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Syntax & Semantics WiSe 2022/2023

Lecture 11: Government & Binding (GB) II

01/12/2022, Christian Bentz

Overview

Q&As Tutorial 5

The solution to exercise 2 on the Chomsky hiearchy seems invalid. If you have a rule $A \rightarrow aa$, and then $aa \rightarrow AA$, then you can also generate a string aaaaaa with this (not just a^{2^n}):

A
aa
AA
aaA
aaaa
AAaa
aaaaaa

This is true, I implicitely assumed that the second rule would be consistently used for all *aa* combinations, whenever possible. But this is not strictily necessary. A better solution is given on the next slide.

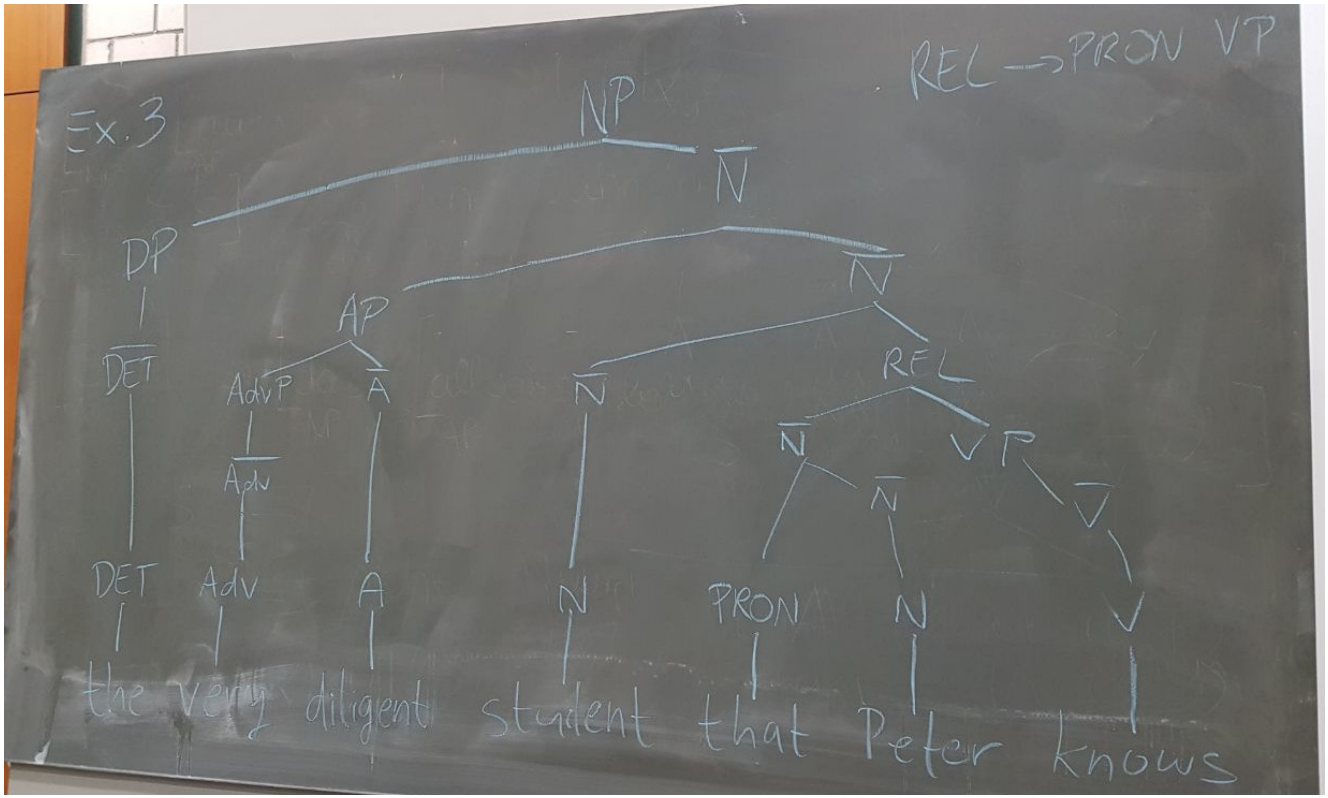
Set of rules generating a^{2^n} sequences:

1. A $\rightarrow$ BB
2. BB $\rightarrow$ AA
3. B $\rightarrow$ aa

Note that we still need the additional rule that before you apply the terminal rewrite rule (3.), you have to have finished applying the non-terminal rewrite rules (1. and 2.).

Q&As Tutorial 5

In Ex 3. there were two different rules (REL $\rightarrow \overline{N}$ VP and REL $\rightarrow$ PRON VP) given between the exercise and the solution for the X-bar tree example. Would the following tree be a possible solution?



No, this would not be valid. Note that you have a recursive rule $\overline{N} \rightarrow$ PRON $\overline{N}$ here. Which would allow derivations like: *student that that that [...] Peter knows*. Peter, as the subject of *knowing*, has to be inside the VP here.

Section 1: Recap of Lecture 10

Additional Symbols in GB

Appart from the non-terminal symbols that we have introduced in the lectures on PSG and $\overline{X}$ theory,[1] there are further symbols introduced within GB. These are in particular:

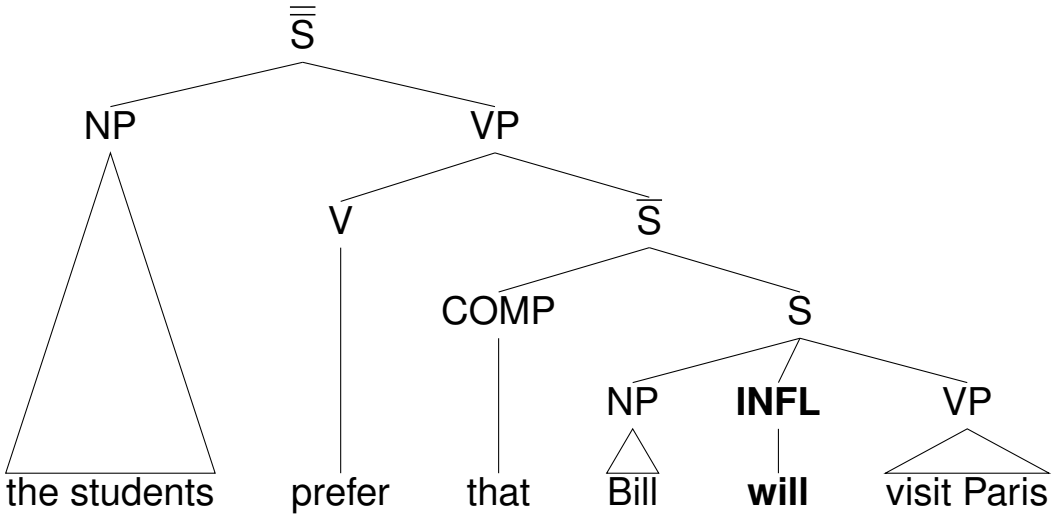
- C: *Complementizer* (subordinating conjunctions such as *that*)
- I: *Finiteness* (as well as Tense and Mood); also *Infl* for *Inflection* in earlier work, and *T* for *Tense* in more recent work.
- D: *Determiner* (article, demonstrative); though this is equivalent to the symbol DET that we used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

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

[1] Note that the transition from $\overline{X}$ theory to GB is not clear cut, such that certain notational conventions can be found in both.

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**.



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.

The CP and IP (and VP)

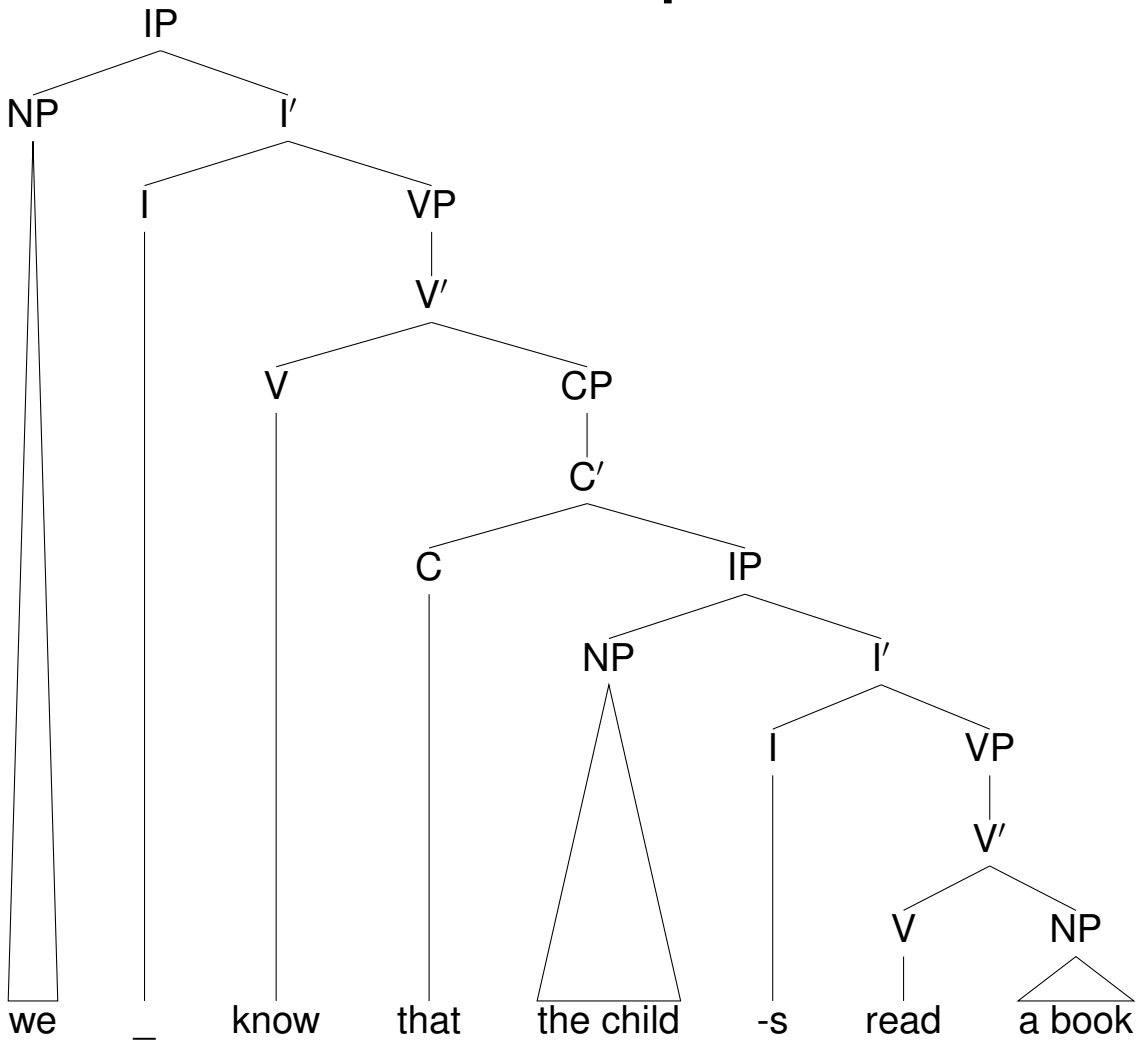
Instead of the *S* symbol, Chomsky introduced the **Complementizer Phrase (CP)** and the **Inflectional Phrase (IP)** as layers *above* the verb phrase such that:

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

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

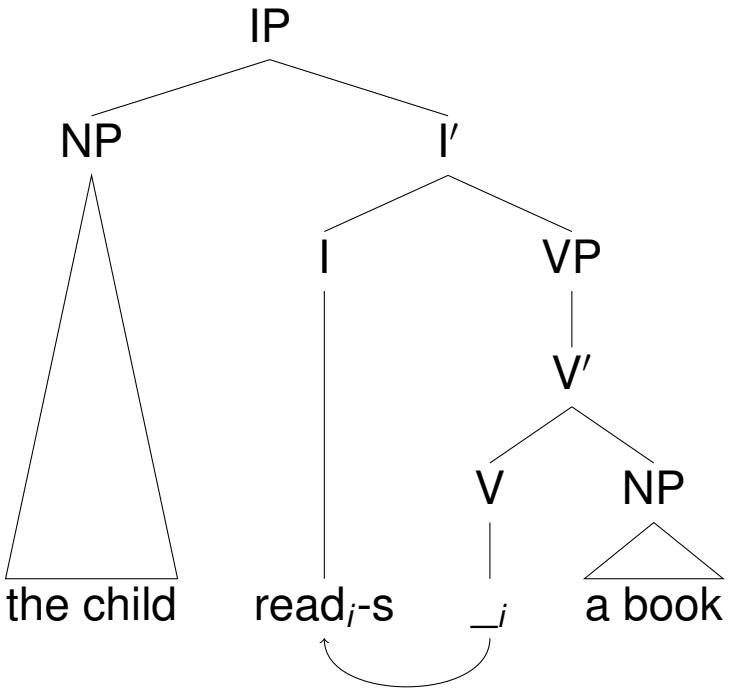
Notes: We have seen examples of *local recursion* within the same re-write rule before (e.g. $\overline{N} \rightarrow A\overline{N}$). Here we see, *recursion* over several re-write rules, e.g. CP occurs on the left hand side of rule number 1, and then further "downstream" on the right-hand side of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

Full Example



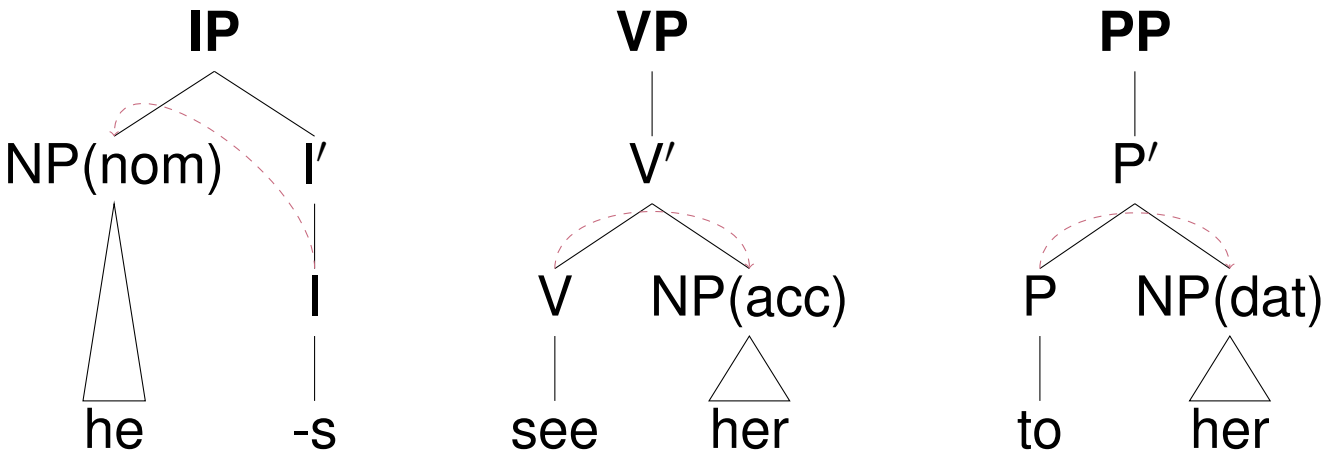
Movement & Trace

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.



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.



Definition: **Government**

α GOVERNS β iff

(i) α is a head, and

(ii) every XP that dominates α also dominates β, and

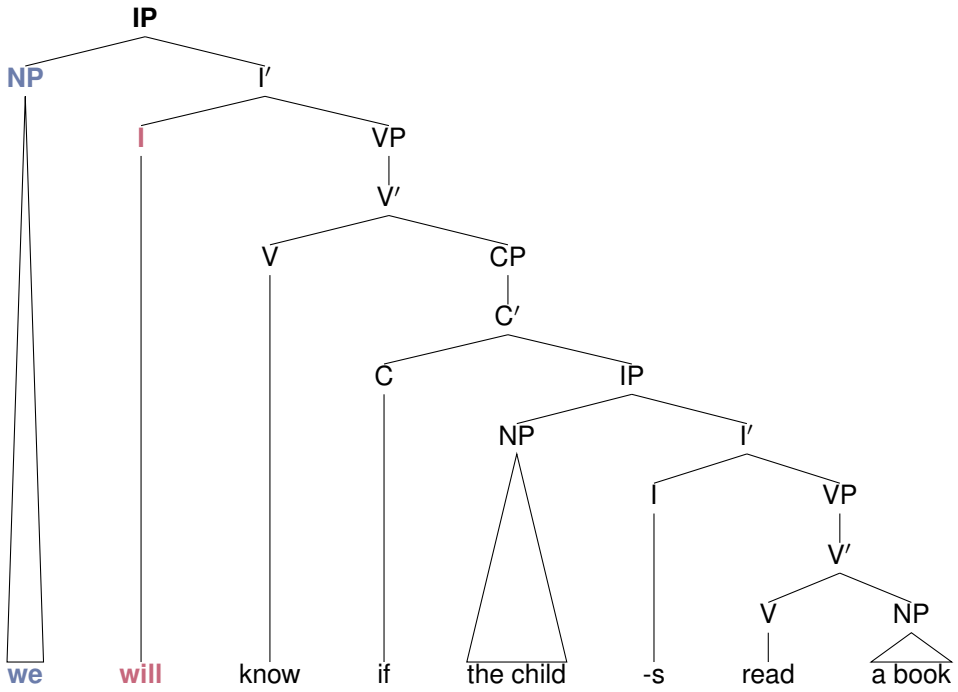
(iii) every XP (other than IP) that dominates β also dominates α

Black (1999), p. 37.

Notes:

- 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.
- α and β 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.

Example



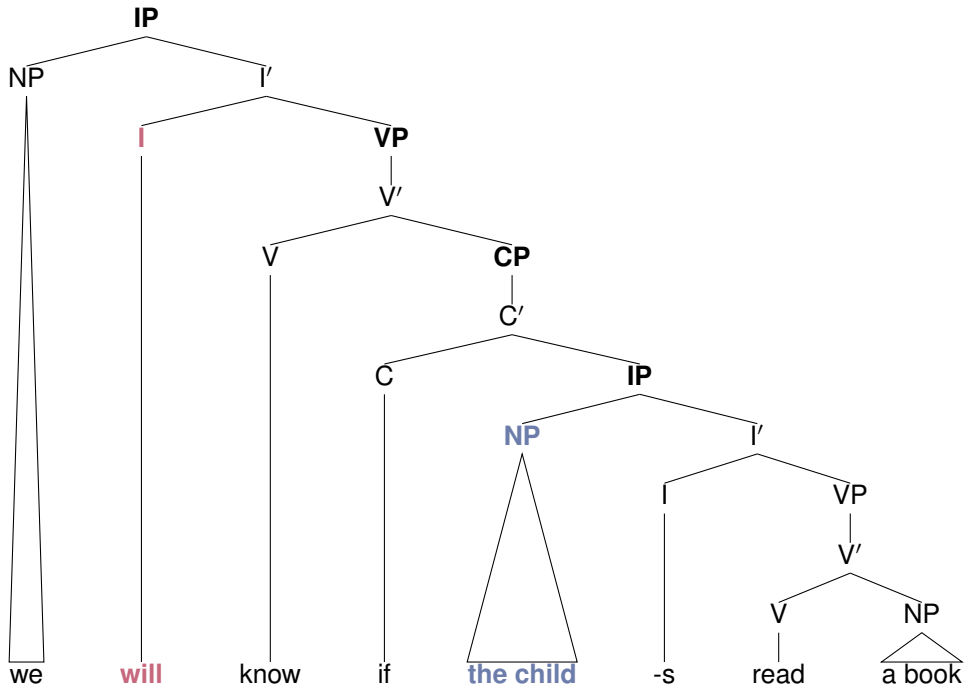
Does **I (will)** *govern* the **NP (we)**? – Yes.

(i) α is a head ✓

(ii) every XP that dominates α also dominates β ✓

(iii) every XP (other than IP) that dominates β also dominates α ✓

Example



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

(i) α is a head ✓

(ii) every XP that dominates α also dominates β ✓

(iii) every XP (other than IP) that dominates β also dominates α x

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Section 2: Binding

Binding: The General Idea

"Case Theory determines whether a nominative pronoun, such as *she* or *he*, is used instead of an accusative pronoun, *her* or *him*, or a genitive pronoun like *his*. It is **Binding Theory's** job to determine when a reflexive anaphor, for example, *herself*, is used instead of one of the pronouns, *she* or *her*."

Black (1999), p. 40.

1. **She**/*herself shuddered.
2. Sally enjoyed *she/**herself**.
3. Sally posted a note for *she/**herself**.
4. Sally believed that **she**/*herself would succeed.

Note: The assumption here is that the NP (Sally) and the pronouns (she/herself) refer to the *same* person. Also, there are many more examples with reflexives which complicate the picture considerably, but we will just use these relatively simple examples to illustrate the general idea behind binding theory.

Binding: Two Preliminary Observations

- **Reflexive pronouns** must co-refer with some **NP before them** in the same sentence (see example sentences 2, and 3).
- This co-reference relationship is further **locally constrained**, namely the NP that the reflexive pronoun co-refers with, must be within the same CP (i.e. example sentence 4).

Black (1999), p. 40.

1. **She**/*herself shuddered.
2. Sally enjoyed *she/**herself**.
3. Sally posted a note for *she/**herself**.
4. Sally believed that **she**/*herself would succeed.

Definition: **Binding**

To further formalize this, we firstly define the relationship of **binding** such that

α BINDS β iff

(i) α does not dominate β,
(ii) the mother-node that dominates α also dominates β,
(iii) α and β are coindexed.

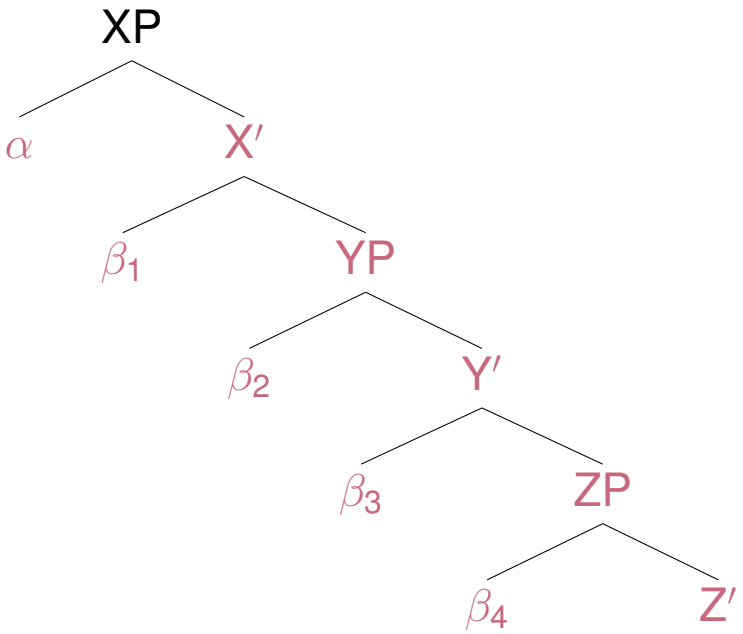
Black (1999), p. 43.

Notes:

- The first two-clauses are equivalent to the definition of *c-command*.
- Note that clause (iii) is underspecified, namely, it is not explicitely said how this *coindexation* would work.

C-Command: Clause (i) and (ii)

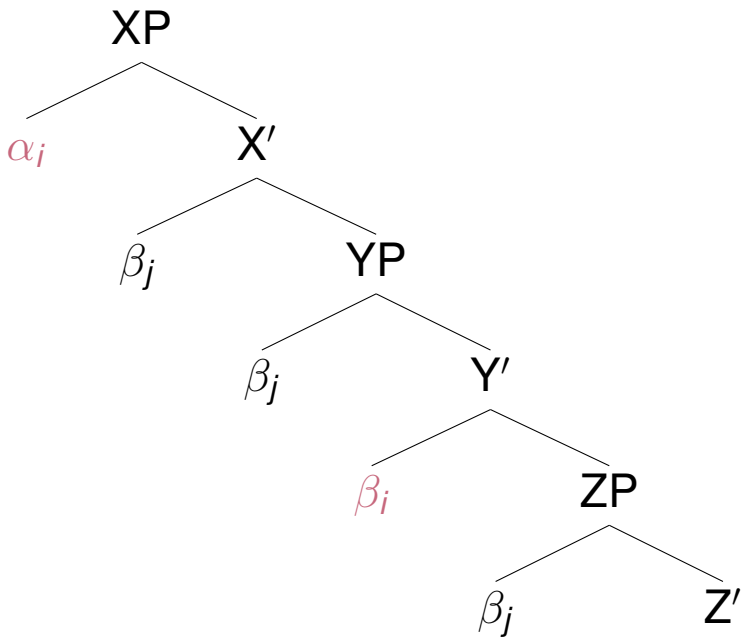
The first two clauses simply mean that α **c-commands** all categories below its own mother node.



Note: The nodes (X′, YP, etc.) could also be referenced as βs.

Coindexation: Clause (iii)

Coindexation reduces this to only certain pairs which are coindexed. As pointed out above, it is not further specified how exactly this conidexation is done.



Note: α_i here only strictly binds β_i.

Principles of Binding Theory

Given the definition of *binding* from above, as well as the earlier definition of *government*, three principles are now formulated which (supposedly) capture the grammaticality patterns in our set of example sentences:

(A) **Pronouns (non-reflexive)** *must not be* bound in their governing Inflectional Phrase (IP).

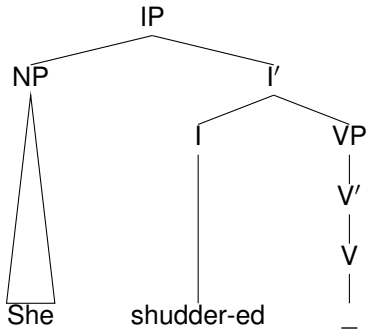
(B) **Reflexive pronouns** *must be* bound in their governing Inflectional Phrase (IP).

(C) **Full NPs** (aka denoting expressions) *must not be* bound.

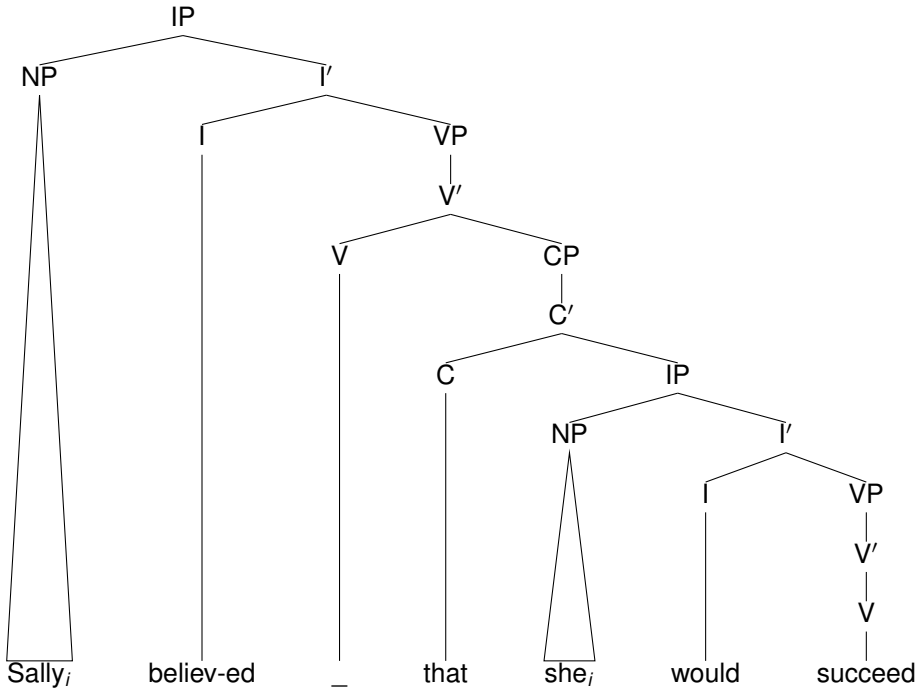
Adopted with modifications from Black (1999), p. 44.

Principle A

Principle A accounts for the fact that the first and fourth sentence have to take a *non-reflexive pronoun*, since the pronouns are not bound in the respective IP.



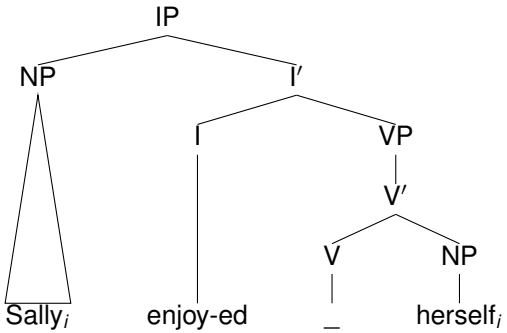
Note: *she* is neither bound in the IP (shudder-ed), nor coindexed with anything in the same sentence.



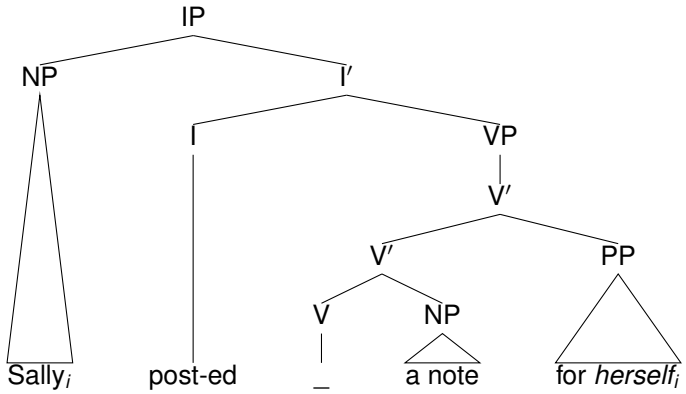
Note: *she* is not bound in the IP (would succeed), albeit coindexed with *Sally*.

Principle B

Principle B accounts for the fact that the second and third sentence have to take a *reflexive pronoun*, since the pronoun is bound in the respective IP.



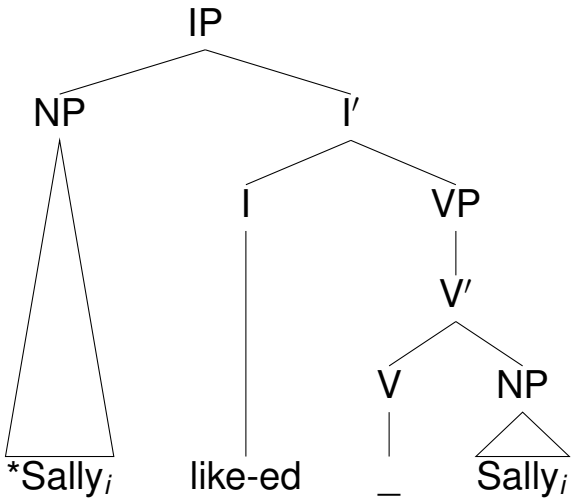
Note: *herself* is bound in the IP (enjoy-ed), and coindexed with *Sally*.



Note: *herself* is bound in the IP (post-ed), and coindexed with *Sally*. Note that this is independent of whether the PP attaches to V′ or further down in the tree to the NP (*a note*).

Principle C

Principle C accounts for the fact we cannot use the same full NP in a single sentence. We would have to represent it by a pronoun in one of the occurrences. In fact, it would be more precise to state that full NPs cannot be coindexed with themselves.



Some Problems

- There are several possible usages of reflexive and non-reflexive pronouns in different varieties of English (and other languages), which do not conform to the rules of Binding Theory outlined above.[2]

  *Sally$_i$ believes Martha$_k$'s description of herself$_i$.

- The method of *coindexation* is purely "stipulated", meaning that there are no clear rules which NPs and pronouns are co-indexed. It is just expected that syntacticians take an intuitive grammaticality judgement. There is always room for discussion when it comes to such intuitions.

  That Sally$_i$ might succeed amazed her$_i$/*herself$_i$.[3]

[2] See also Carnie (2013, pp. 478) for a discussion.

[3] According to Black (1999, p. 40) this sentence is ungrammatical with *herself*, but it seems fine to me.

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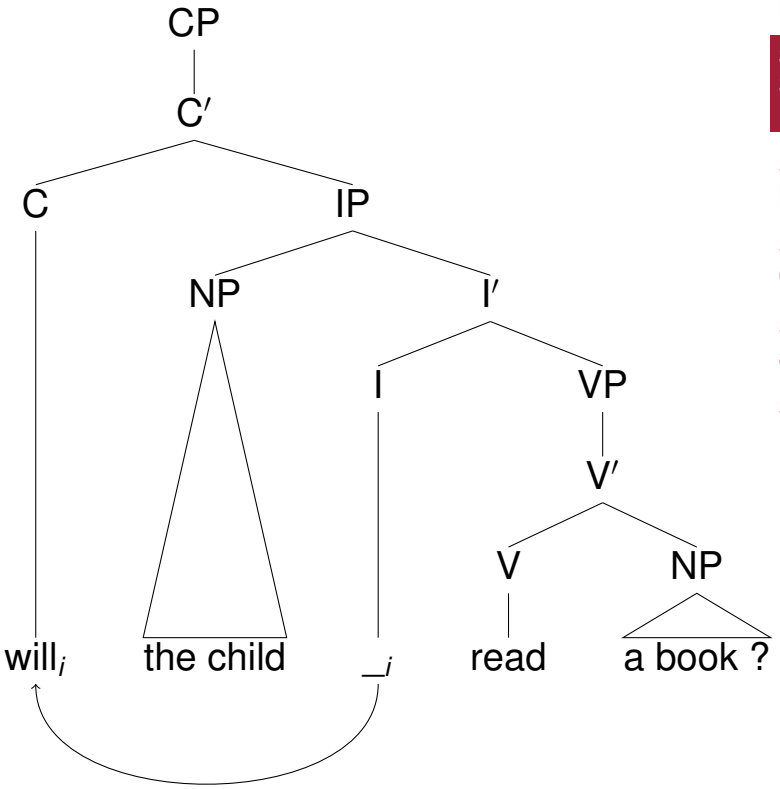
Section 3: Syntactic Phenomena

Yes/No Questions

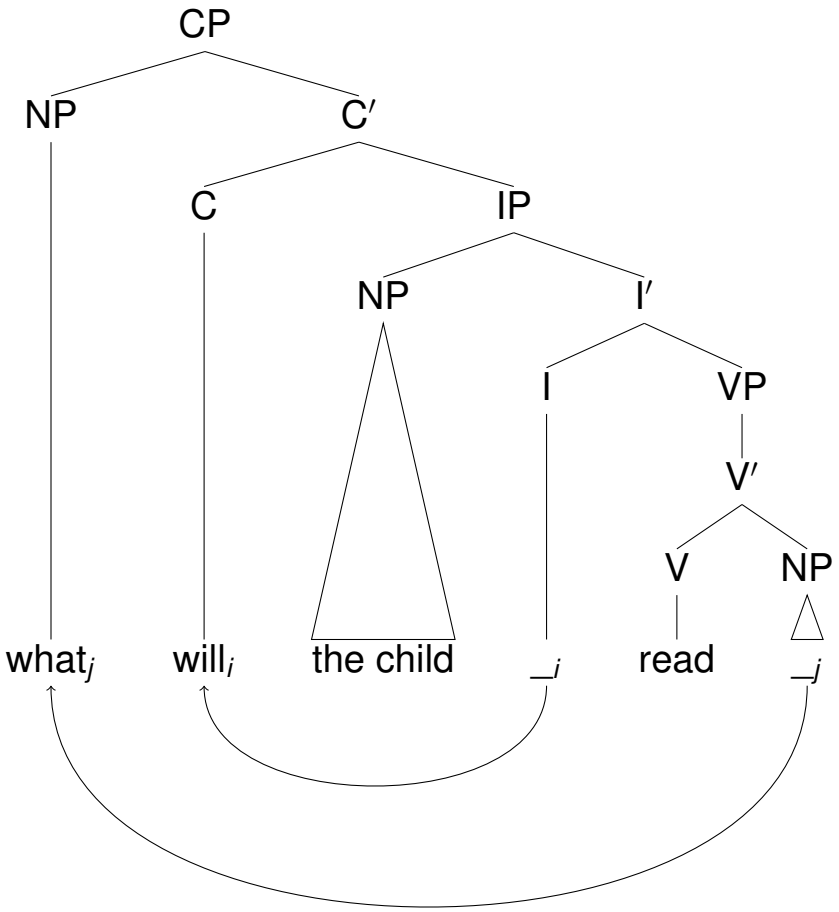
In some languages, including English and German, the finite verb “moves” to the beginning of the sentence to form a **yes/no question**. In the GB framework, this means that the verb moves into the Complementizer (C) position.

Note: The auxiliary *will* is now under the non-terminal symbol C which actually stands for a different part-of-speech category, i.e. complementizer (*that*). So here the consistency of classing lexical items under the correct POS symbols is now given up in favor of maintaining the same deep structure template.



Wh-Questions

In so-called **wh-questions**, it is assumed that the wh-word is in the complement position of the verb phrase in deep structure (i.e. *what* → *the book*). It then moves to the NP position of the CP to form the surface structure realization.



Verb Position

Verb position (initial, medial, final) can be handled in GB theory (similar to other PSG based frameworks) by flexibly changing the order of elements in the re-write rules for the IP and the VP.

Black (1999). A step-by-step introduction to the government and binding framework.

Abaza (abq, Abkhaz-Adyge)

(1) H-pa xsʲı yıǰın
our-son milk **drink**.PRF.3SG
"Our son drank milk."

Tzotzil (tzo, Mayan)

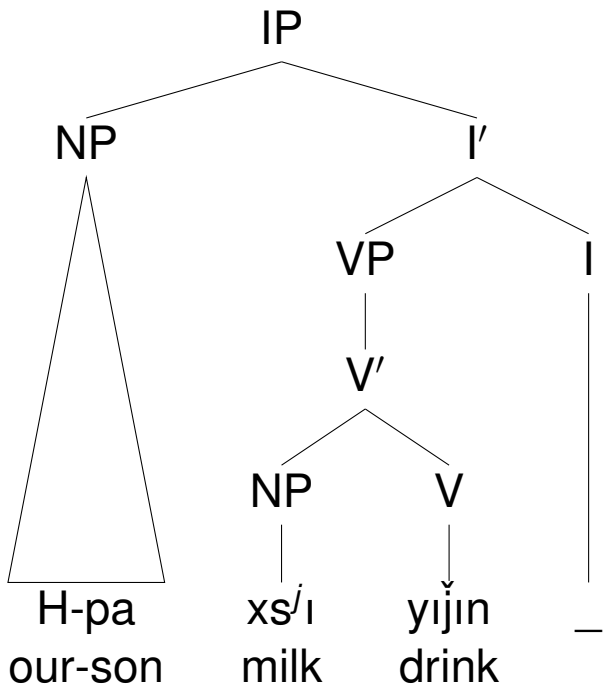
(2) ʔi-s-pet lok'el ʔantz ti t'ul-e.
CP-A3-**carry** away woman the rabbit-CL[4]
"The rabbit carried away the woman."

[4]Abbreviations: CP = completive aspect; CL = clitic; A3 = third person absolutive.

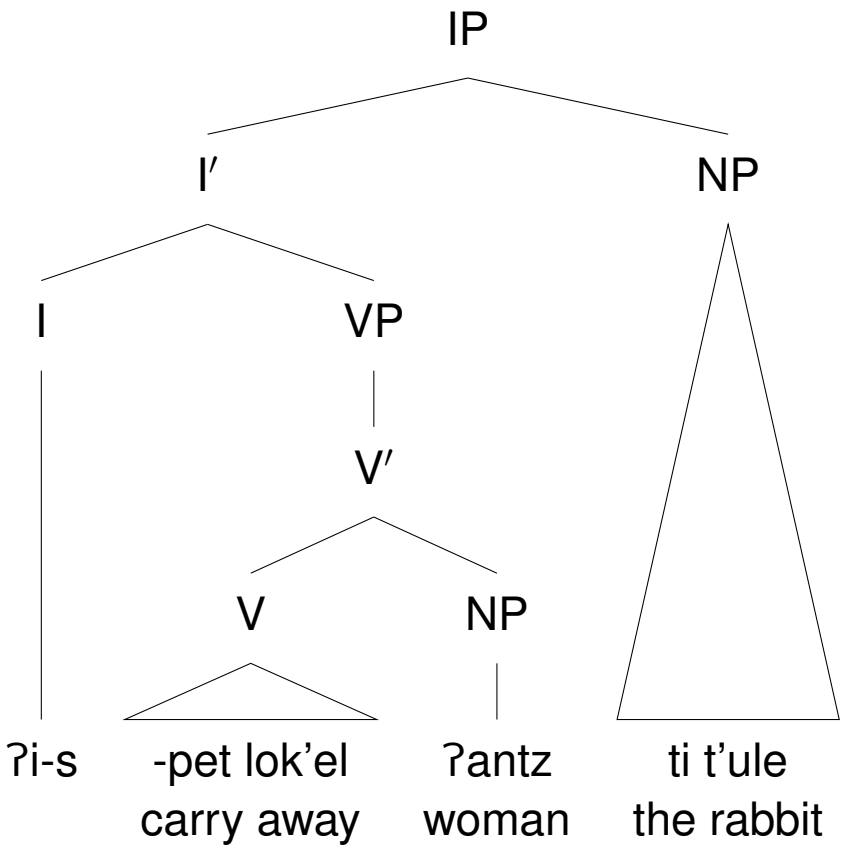
Verb final position (SOV)

Note: Black (1999), p. 15 gives an alternative notation where the underscore representing an empty element in I is replaced by a feature matrix which reflects the inflectional features of the verb, i.e.

$$\begin{bmatrix} +past \\ 3pers \\ +sg \end{bmatrix}.$$



Verb initial position (VOS)



Parameters

The idea of **parameter** settings was introduced to explain how variation (e.g. in verb position) across languages of the world can be accounted for (explained?) against the backdrop of the same underlying deep structure.

118) X-bar parameters switch box

Specifier	*Adjunct*	*Complement*
XP → (YP) X'	X' → (ZP) X'	X' → (WP) X
		
XP → X' (YP)	X' → X' (ZP)	X' → X (WP)

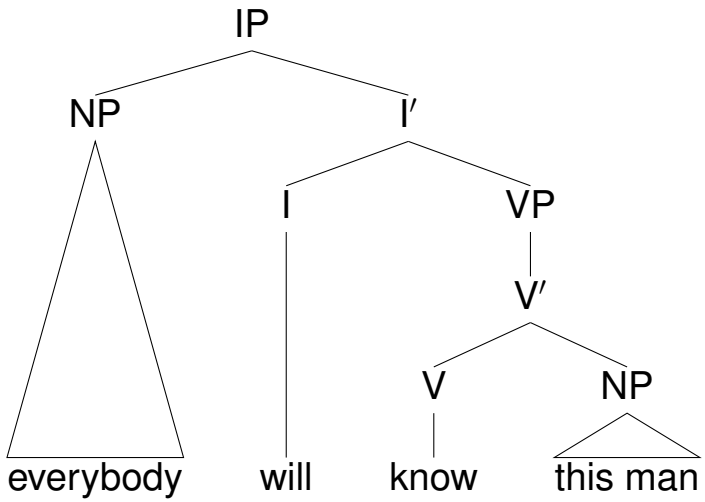
When you are a child acquiring your language, you subconsciously set these switches, to tell you which version of the rules to use.

Carnie (2013), p. 188.

Fronting

Fronting of elements that are topicalized is handled similar to other types of movement such as wh-movement or movement of auxiliaries in questions (see examples above). Namely, the fronted element(s) can move into positions of higher level phrases (CP and IP).

Regular Structure



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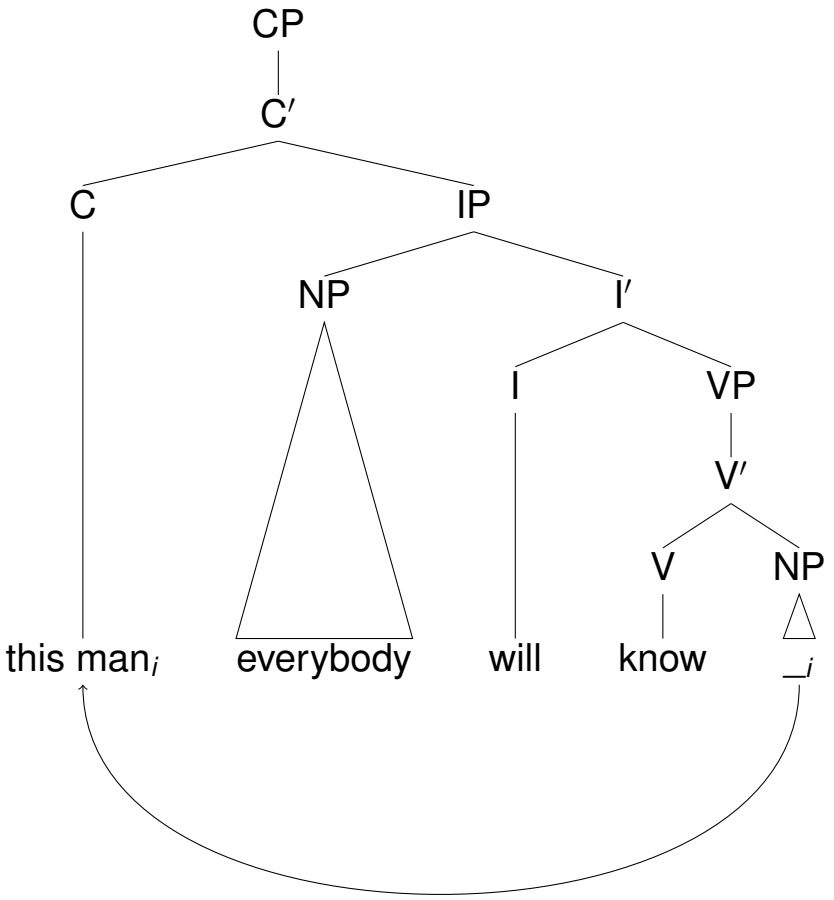
Fronted Structure



Passive

Passive constructions are handled in GB with the same underlying deep structure as **active constructions**. Within GB active and passive sentences are connected, i.e. the active sentence is **transformed** into a passive sentence.

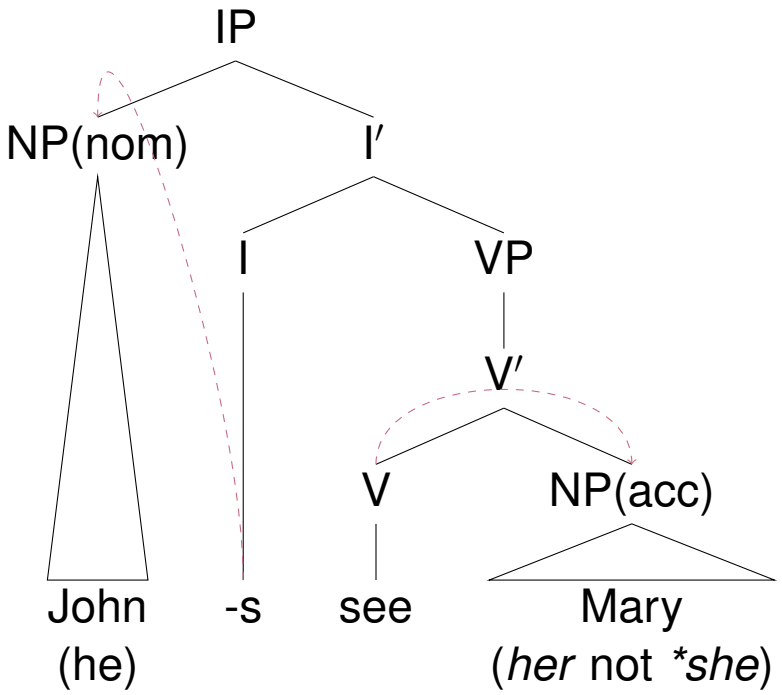
Early example of a transformational rule going back to Chomsky (1957):

$NP_1\ V_2\ NP_3 \rightarrow 3\ [_{AUX}$ be] 2en $[_{PP}\ [_P$ by] 1]
John sees Mary $\rightarrow$ Mary $[_{AUX}$ is] seen $[_{PP}\ [_P$ by] John]

Müller (2019). Grammatical theory, p. 85.

Active (D-Structure)

Given the case principle, in an **active phrase**, I assigns nominal case to the NP in the specifier position of IP (aka SpecIP), while V assigns accusative case to its complements.



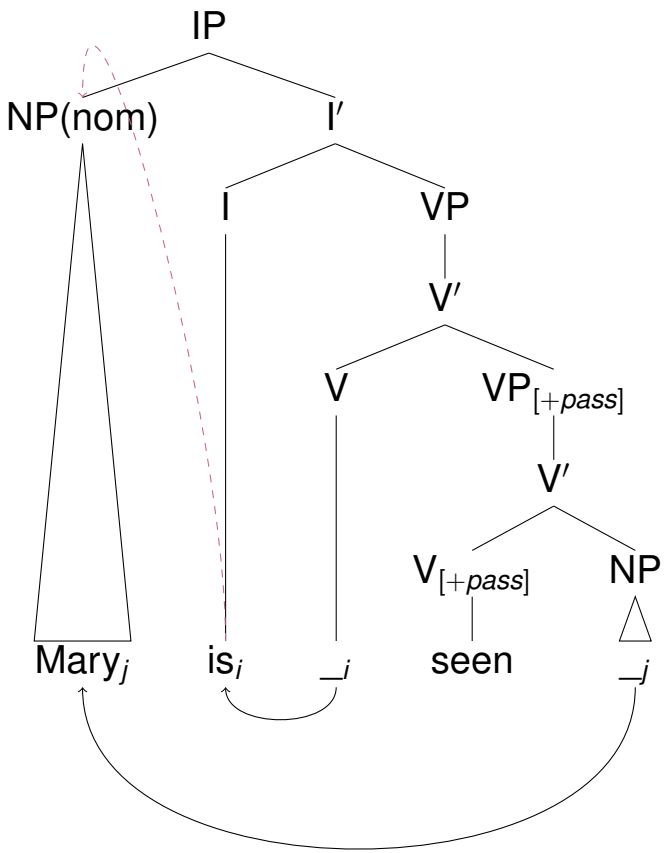
Passive (S-Structure)

In the corresponding **passive sentence**, firstly, the subject of the active sentence is cancelled. This allows for the accusative object of the active sentence to move into the NP position of the IP. Also, a new verb (is) is "recruited" from the lexicon. This is enabled by the additional rewrite rule:

- $V' \rightarrow V\ VP$

Hence, nominative case is then assigned by the auxiliary *is* to the new subject. Accusative case is "absorbed", i.e. not assigned anymore.

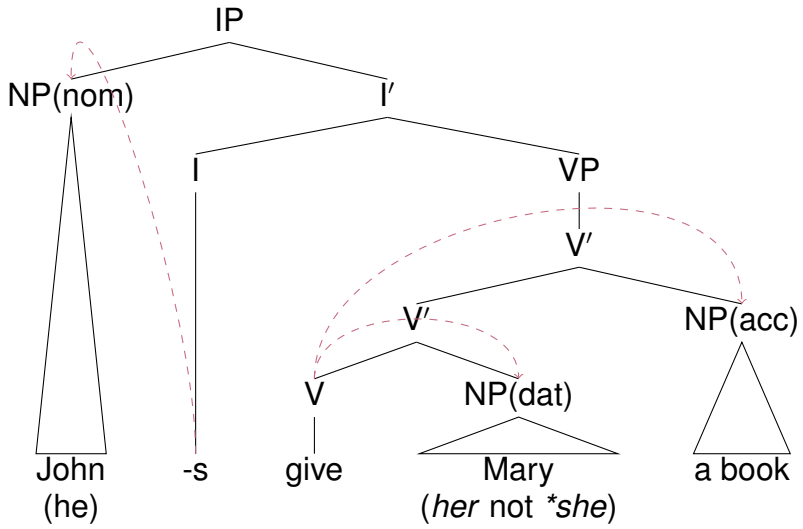
see also Black (1999), p. 30-31



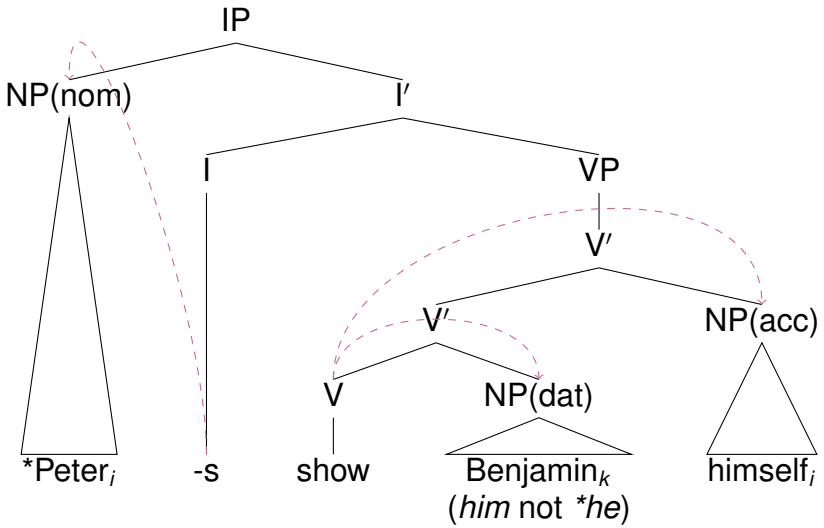
Ditransitives

Ditransitive constructions turn out to be problematic for a GB analysis. A possible solution is given by Müller (2019, p. 111) for German subordinate clauses. This is here adopted for English. Note that this requires us to formulate an additional, recursive rule:

- $V' \rightarrow V'$ NP (formerly we had a non-recursive version: $V' \rightarrow$ V NP)



Ditransitives: Some Problems

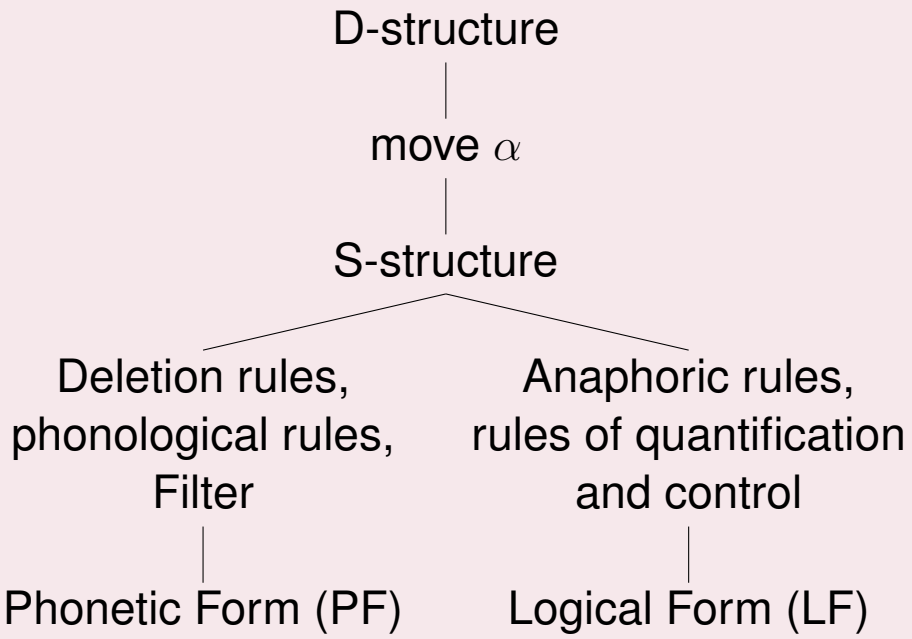


We run into problems with Binding Theory when reflexive pronouns are used here instead of the object NPs. This sentence is considered ungrammatical (by most people?) with the respective coindexations. Note, however, that the tree structure could be seen as exactly parallel to the example above. This means that *himself* is bound by Peter, and not by Benjamin, such that according to the Principles of Binding Theory (as exposed here) the sentence would be considered grammatical. Such examples are the reason why many GB practitioners (and later Minimalists) disprefer this analysis of ditransitives. An alternative analysis is given in the lecture on Minimalism.

Section 4: The T Model

The T Model

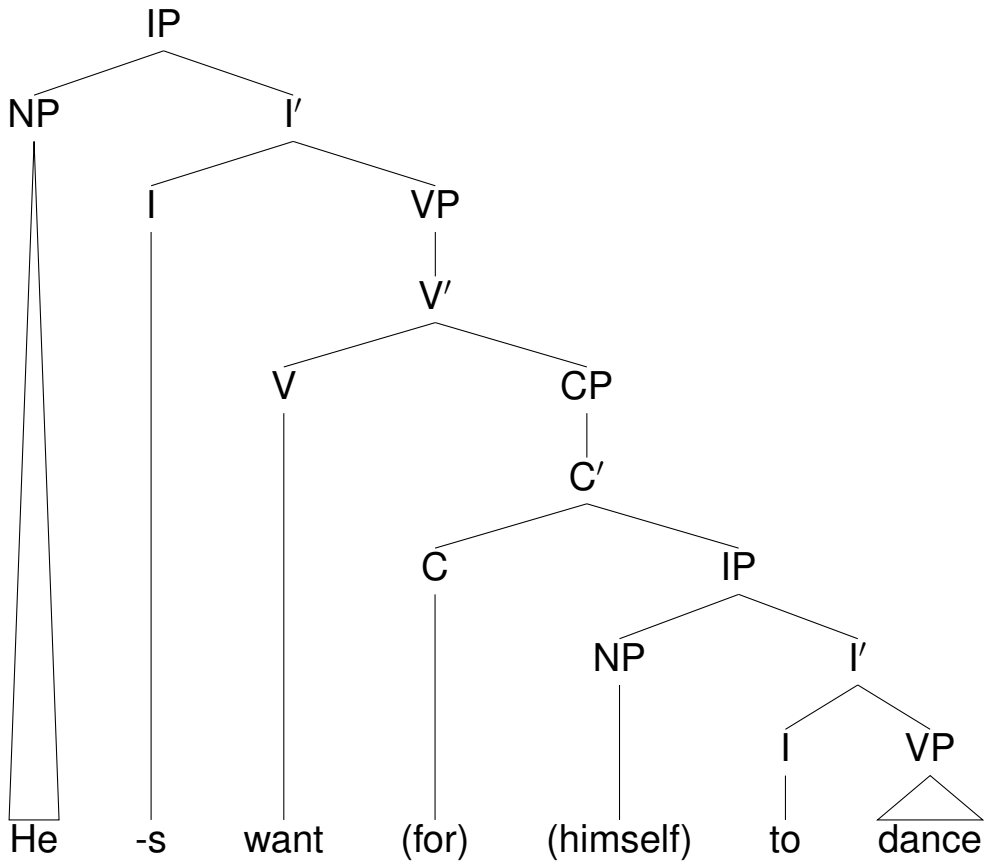
The T (Y) model (called by its shape when you invert it) is a schematic representation of all the underlying processes assumed for generating well formed sentences in GB theory.



Müller (2019). Grammatical theory, p. 88.

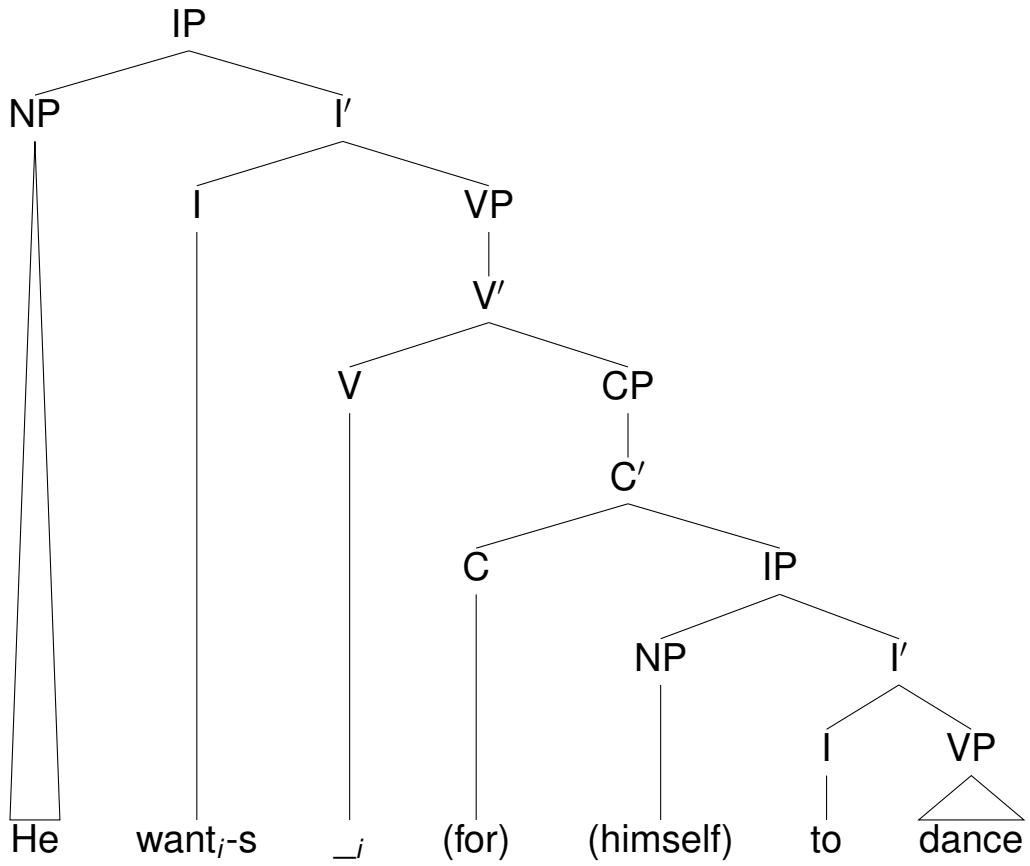
D-Structure

Deep structure in GB theory refers to the underlying template or mould that is used to build all grammatical sentences in a given language.



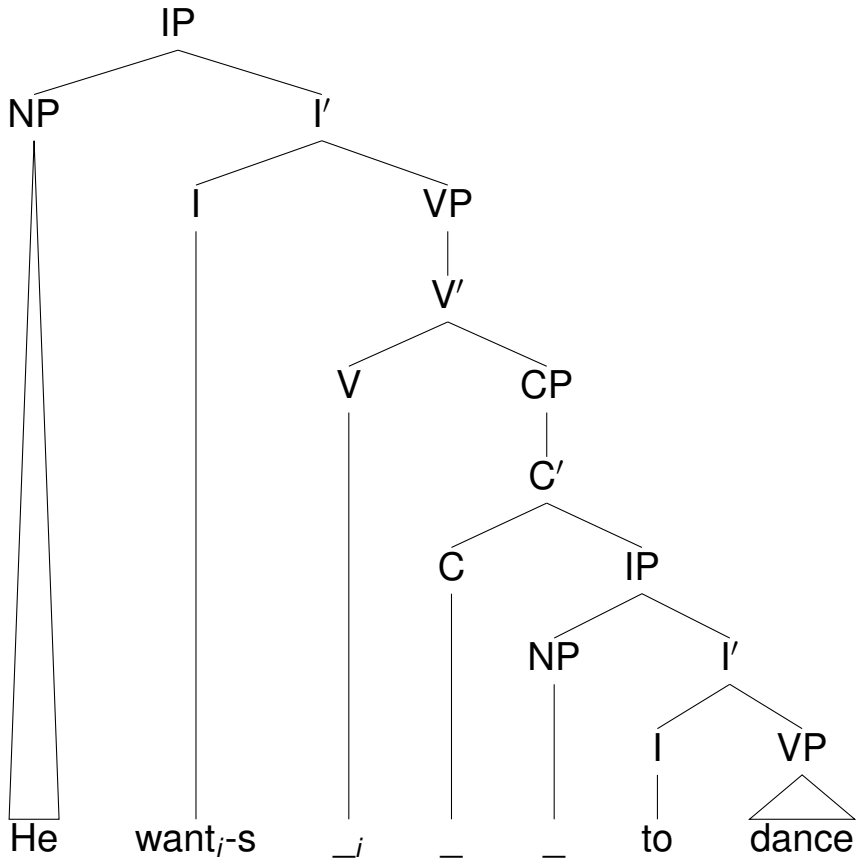
S-Structure

Surface structure is then derived by transformations which allow to move elements around (move α) and reassign cases.



Deletion Rules

Furthermore, deletion rules can be applied to the surface structure.
Note that the underscores here represent deletions, not movement.



Phonetic Form

Finally, there are certain regular changes to the surface structure based on phonetic processes. An example of such a change is given by Chomsky (1981, p. 21) as *want + to* $\rightarrow$ *wanna*.

He wants to dance $\rightarrow$ He *wanna* dance

Important Take-Home-Message

What is called *S-structure* or *surface structure* in GB theory is not necessarily the actual string of characters or phonemes that you might read or hear. Rather, there are two further levels which intervene between S-structure and the actual phonetic realization. For instance deletions and phonetic rules might still apply.

Logical Form

Logical Form was only marginally discussed here, namely through Binding Theory (anaphora resolution). The concepts of logical form are more strongly represented in the semantics lectures. Just note that in the GB framework questions of LF (i.e. semantics) are adressed at a later stage than D-Structure and S-structure, which reflects the “primacy” of syntax within this framework.

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Section 5: Basic Concepts in GB

Basic Concepts in GB

- Constituency ✓
- POS ✓[5]
- Heads ✓[6]
- Valency ✓[7]
- Grammatical Functions ✓[8]

[5] "Categories" play a role in different definitions. However, they are not strictly adhered to in the tree structure, e.g. C is not necessarily a complementizer.

[6] Necessary for government.

[7] Given strictly binary branching, as well as the X-bar schema with one complement the valency of verbs is not as important for structure building as in other frameworks.

[8] Rather marginal, relevant for deciding on specifiers and complements of verbs.

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Section 6: Pros and Cons of GB

Pros (Advantages)

- Formulates a highly abstract and general template (D-Structure) which can be used to model all types of sentences and syntactic phenomena (at least that is the aim)

Cons (Disadvantages)

- This highly abstract template requires many complicated mechanisms (movement, empty elements, case assignment, etc.) to derive the set of possible sentences of a language
- The lack of precise formulizations of these mechanisms has resulted in GB theory – and other so-called Mainstream Generative Grammar approaches – being largely ignored by computational linguists. See the discussion in Müller (2019, p. 120).

Section 7: References

References

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Thank You.

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