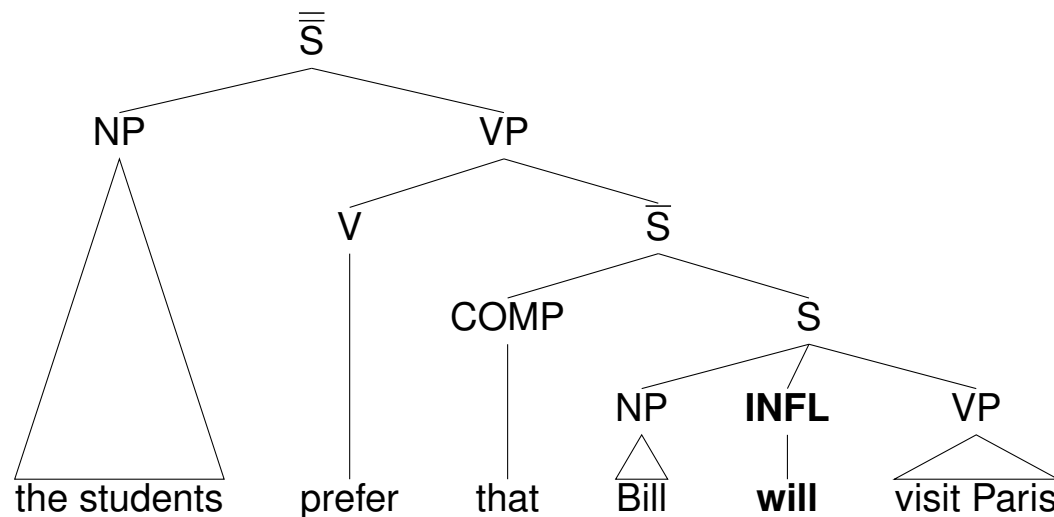
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## The Inflection Symbol (I)

The idea that INFL should be in this position, namely before the verb it is actually attached to in linear order, comes from the fact that (in English) auxiliary verbs also appear in this position, and these are the finite (i.e. inflected) elements of the sentence. Hence, both auxiliary and non-auxiliary constructions can be captured by the **same underlying tree structure**.



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## Important Take-Home-Message

As this example of inverted linear order (*-s visit*) shows, syntacticians – in the tradition of generative grammar – have grown accustomed to deviations between so-called **Deep Structure** (e.g. INFL VP) and **Surface Structure** (e.g. *visit-s*). This is seen as a necessary prerequisite for fitting all possible grammatical sentences of a given language into the same underlying mould.

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## Problem: Missing Inflections

In English, the third person plural *-s* is highly regular, i.e. attaching to any verb stem for ensuring agreement. Similarly, in German, the third person *-t* attaches to the (sometimes modified) verb stem. But how about languages where these inflections *do not exist* (e.g. Mandarin Chinese)?

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English  
(eng, Indo-European)

read-**s** (read)  
speak-**s** (speak)  
see-**s** (see)  
go-**es** (go)

Mandarin Chinese  
(cmn, Sino-Tibetan)

dú (dú)  
shuō (shuō)  
kàn (kàn)  
qù (qù)



## Problem: Irregulars

What about languages in which the finite forms are derived from roots in *more complicated ways* (e.g. template morphology in Standard Arabic)?

(p.c. Hebah Ahmend)

قِرَاءَةٌ	تَقْرَأُ	يَقْرَأُ
qira'atan	tagra'	yagra'
Infinitive	Feminine	Masculine

تَحَدَّثُ	تَتَحَدَّثُ	يَتَحَدَّثُ
tahaDuthan	tatahDath	yatahDath
Infinitive	Feminine	Masculine

رُؤْيَةٌ	تَرَى	يَرَى
ru'yatan	tara	yara
Infinitive	Feminine	Masculine

ذَهَابًا	تَذْهَبُ	يَذْهَبُ
thahaban	tathhab	yathhab
Infinitive	Feminine	Masculine

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## Problem: Language Diversity

We can make adhoc assumptions to save our template, e.g. positing empty elements (e.g.  $INFL \rightarrow \epsilon$ ) in languages (or particular sentences) where the inflectional category does not seem to exist. However, notice that we here essentially shoehorn a language into a structural analysis template that was developed for English.

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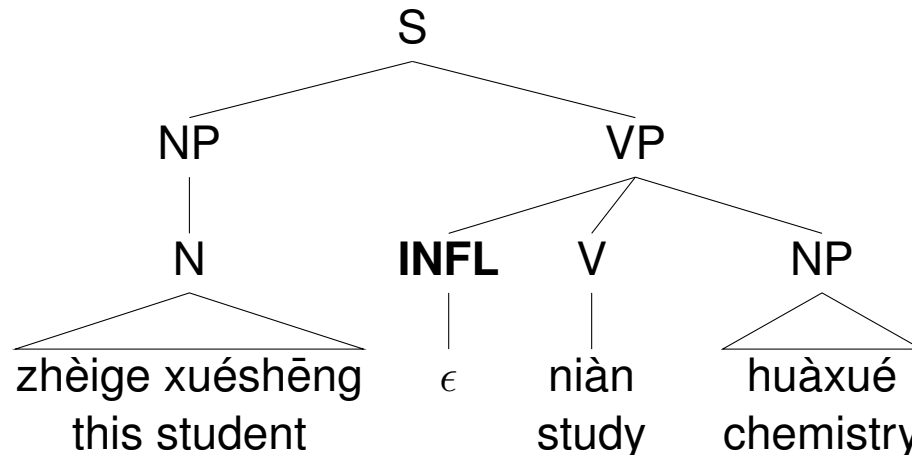
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Mandarin Chinese (cmn, Sino-Tibetan)



Sackmann (1996), p. 261.



## Back To English

If we accept the inflectional symbol as a fact of our rewrite rules then they need to be extended in the following way:

1.  $S \rightarrow NP \text{ INFL } VP$

Müller (2019). Grammatical theory, p. 96.

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## The CP and IP (and VP)

Instead of the *S* symbol, Chomsky introduced the **Complementizer Phrase (CP)** and the **Inflectional Phrase (IP)** as layers *above* the verb phrase such that:

1. **CP** → C'
2. CP → NP C'
3. C' → C IP
4. IP → NP I'
5. I' → I VP
6. VP → V'
7. V' → V **CP**
8. V' → V' AdvP
9. V' → V' PP
10. V' → V
11. V' → V NP
12. NP → DET N'
13. etc.

See lecture on X-bar theory for further rules dealing with the NPs, APs, AdvP, and PPs.

**Notes:** We have seen examples of *local recursion* within the same re-write rule before (e.g.  $\bar{N} \rightarrow A\bar{N}$ ). Here we see, *recursion over several re-write rules*, e.g. CP occurs on the left hand side of rule number 1, and then further “downstream” on the right-hand side of rule number 7. This allows for sentences like “I know that she thinks that I think that [...]”

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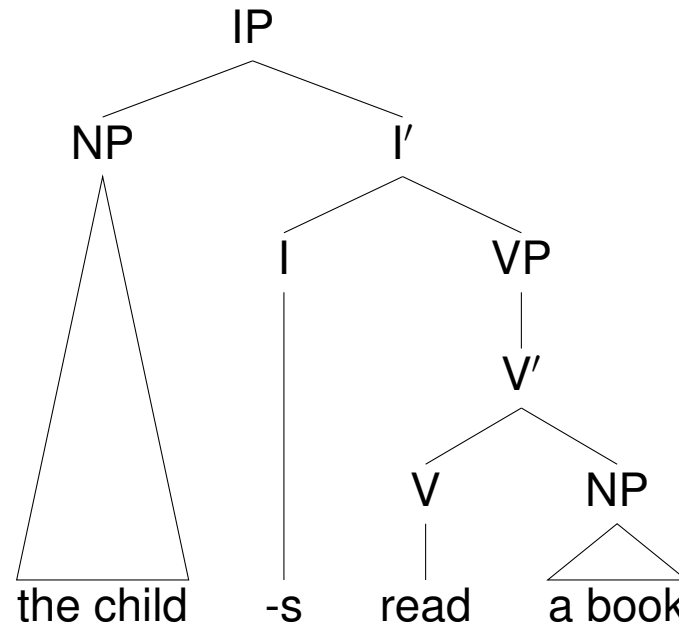
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## Inflectional Phrase

Just as in X-bar theory, we have unary branches from highest level projections to intermediate level projections if there are no other elements involved in the phrase (e.g.  $VP \rightarrow V'$ ). Also, the subject (the child) is considered the **specifier** of the IP (often referred to as SpecIP), and the object *a book* is the **complement** of the IP.



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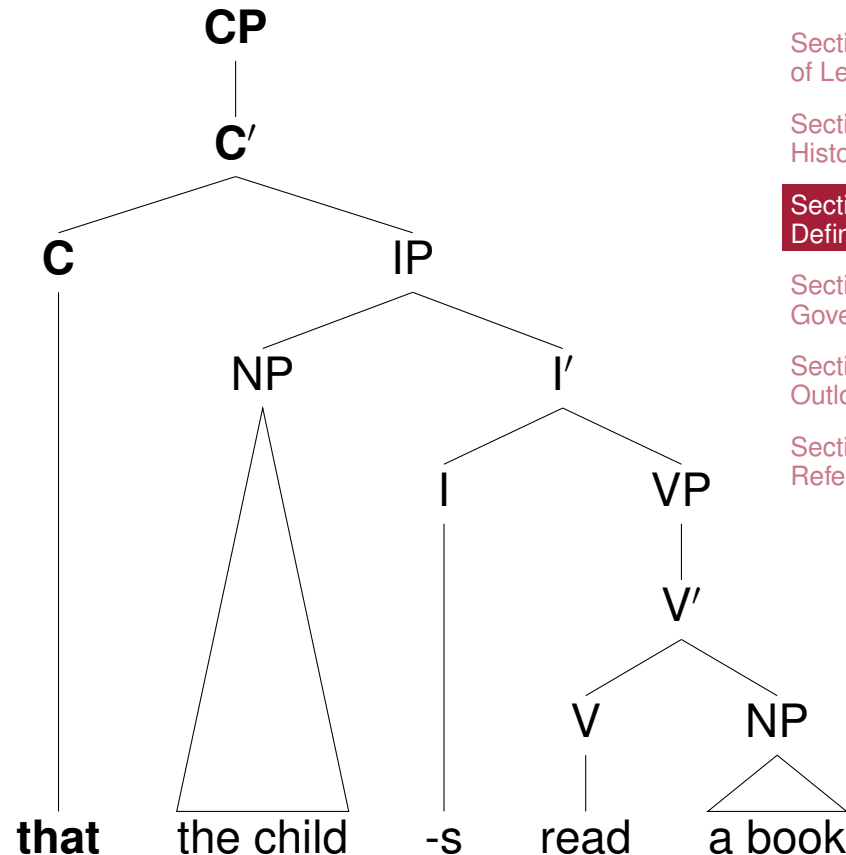
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## Complementizer Phrase

The CP is yet another level above the VP. It is relevant when a complementizer is used, but also for other syntactic phenomena, as we will see in the next section.

Note: The IP symbol essentially replaces the starting symbol S in GB analyses. Of course, we could keep the starting symbol and rewrite it into IP, but this would be somewhat redundant.



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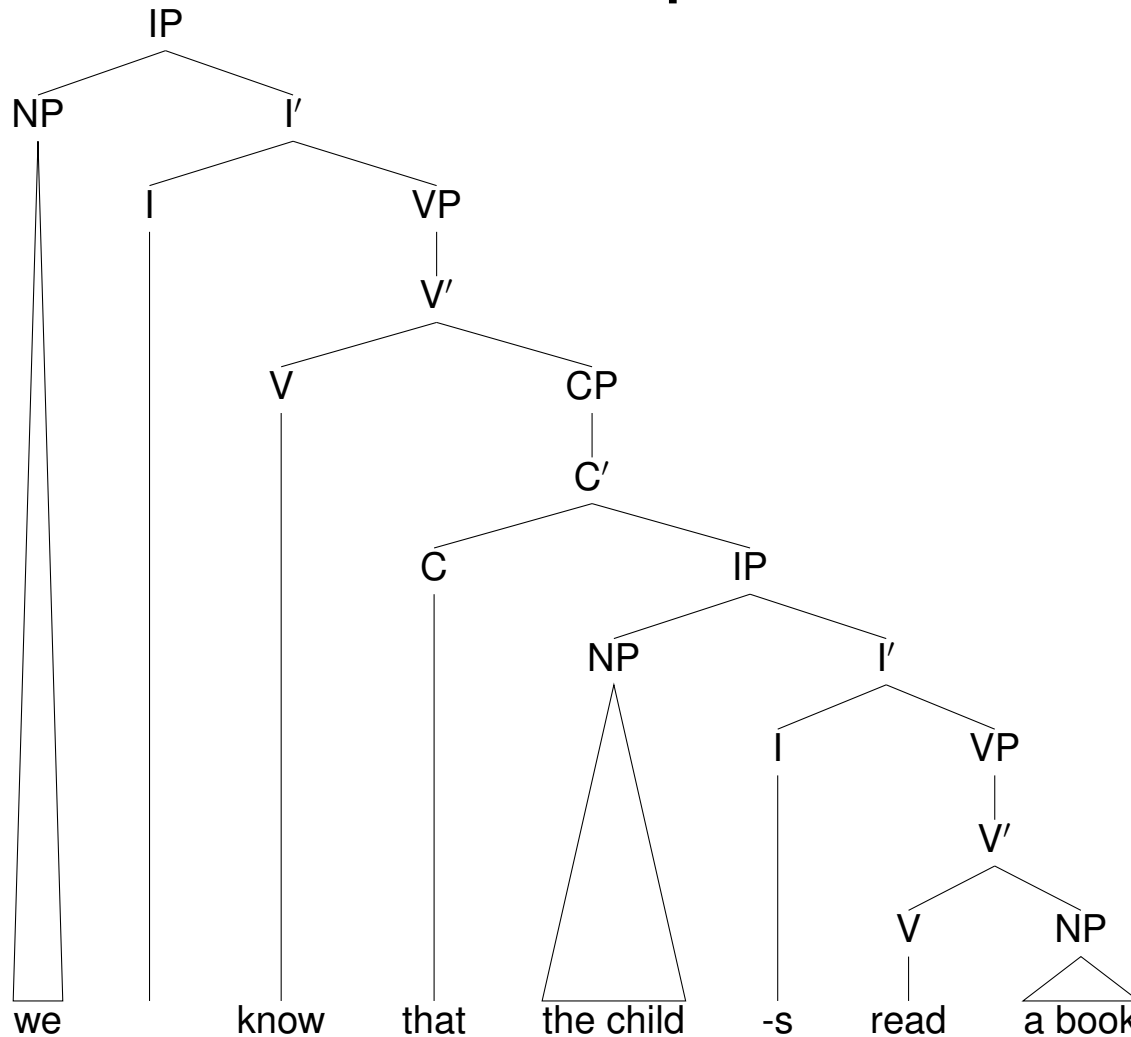
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## Full Example



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# Movement

“Since the inflectional affix precedes the verb [in deep structure], some kind of **movement operation** still needs to take place [to derive the actual surface structure]. There are two suggestions in the literature: one is to assume lowering, that is, the affix moves down to the verb [...]. The alternative is to assume that the verb moves up to the affix [...] I [...] assume that the verb moves from V to I in English [...]”

Müller (2019). Grammatical theory, p. 100.

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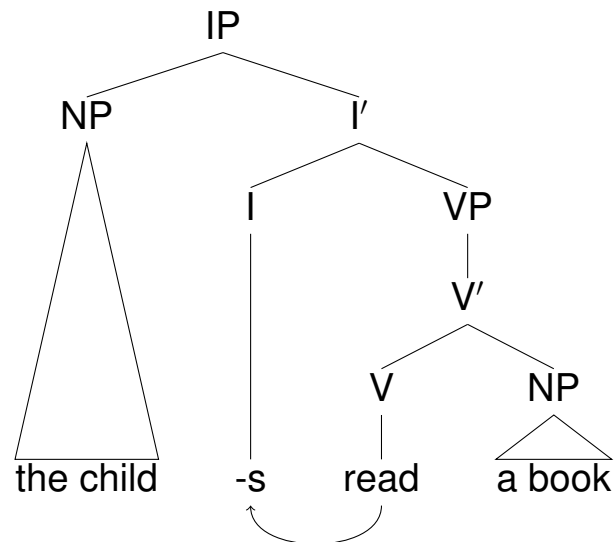
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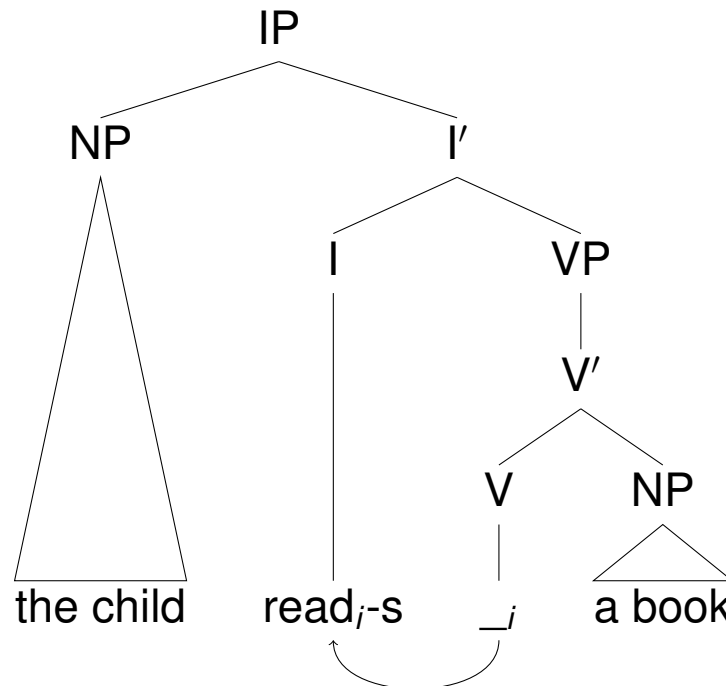
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# Trace

When an element moves into another position in the tree, it leaves a so-called **trace** in the position where it was before. The trace is an empty element that is typically marked by an underscore <\_> and an index (often starting with *i*, *j*, and *k*, etc. for further traces) which is then also found on the moved element.



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# Notation Glossary

A: adjective

AP: adjective phrase

Adv: adverb

AdvP: adverbial phrase

C: complementizer (i.e. *that*)

D: determiner

I: finiteness or inflection

IP: inflectional phrase

N: noun

NP: noun phrase

P: preposition

PP: prepositional phrase

PRON: pronoun

REL: relative clause

V: verb

VP: verb phrase

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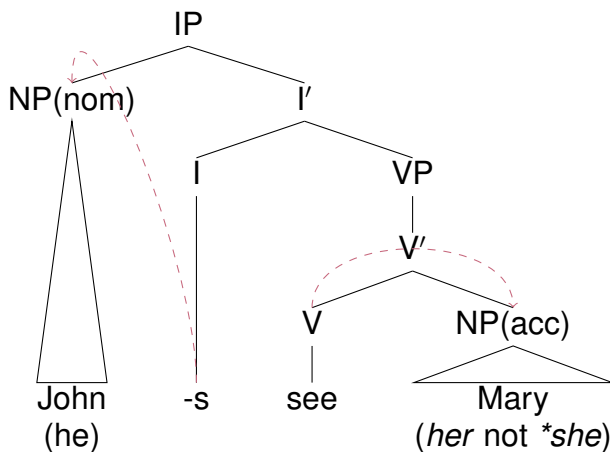
## **Section 4: Government**



## Definition: Case Principle

- ▶ V assigns objective case (accusative) to its complements if it bears structural case.<sup>7</sup>
- ▶ When finite, INFL assigns case to the subject.

Müller (2019), p. 111.



<sup>7</sup>Note: The difference between *structural case* and *lexical case* is discussed in Müller (2019), p. 109-110. However, it is generally controversial whether such a distinction is actually valuable, or if all case should be considered lexical case.

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## Further Case Assignments

Arguably, cases are also assigned by prepositions to the NPs they head.

Black (1999), p. 36-37.

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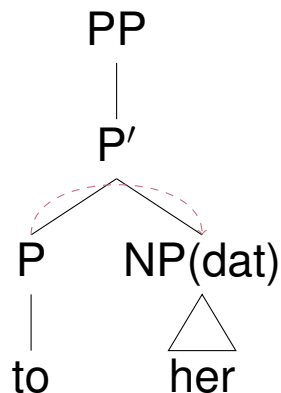
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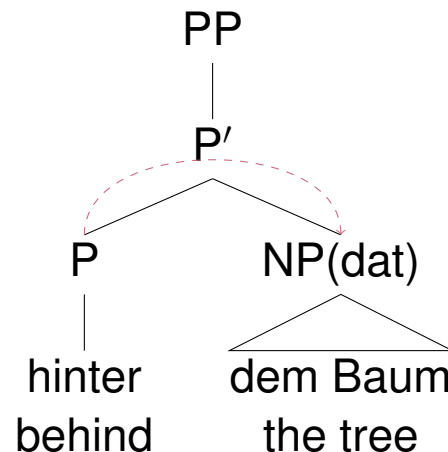
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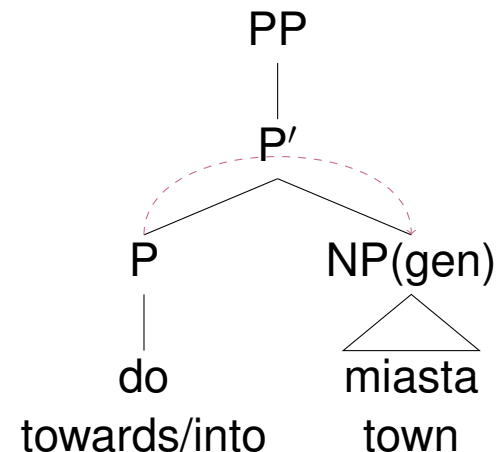
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## Case Assignment

A question arising here is: what is the position (in the tree structure) of an element which assigns case in relation to an element which receives case? Black (1999, p. 37) states that: “every **maximal projection (XP)** that dominates the NP that receives Case also dominates the head that assigns it [...]”. The definition of Government then captures this generalization.

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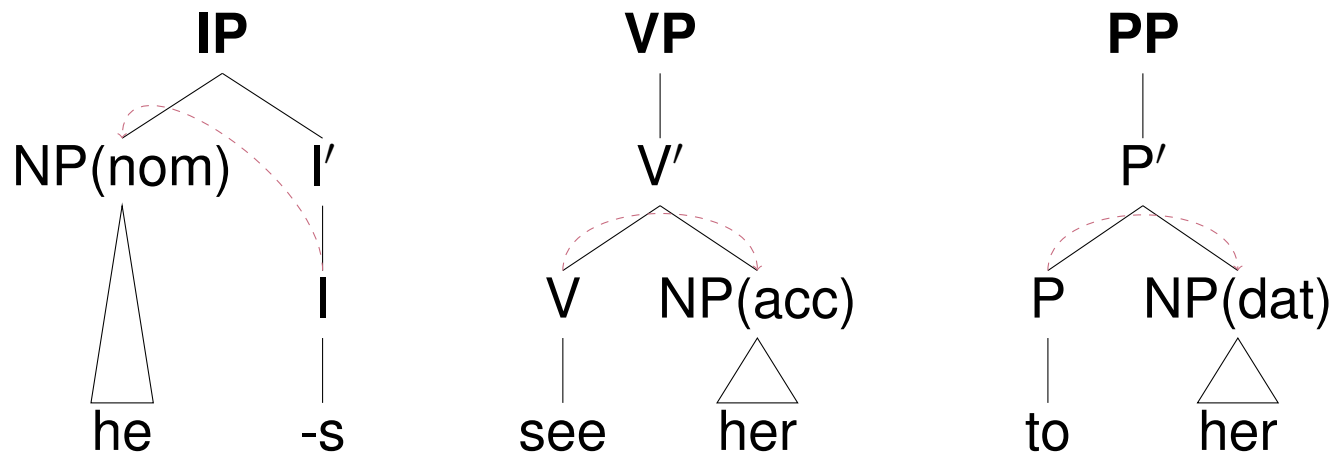
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## Definition: Government

$\alpha$  GOVERNS  $\beta$  iff

- (i)  $\alpha$  is a head, and
- (ii) every XP that dominates  $\alpha$  also dominates  $\beta$ , and
- (iii) every XP (other than IP) that dominates  $\beta$  also dominates  $\alpha$

Black (1999), p. 37.

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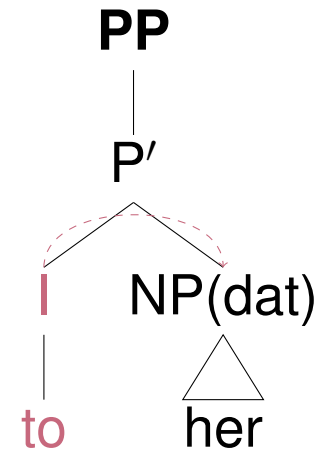
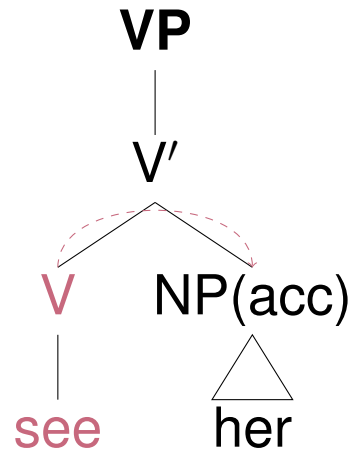
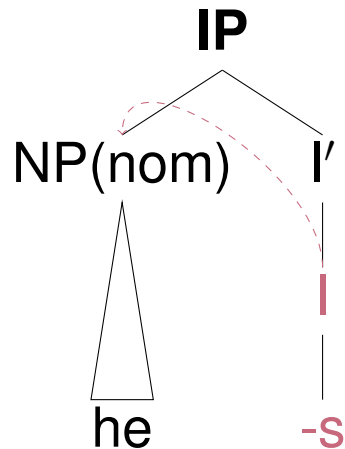
- ▶ The term *dominates* means that a certain element is the mother-node (or higher up in the tree, i.e. the mother-node of a mother-node, etc.) of another element.
- ▶  $\alpha$  and  $\beta$  here represent single non-terminals (called “categories” by Black (1999)).
- ▶ There are several alternative definitions of *Government* depending on which terminology is used (XP, c-command, etc.). See for example Chomsky (1981, pp. 162). We follow this particular definition by Black (1999) here since it dovetails with the terminology used in this lecture so far.





## Clause (i)

This clause determines one of the elements ( $\alpha$ ) is the **head**. Only the head can govern the other element (and assign case to it).



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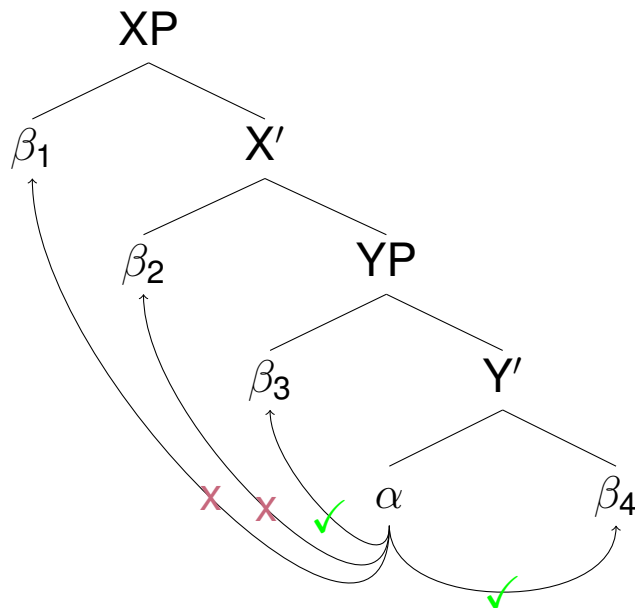
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## Clause (ii)

This clause can be seen as an **upper limit**, i.e. *how high up the tree*  $\alpha$  can govern.



**Note:**  $\alpha$  can govern  $\beta_3$  and  $\beta_4$ , but it cannot govern  $\beta_1$  or  $\beta_2$  (since  $YP$  dominates  $\alpha$  but not  $\beta_1$  or  $\beta_2$ ). In fact, most of the time when government is relevant, it occurs between two elements which have the same mother node.

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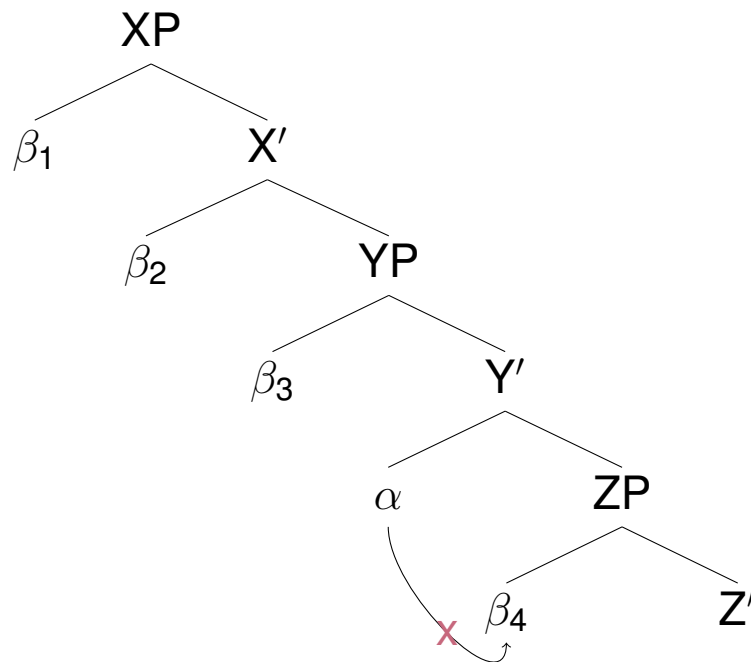
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## Clause (iii)

This clause can be seen as a **lower limit**, i.e. *how far down the tree*  $\alpha$  can govern.



**Note:** In general,  $\alpha$  cannot govern into the next lower phrase (ZP here), since this lower level phrase will not dominate  $\alpha$ . However ...

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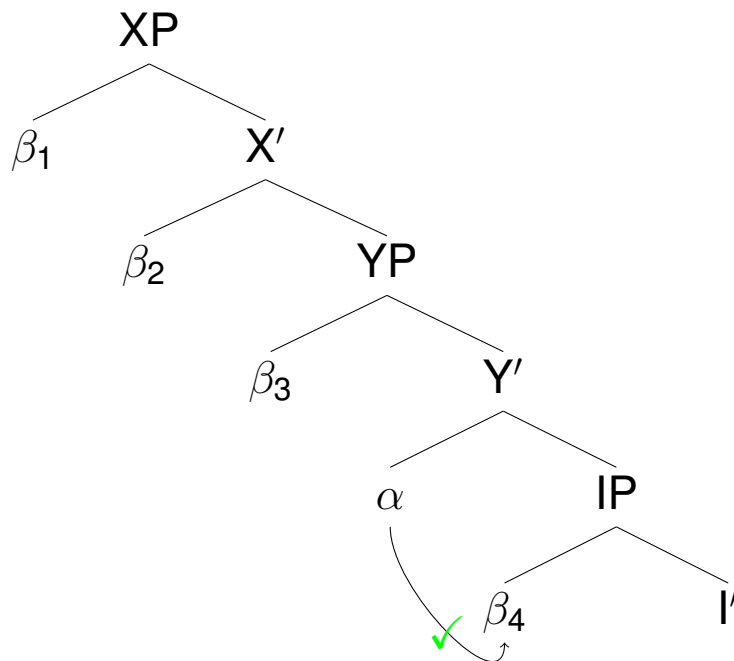
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## Clause (iii)

This clause can be seen as a **lower limit**, i.e. *how far down the tree*  $\alpha$  can govern.



**Note:** ... if the next lower level phrase is an IP, than  $\alpha$  can govern into it. This is why we have the additional condition in parentheses “(other than IP)”. In Black (199, p. 38) it is argued that this is necessary for dealing with structures like “He wants for her to read” (see full example below).

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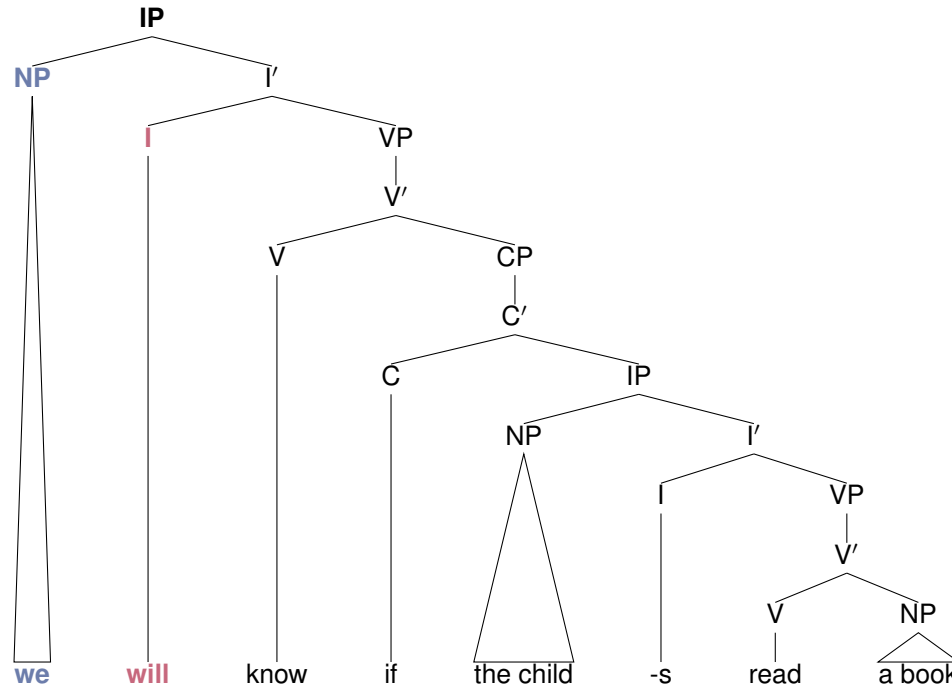
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## Example



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Does **I (will)** govern the **NP (we)**? – **Yes.**

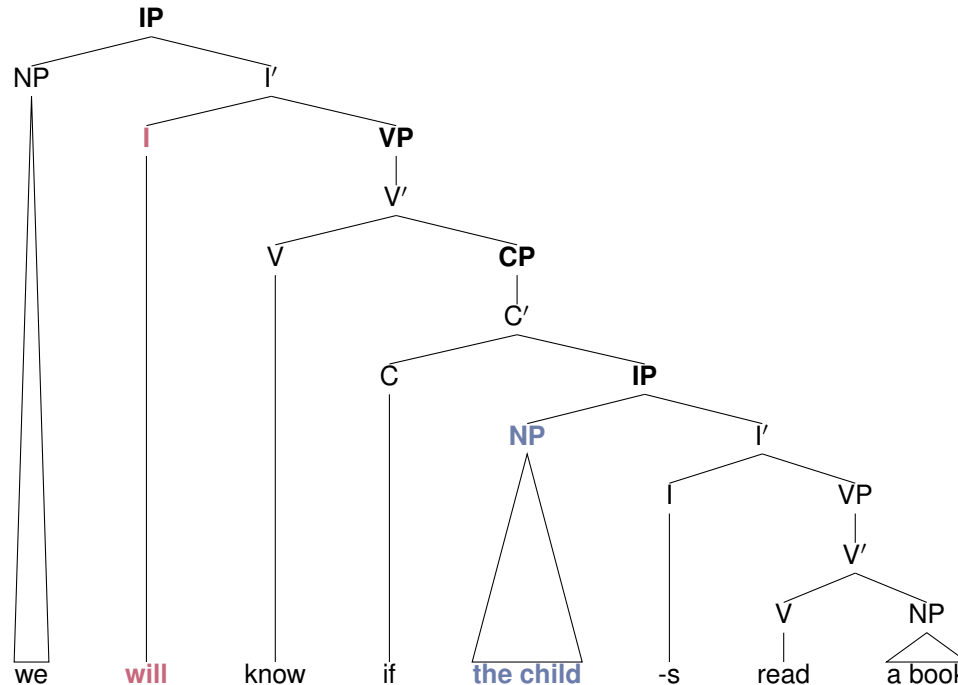
(i)  $\alpha$  is a head ✓

(ii) every XP that dominates  $\alpha$  also dominates  $\beta$  ✓

(iii) every XP (other than IP) that dominates  $\beta$  also dominates  $\alpha$  ✓



## Example



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Does **I (will)** govern the **NP (the child)**? – No.

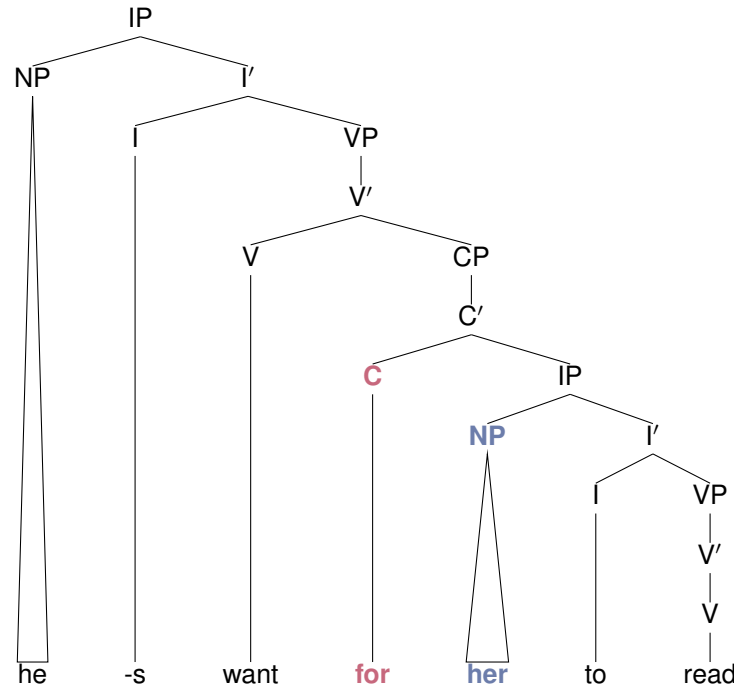
(i)  $\alpha$  is a head ✓

(ii) every XP that dominates  $\alpha$  also dominates  $\beta$  ✓

(iii) every XP (other than IP) that dominates  $\beta$  also dominates  $\alpha$  ✗



## Example



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Does **C (for)** govern the **NP (her)**? – **Yes.**

(i)  $\alpha$  is a head ✓

(ii) every XP that dominates  $\alpha$  also dominates  $\beta$  ✓

(iii) every XP (other than IP) that dominates  $\beta$  also dominates  $\alpha$  ✓



## Take-Home-Message

In the vast majority of cases, the term *government* is used in connection with *case assignment* between

1. an **inflectional category I** (e.g. *will*) and its **specifier** (e.g. the subject in nominative case),
2. a **verb head** (e.g. *read*) and its **complement**, (e.g. an object like *a book* in accusative/dative case).

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## Some Problems

- ▶ It is unclear what exactly the relationship between *case assignment* and *government* is. Is government a more general principle which in some cases leads to case assignment? Is government supposed to “explain” case assignment?
- ▶ A more technical problem is that *government* (at least in the current definition) does not hold between terminal (or pre-terminal) symbols. That is, we cannot say that *will* governs *we* in the example *we will know [...]*. Notice that *we* is itself an NP which does not dominate *will*, such that clause (iii) would fail. Hence, case assignment can only work between some governor and a XP, e.g. NP. It is unclear how this case then gets assigned to the elements further down the branches.

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## Section 5: Outlook



# Outlook: Government and Binding II

- ▶ Binding Theory
  - ▶ Definition of Binding
  - ▶ C-command
  - ▶ Problems with Binding Theory
  
- ▶ Syntactic Phenomena
  - ▶ Verb Position
  - ▶ Question Formation
  - ▶ Fronting
  - ▶ The Passive
  
- ▶ The T-Model

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## Section 6: References



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# Thank You.

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