EBERHARD KARLS
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Faculty of Philosophy
General Linguistics

Syntax & Semantics WiSe 2021/2022

Lecture 12: Minimalism

06/12/2022, Christian Bentz

Overview

Updated Schedule (2022)

25/10/2022	**Lecture 1**	Organization & Introduction
27/10/2022	**Lecture 2**	Basic Concepts I
03/11/2022	**Lecture 3**	Basic Concepts II
08/11/2022	**Lecture 4**	Dependency Grammar I
10/11/2022	**Lecture 5**	Dependency Grammar II
15/11/2022	**Lecture 6**	Phrase Structure Grammar I
17/11/2022	**Lecture 7**	Phrase Structure Grammar II
22/11/2022	**Lecture 8**	The Chomsky Hierarchy
24/11/2022	**Lecture 9**	X-bar Theory
29/11/2022	**Lecture 10**	Government & Binding I
01/12/2022	**Lecture 11**	Government & Binding II
06/12/2022	**Lecture 12**	Minimalism
08/12/2022	**Lecture 13**	Lexical Functional Grammar I
13/12/2022	**Lecture 14**	Lexical Functional Grammar II
15/12/2022	**Lecture 15**	Construction Grammar
20/12/2022	**Lecture 16**	The Evolution of Syntax
		Christmas Holidays

Updated Schedule (2023)

10/01/2023	**Lecture 17**	Syntax Summary
12/01/2023		**Mock Exam**
17/01/2023	**Lecture 18**	Introduction to Semantics
19/01/2023	**Lecture 19**	Word Meaning
24/01/2023	**Lecture 20**	Propositional Logic
26/01/2023	**Lecture 21**	Predicate Logic
31/01/2023	**Lecture 22**	Syntax & Semantics Interface
02/02/2023	**Lecture 23**	Semantics Summary
09/02/2022		**Exam**

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Section 1: Recap of Lectures 10 and 11

The CP and IP (and VP)

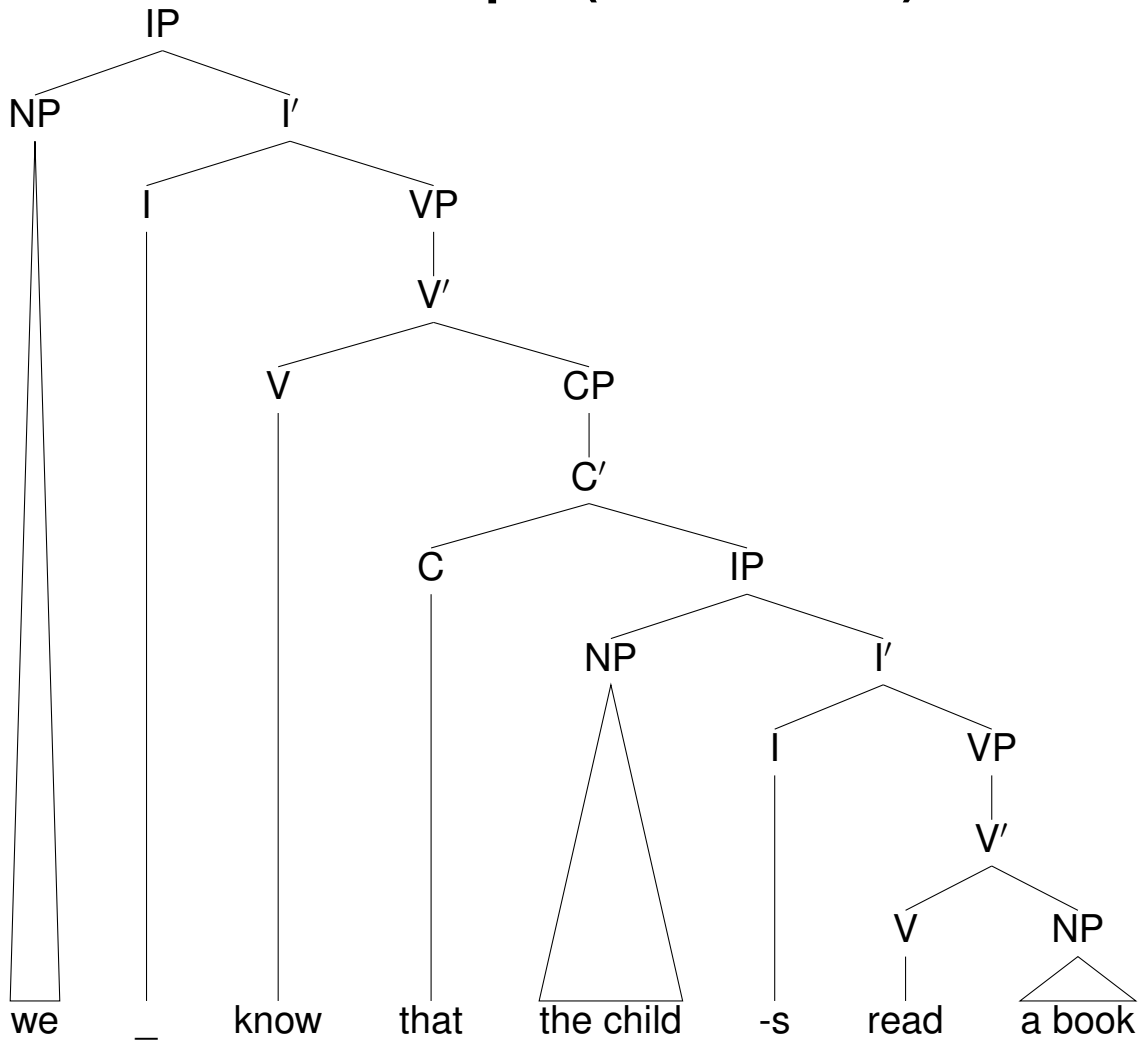
Instead of the *S* symbol, Chomsky introduced the **Complementizer Phrase (CP)** and the **Inflectional Phrase (IP)** as layers *above* the verb phrase such that:

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**
9. V′ $\rightarrow$ V′ AdvP
10. V′ $\rightarrow$ V′ PP
11. V′ $\rightarrow$ V
12. V′ $\rightarrow$ V NP
13. NP $\rightarrow$ DET N′
14. etc.

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

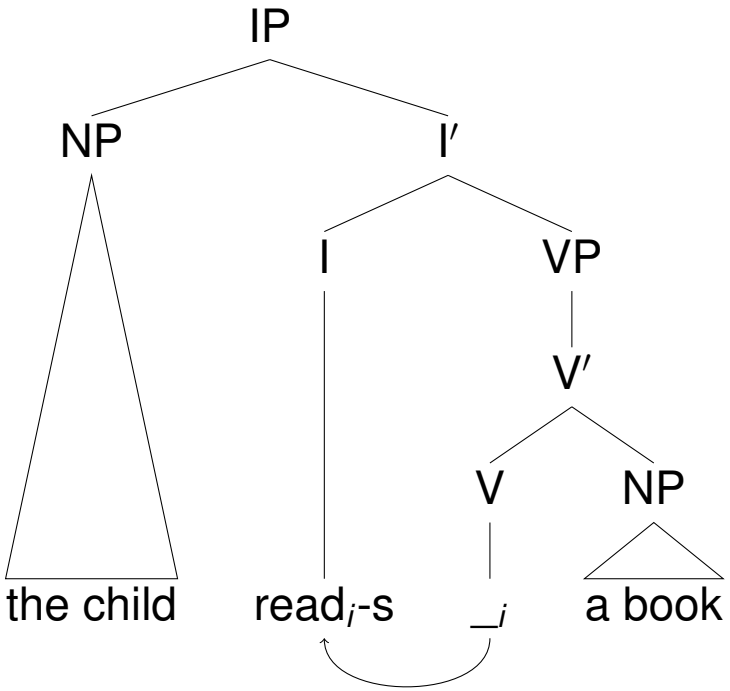
Notes: We have seen examples of *local recursion* within the same re-write rule before (e.g. $\overline{N} \rightarrow A\overline{N}$). Here we see, *recursion* over several re-write rules, e.g. CP occurs on the left hand side of rule number 1, and then further "downstream" on the right-hand side of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

Full Example (D-Structure)



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.



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

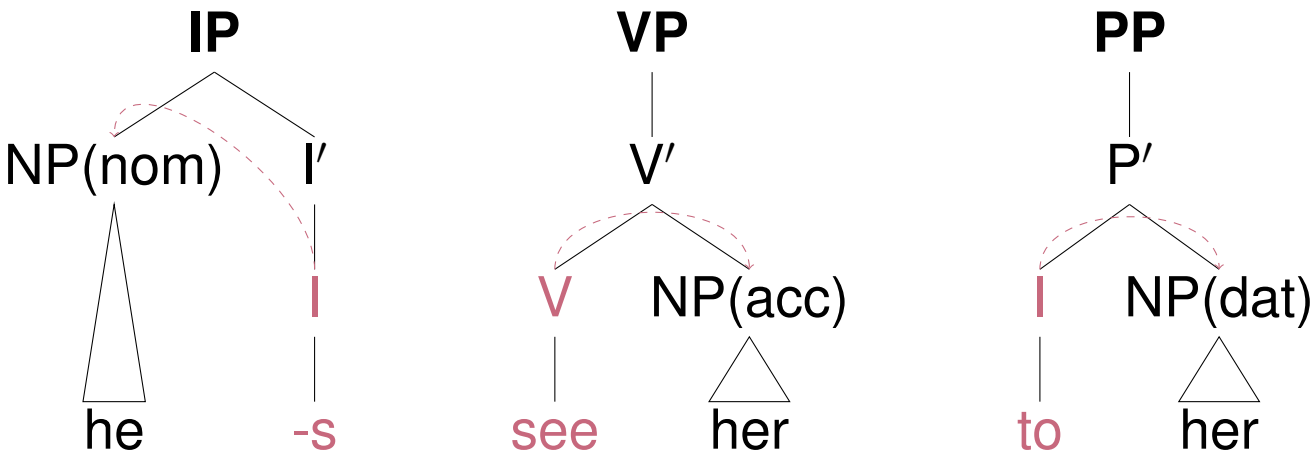
Black (1999), p. 37.

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.

Clause (i)

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



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.

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).

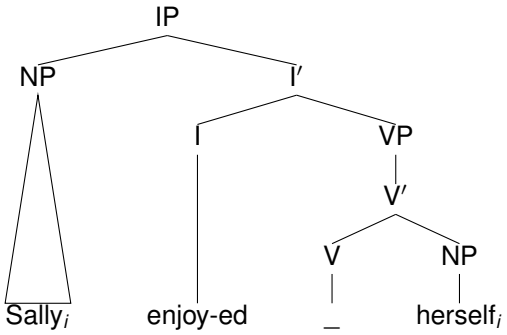
(B) **Reflexive pronouns** *must be* bound in their governing Inflectional Phrase (IP).

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

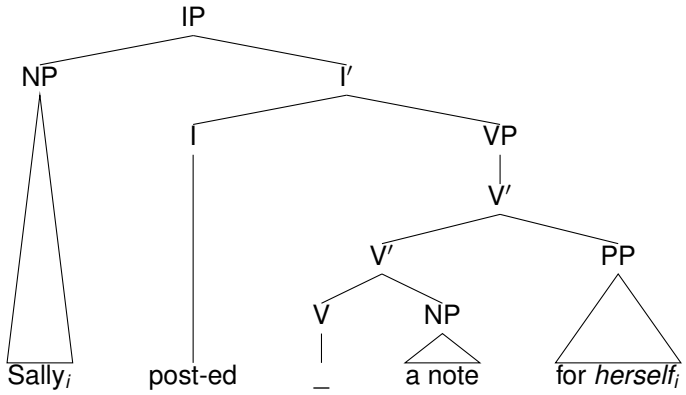
Adopted with modifications from Black (1999), p. 44.

Principle 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*.

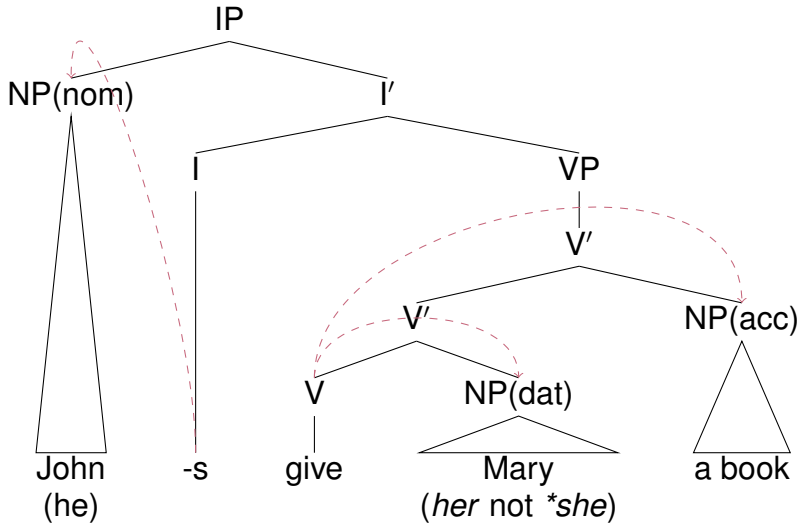


Note: *herself* is bound in the IP (post-ed), and coindexed with *Sally*. Note that this is independent of whether the PP attaches to V′ or further down in the tree to the NP (*a note*).

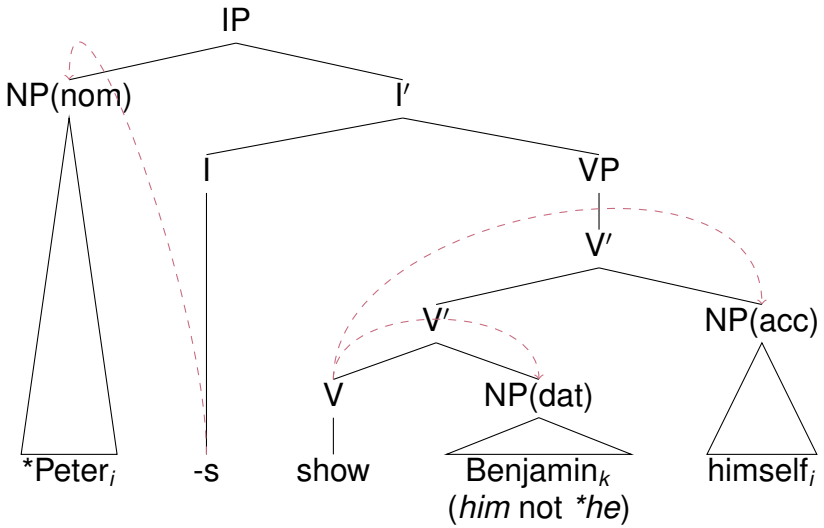
Problem: Ditransitives in GB

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



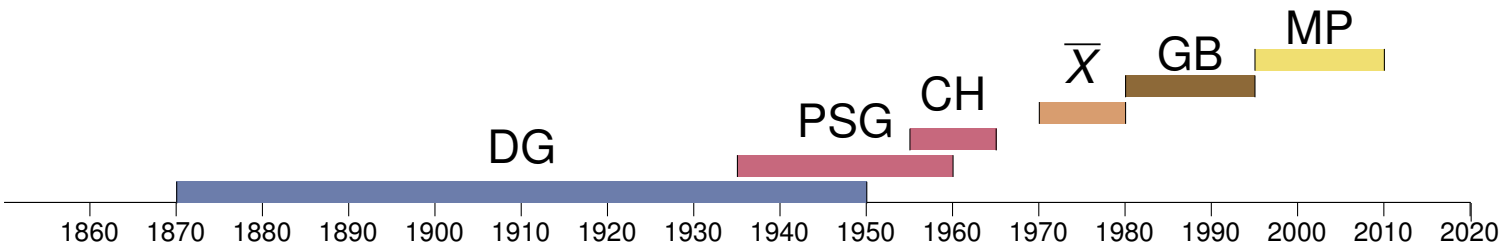
We run into problems with Binding Theory when reflexive pronouns are used here instead of the object NPs. This sentence is considered ungrammatical (by most people?) with the respective coindexations. Note, however, that the tree structure could be seen as exactly parallel to the example above. This 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 2: Historical Notes

Historical Perspective

"Like the Government & Binding framework that was introduced in the previous chapter, the Minimalist framework was initiated by Noam Chomsky at the MIT in Boston. Chomsky (1993; 1995b) argued that the problem of language evolution should be taken seriously [...] To that end he suggested refocusing the theoretical developments towards models [...] that assume less language specific innate knowledge."

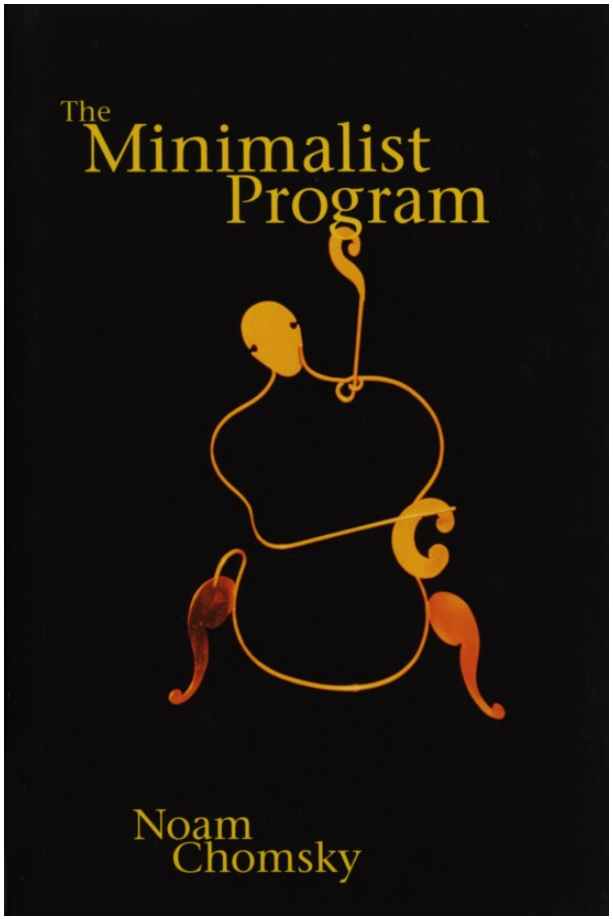
Müller (2019). Grammatical theory, p. 311.



The Minimalist *Program*

"It is important to recognize that the Minimalist Program (MP) under development in this work, and since, is a *program*, not a *theory*, a fact that has often been misunderstood. In central respects, MP is a seamless continuation of pursuits that trace back to the origins of generative grammar [...]" Chomsky

(2015). The Minimalist Program, p. vii.



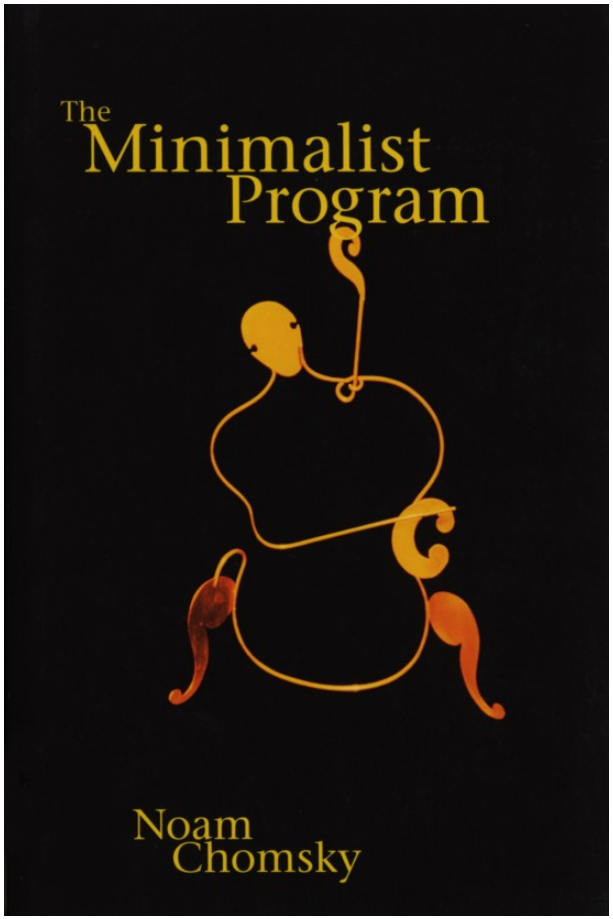
The Minimalist Program

"In particular, a leading concern from the outset had been to clarify the concept "simplest grammar". [...]

Any complication of UG poses barriers to some eventual account of of the evolution of FL. There is, then, an additional and compelling reason to seek the simplest formulation of UG, eliminating stipulations, redundancy, and other complications [...]

MP was a natural development after the crystallization of the principles-and-parameters (P&P) framework in the early 1980s. P&P overcame fundamental quandaries of the earlier framework, evaluation the need for an evaluation procedure [...] "

Chomsky (2015). The Minimalist Program, p. vii-viii.



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Section 3: Features in MP

Features

Features are a core part of Minimalist Syntax. The term is here generally interpreted in a similar way as for so-called *feature descriptions*. An important terminological difference, however, is that the term *feature* in MP refers to a *feature value*, rather than to the *feature label*. For example, verbs might be said to have the "feature" *past*, *plural*, etc. Against this background, the following types of features are defined:

1. categorial features
2. ϕ-features
3. Case features
4. strong F, where F is categorial

Chomsky (2015). The Minimalist Program, p. 254.

Categorial Features

Categorial features take as values the "category" of a word or phrase, i.e. the POS in case of words, and the phrase symbol in case of phrases. Examples for categorial features are then A, N, V, NP, VP, etc.

Examples:

- The noun *airplanes* takes the categorial feature [N]
- The determiner *the* takes [D]
- The phrase *the airplanes* takes [DP][1]
- The verb *build* takes [V]
- The phrase *build an airplane* takes [VP]
- The preposition *to* takes [P]
- etc.

[1] Note that this is a deviation from other frameworks, where the combination of determiner and noun is often defined as an NP.

ϕ-features

ϕ-features are considered to cover features relevant for agreement such as, for example, PERSON, NUMBER and GENDER in English.[2]

Adger (2003), p. 35.

Example:

airplanes takes the categorial feature value [N], and the ϕ-feature values [plural], [neuter], [3 person].

[2] Note that Chomsky (2015), p. 31, seems to include Case features in ϕ-features according to the following quote: "A typical lexical entry consists of a phonological matrix and other features, among them the categorial features N, V, and so on; and in the case of Ns, Case and agreement features (person, number, gender), henceforth ϕ-features." Also, the same quote suggests that only Ns can take ϕ-features since he uses the specification "[...] and in the case of Ns, [...]".

Case features

Case features take as values the case of the respective noun, similar to the CASE feature in frameworks such as LFG.

Example:
In the sentence *we build airplanes* the subject *we* takes [nominative] as Case feature, and *airplanes* takes [accusative] as Case feature.

Strong Features

"Languages differ in the values that certain features may have and in addition to this, features may be **strong or weak** and feature strength is also a property that may vary from language to language. **Strong features** make syntactic objects move to higher positions."

Müller (2019), p. 127-128.

Interpretable and Uninterpretable Features

A further fundamental distinction is made between so-called **interpretable and uninterpretable** features:

> *"The Interpretable features, then, are categorial features generally and ϕ-features of nouns. Others are -Interpretable [i.e. Uninterpretable]."*

Chomsky (2015), p. 255.

Interpretable features:
categorial features (N, V, etc.)
ϕ-features *of nouns* (e.g. plural, neuter, third person)

Uninterpretable features:
ϕ-features *of predicates* (e.g. number and person of a verb)
Case features (e.g. nominative, accusative)
strong/weak F

Interpretable and Uninterpretable Features

Importantly: The notion of *interpretability* makes reference to *semantics*.

> *"The plural feature clearly has an effect not just on the morphology of the word, but also on its meaning: in this case it affects whether we are talking about one child or more than one; one man or more than one, and so on.* ***Features that have an effect on semantic interpretation in this way are called interpretable features****."*

> *"Another clear example of a feature which is* ***uninterpretable*** *is nominative or accusative case. We saw that this feature appeared to* ***simply regulate the syntactic position of words****, while telling us nothing about the semantics of those words."*

Adger (2003), Core Syntax: A minimalist introduction, p. 24 and p. 53.

Interpretable Features in English

Type	Labels	Values
categorial	POS	N, P, NP, VP, etc.
ϕ-features (nouns)	GENDER	masc, fem, neut
	NUMBER	sg, pl
	PERSON	1, 2, 3 pers
Semantically interpretable features of verbs	TENSE	present, past
	ASPECT	perfective, imperfective

Example:

(1) The girl saw ghost-s
the.NOM.3SG girl.F.NOM.3SG see/PAST.3SG ghost-N.ACC.3PL

Note: As pointed out above, feature labels are normally not given within the MP framework, only the feature values. I here add the feature labels for completeness. Also, it is assumed here that we know the GENDER value of *girl* and *ghost* (F and N) since these could be replaced by the respective pronouns, i.e. *she* and *it*.

Uninterpretable Features in English

Type	Labels	Values
ϕ-features (verbs)	NUMBER	sg, pl
	PERSON	1, 2, 3 pers
Case features	CASE	nominative, accusative
strong/weak F	_	strong, weak

Example:

(2) The girl saw ghost-s
the.NOM.3SG girl.F.NOM.3SG see/PAST.**3SG** ghost-N.ACC.3PL

Note: Somewhat counterintuitively, NUMBER and PERSON are supposed to be interpretable on *nouns*, but *not on verbs*. The idea is that the difference between *the child see-s* and *the child see* is somewhat arbitrary, and does not contribute to a change in meaning. However, the difference between *the child see* and *the children see* does contribute to a change in meaning. This definition is later used to justify why agreement is necessary between nouns and verbs.

Interpretable and Uninterpretable Features **Cross-Linguistically**

The *interpretability* of features might change from one language to another. For instance, while for English the GENDER feature is interpretable (i.e. grammatical gender maps onto semantic gender), in German (and many other languages) it does not necessarily.

See also the discussion in Adger (2003), p. 31 pp.

Example:

(3) Das Mädchen sag-t, dass **es**/**sie** Geist-er sah
the.**N**.NOM.SG girl.**N**.NOM.SG say-3P.SG that **it**/**she** ghost-M.ACC.PL see/PAST.3SG

"The girl says that she saw ghosts."

Uninterpretable Categorial Features

We have defined above that categorial features (i.e. POS and phrase symbols) are *interpretable*. This generally holds true for categorial features which describe *the lexical item itself*. However, lexical items can also have **uninterpretable categorial features**, namely, representing a *complement* or *specifier* that is missing to build a complete phrase.

See also Adger (2003), p. 91.

Examples:

kiss [V, ***u*N**] → a noun is missing as the complement, e.g. *kiss trees*
letter [N, ***u*P**] → a preposition is missing, e.g. *letters to*
to [P, ***u*D**] → a determiner (or single noun uN) is missing, e.g. *to the*
the [D, ***u*N**] → a noun is missing, e.g. *the letters*[3]

[3] Remember that for the combination of determiners and nouns the MP framework generally assumes a DP rather than NP, i.e. the determiner is the head. For arguments why, see Adger (2003), p. 250.

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Section 4: Feature Checking

Feature Checking

A core mechanism within Minimalist Syntax is **feature checking**. Note that feature checking essentially links *features with phrase structure*, and hence replaces traditional *phrase structure rules*.

The **Checking Requirement**

Uninterpretable features **must be checked**, and once checked they **delete**.

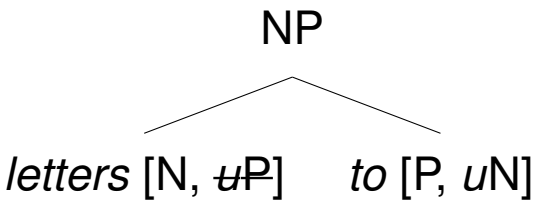
See also Adger (2003), p. 91.

Checking of Categorial Features: NP

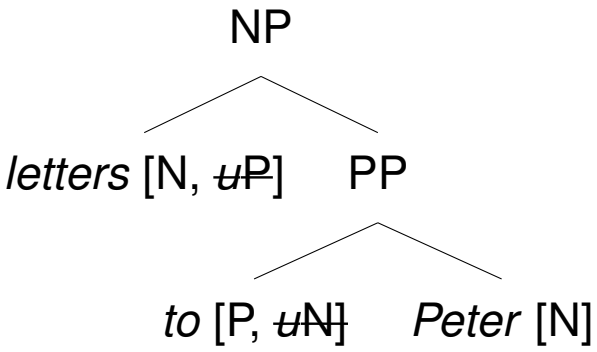
Lexical item:

letters [N, *u*P]

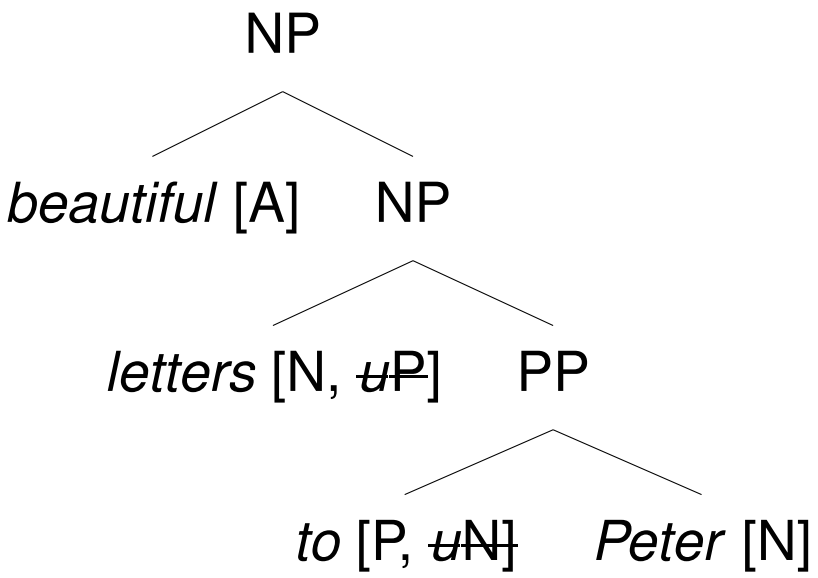
Incomplete phrase:



Complete phrase:

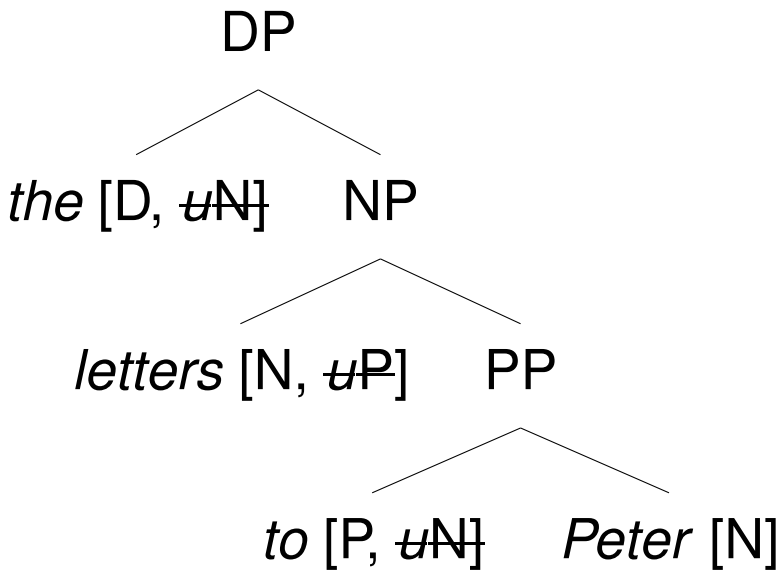


Checking of Categorial Features: NP with Adjective

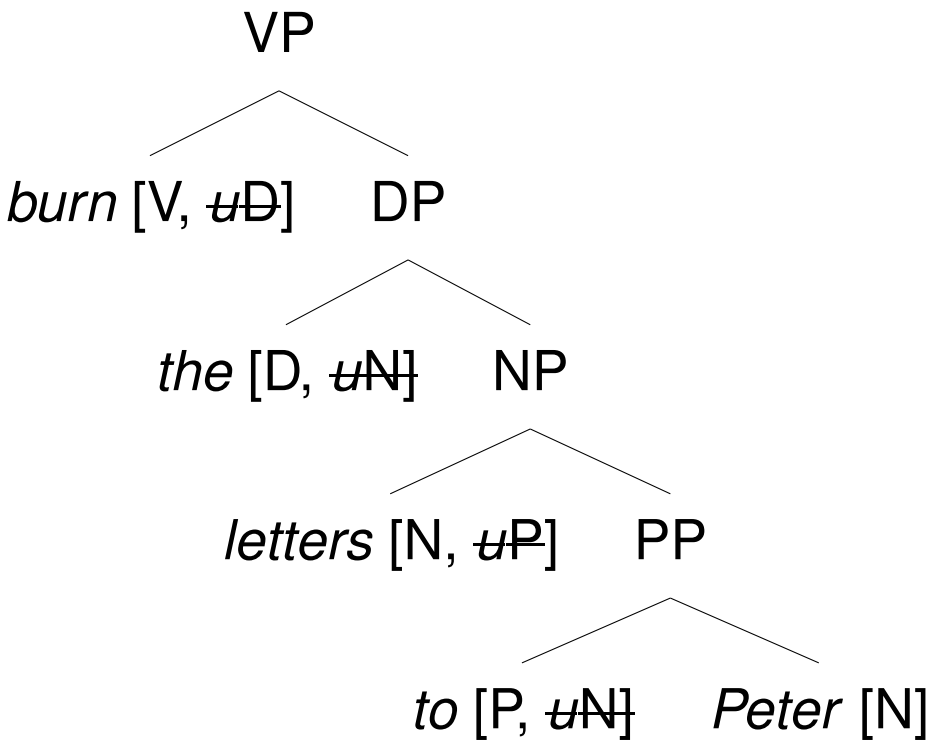


Note: According to Adger (2003, pp. 275) it is an open research question how adjectives and other adjuncts (e.g. adverbs) are integrated into this framework. One option is to model them as attaching to a higher level NP, but without an uninterpretable categorial feature that needs to be checked. The problem here is that if we posited an *u*N feature for the adjective, then the adjective would head the noun phrase, which is counter the general idea that adjectives purely modify nouns, and are hence adjuncts of the noun phrase.

Checking of Categorial Features: DP



Checking of Categorial Features: VP

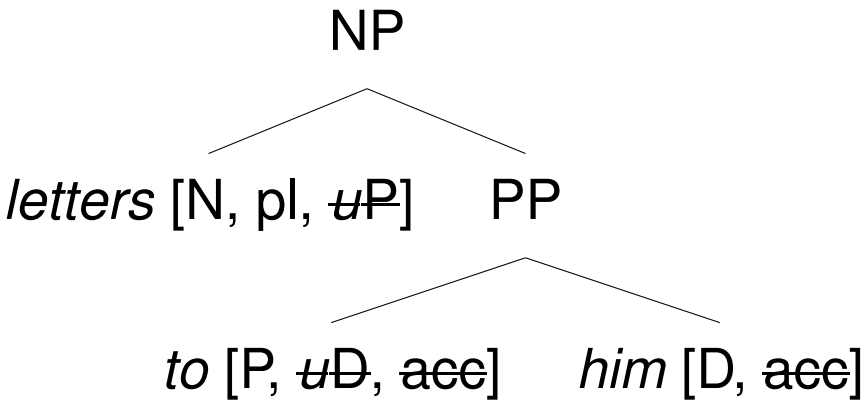


Adopted from Adger (2003), p. 84.

Checking Agreement Features

"Selectional features are atomic, that is, the preposition cannot select an DP[*acc*] as in GB and the other theories in this book unless DP[*acc*] is assumed to be atomic. Therefore, an additional mechanism is assumed that can check other features in addition to selectional features. This mechanism is called **Agree**."

Müller (2019), p. 130.



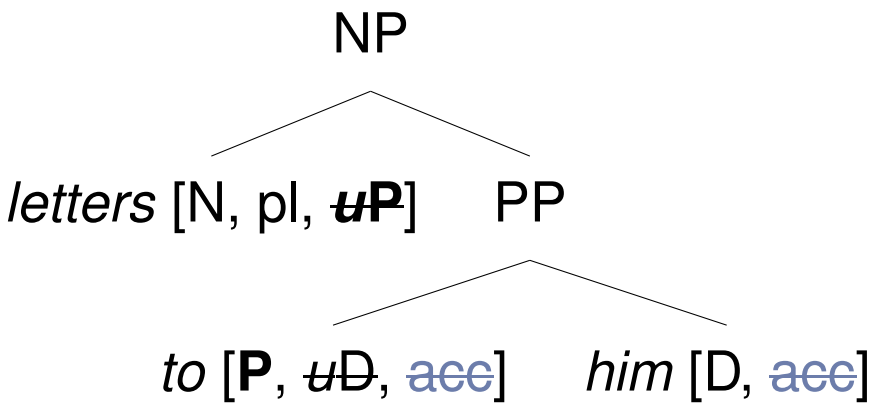
Note: *Selectional features* are here the uninterpretable features which select for a particular category (uN, uP, uD, etc.).

Checking Agreement Features

"The features that are checked via Agree do not have to be at the top node of the object that is combined with a head."

Müller (2019), p. 131.

In other words, **agreement features** can be checked in a sister node **or further down the tree**, whereas **categorial features** have to be checked in the sister node (or right below the sister node) of the feature to be checked.



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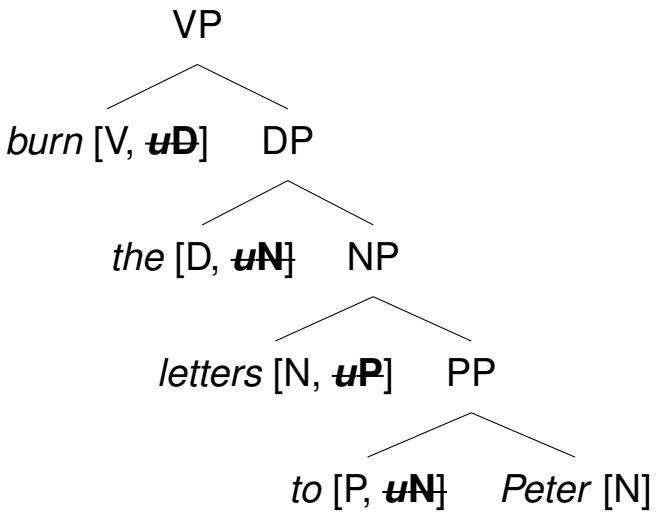
Section 5: Merge and Move

Merge

Note that in the examples above we have implicitely assumed that the tree is binary. This naturally derives from the fact that there is always only **one uninterpretable categorial feature in each node** which has to be feature checked and deleted. The operation which combines exactly two elements to a complex phrase is called **merge**.



External and Internal Merge

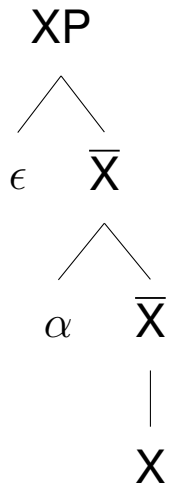
"Chomsky assumes that there are just two operations (rules) for combining linguistic objects: **External and Internal Merge**. **External Merge** simply combines two elements like *the* and *book* and results in a complex phrase. *Internal Merge* (aka **Move** (α)) is used to account for movement of constituents. It applies to one linguistic object and takes some part of this linguistic object and **adjoins it to the left** of the respective object."

Müller (2019), p. 128.

External Merge (Merge)

External Merge simply combines two elements like *the* and *book* and results in a complex phrase.

External Merge (aka Merge)



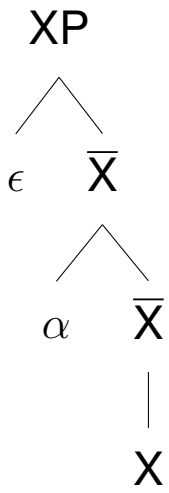
Internal Merge (aka Move)

Note: An XP his here built by first merging α with $\overline{X}$ (i.e. X) and then merging the resulting $\overline{X}$ with an empty element ϵ. Remember that this has to be motivated by feature checking, and essentially replaces phrase structure rules.

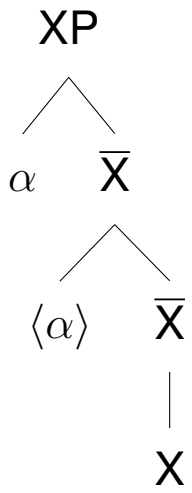
Internal Merge (Move)

Internal merge (Move) applies to one linguistic object and takes some part of this linguistic object and **adjoins it to the left** of the respective object.

External Merge (aka Merge)



Internal Merge (aka Move)

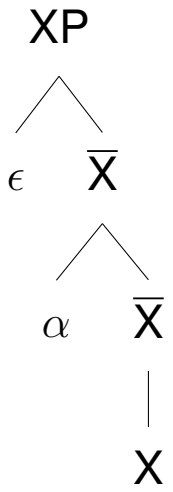


Note: α moves into the position of ϵ and replaces it (i.e. it fills the empty slot). Again this will be motivated by feature checking, for example, checking an agreement feature. The original position of α, i.e. the *trace*, is indicated here by $\langle\alpha\rangle$. In Chomsky (2015) it is indicated by *t*.

Internal Merge (Move)

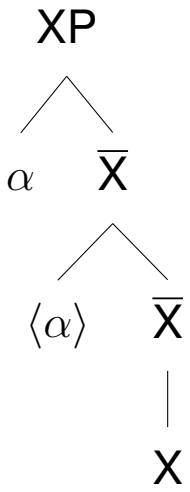
Internal merge (Move) applies to one linguistic object and takes some part of this linguistic object and **adjoins it to the left** of the respective object.

External Merge (aka Merge)



[XP [ϵ $\overline{X}$ [α $\overline{X}$ [X]]]]

Internal Merge (aka Move)



[XP [α $\overline{X}$ [$\langle\alpha\rangle$ $\overline{X}$ [X]]]]

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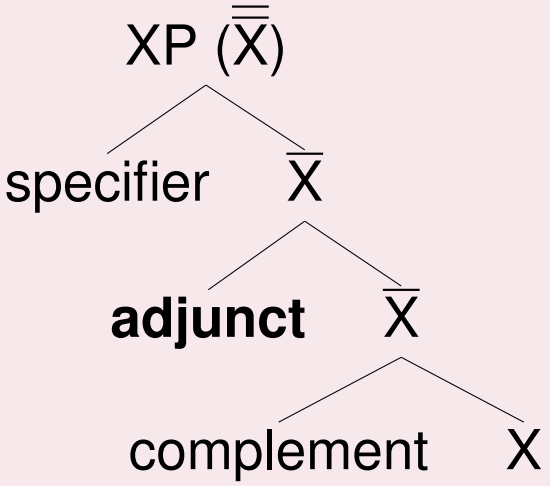
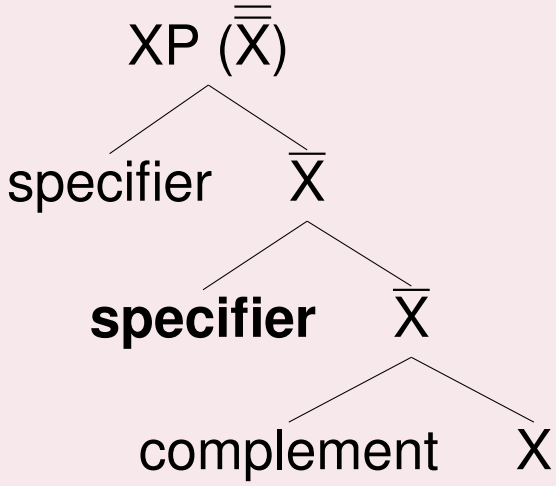
Section 6: Phrase Structure

$\overline{X}$ Structure in GB and MP

Maximal Structure in GB:



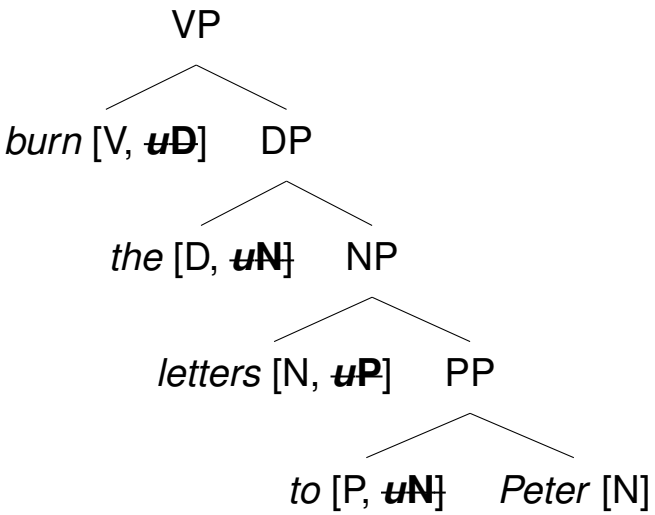
Maximal Structure in MP:



Müller (2019). Grammatical theory, p. 78 and p. 131.

First Merge – Complements

First merge always combines a **head** with a single **complement** to create a complete phrase (XP), i.e. a maximal projection.

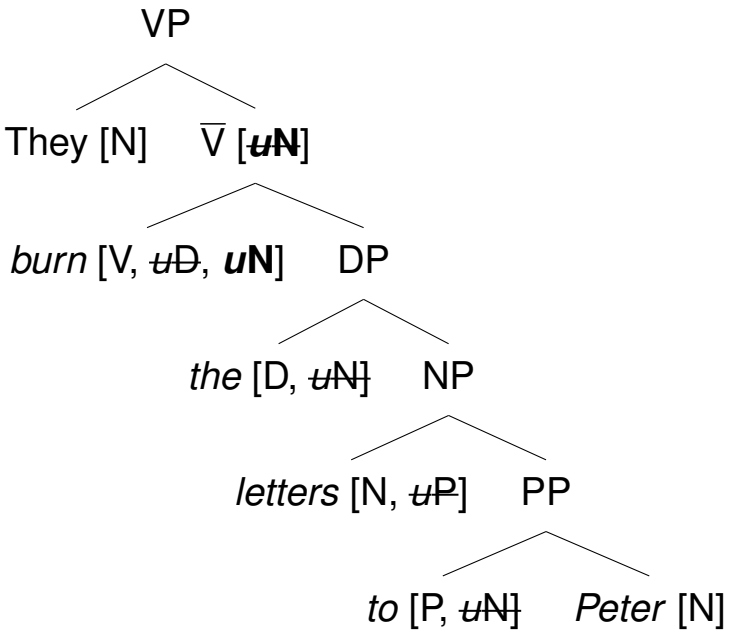


1. *Peter* (complement) is **first-merged** with *to* (head) to yield a complete PP
2. *to Peter* (complement) is **first-merged** with *letters* (head) to yield a complete NP
3. *letters to Peter* (complement) is **first-merged** with *the* (head) to yield a complete DP
4. *the letters to Peter* (complement) is **first-merged** with *burn* (head) to yield a complete VP

Adopted from Adger (2003), p. 82-84.

Second Merge – Specifiers

Second merge then combines a **head** with a **specifier**.



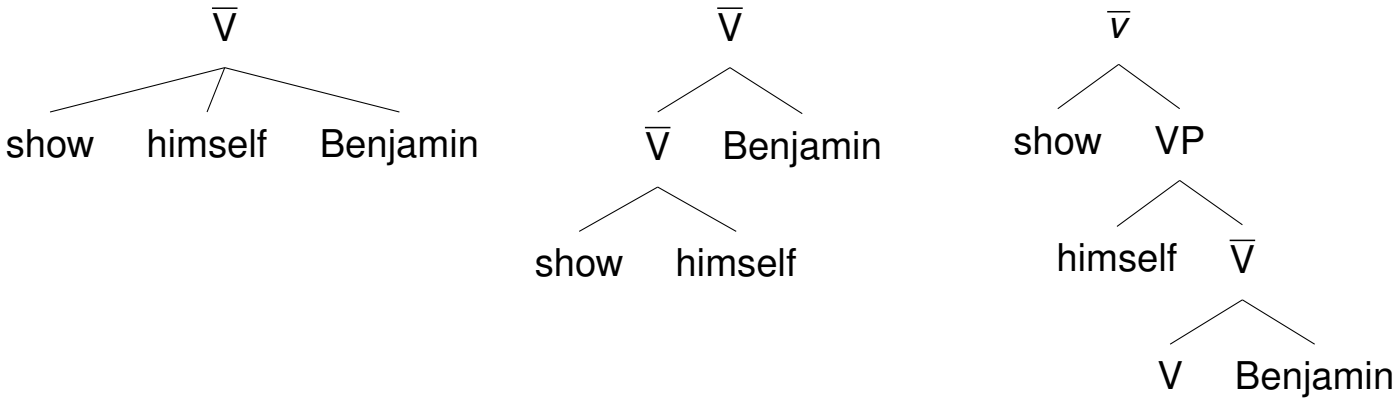
Adopted from Adger (2003), p. 86.

- In the case of a transitive verb like *burn*, it is assumed that there are actually two uninterpreted categorial features (here construed as a determiner phrase and a noun phrase).
- Note that second merge is different from first merge here, since the uninterpretable uN feature is **first handed to the next node up** (V-bar level) and then checked by the specifier.
- Beware notational variant: Sometimes the uN is then not even shown in the features of the verb, just on the node where it is checked.

Little *v*

Remember the issue of modelling ditransitives with reflexive pronouns in GB. There are at least three different options. The last of the three options below – which involves another higher level of the verb phrase termed **little *v*** – is preferred by many practitioners of the MP, since here *himself* is higher in the tree than Benjamin (i.e. c-commands Benjamin) and cannot be interpreted as referring to Benjamin.

Müller (2019), p. 132.

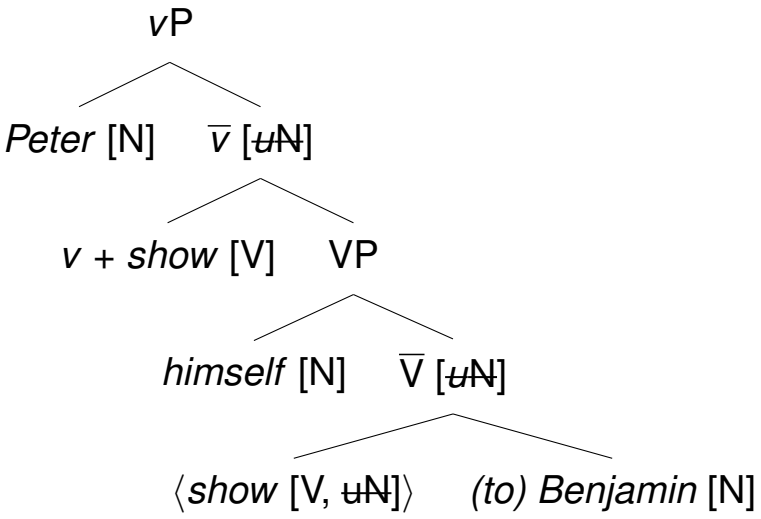


Note: The full sentence assumed here is *Peter$_i$ shows himself$_i$ Benjamin in the mirror*. Where the reflexive pronoun refers back to Peter.

Little *v*

In the full example [with categorial features checked], we would put the subject *Peter* in the specifier position of the highest level *v*P. Also, it is assumed that the verb starts out in V, and moves up to *v* (for checking its inflectional features, see next slide).

Müller (2019), p. 133.



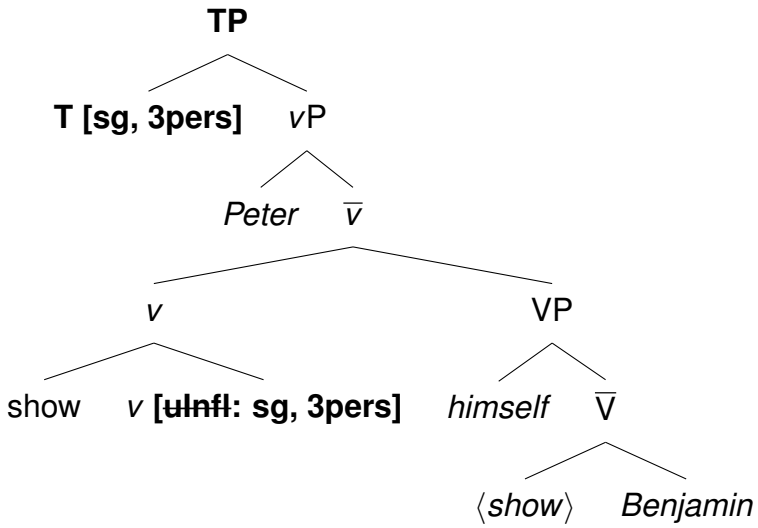
Adopted from Adger (2003), p. 107.

- We here only show the checking of categorial features.
- The feature description of the lexical item *show* is here assumed to be [V, uN, uN], where both uNs are complements (i.e. *himself*, *Benjamin*), while the specifier (*Peter*) is assumed a feature of little *v*.
- *v + show [V]* stands in for another binary branching with *v* and *show* as sisters (see next slide).

Tense Phrase (TP)

"Section 3.1.5 dealt with the CP/IP system in GB. In the course of the development of Minimalism, the Inflectional Phrase was split into several functional projections (Chomsky 1989) of which only the **Tense Phrase** is assumed in current Minimalist analyses. So, the **TP of Minimalism** corresponds to IP in the GB analysis."

Müller (2019), p. 134.



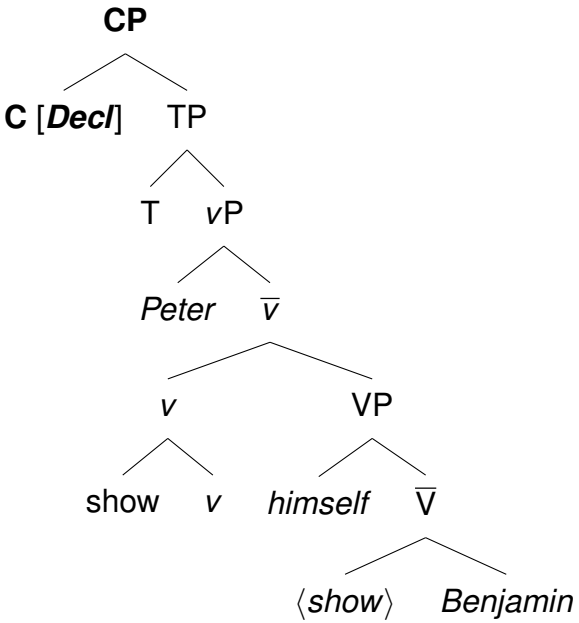
Adopted from Adger (2003), p. 137.

- The **Tense Phrase** (TP) is introduced on top of the vP.
- We here only look at inflectional features (categorial features are dropped).
- Uninterpretable Infl features are checked with what follows after the colon ':'.
- Note that feature checking from T to v is possible due the definition of the **Agree** mechanism (see definitions above).

Complementizer Phrase (CP)

In contrast to GB – where full sentences could be IPs – full sentences in the MP are always **complementizer phrases**. The head of a complementizer phrase (C) can take an actual complementizer (e.g. *that*) or a wh-word (i.e. question word Q) as before in GB. However, if it is empty then it still contributes a so-called **clause-type feature**, e.g. *Decl* for *declarative*.

Müller (2019), p. 134.



Adopted from Müller (2019), p. 136.

- The **Complementizer Phrase** (CP) is thus considered the highest level phrase in MP.
- Here we only look at the tree structure with the respective lexical items of the sentence, but without feature checking of categorial or inflectional features.
- Note that feature checking can also be relevant for the CP (see Adger 2003, pp. 240), but we do not discuss this here further.

Differences between Minimalism and GB

- Structure building relies on **feature checking**, rather than rewrite rules.
- There is just **merge (external)** and **move (internal merge)** applied in any order, rather than a Deep Structure and Surface Structure (after move).
- Case assignment is no longer handled with the principle of government, but also by **feature checking (Agree)**.

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Section 7: Basic Concepts in Minimalism

Basic Concepts in Minimalism

- Constituency ✓[4]
- POS ✓[5]
- Heads ✓[6]
- Valency ✓[7]
- Grammatical Functions ✓[8]

[4] Relevant for merge operations.

[5] Relevant for categorial feature checking, though not strictly adhered to in the tree structure, e.g. C is not necessarily a complementizer. Same as for GB.

[6] Strictly necessary for merge operations and categorial feature checking.

[7] Given strictly binary branching, as well as the new X-bar schema with one complement and otherwise specifiers, the valency of verbs is not as important for structure building as before.

[8] Rather marginal, relevant for deciding on specifiers and complements of verbs (as in GB).

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Section 8: Pros and Cons of Minimalism

Pros (Advantages)

- Reduces the operations assumed for structure building (feature checking, Merge and Move) and is hence more evolutionary plausible (?).
- The MP analyses with one complement (first merge) and several specifiers (second merge) leads to a strictly binary structure without lots of unary branches (as before in X-bar theory).

Cons (Disadvantages)

- Not formalized fully, i.e. hard to implement computationally.
- While the GB literature in the 80s and 90s was reasonably coherent with regards to fundamental assumptions, the MP quickly fragmented into many divergent frameworks.
- The development of implementations of large grammar fragments (even for a single language) requires collaboration of researchers over years and even decades. As Müller (2019, p. 176) puts it: “This process is disrupted if fundamental assumptions are repeatedly changed at short intervalls.”

Section 9: References

References

Adger, D. (2003). *Core Syntax. A minimalist approach.* Oxford: Oxford University Press.

Chomsky, Noam (2015). *The minimalist program*. 20th anniversary edition. Cambridge, Massachusetts: MIT Press.

Müller, Stefan. 2019. *Grammatical theory: From transformational grammar to constraint-based approaches. Third revised and extended edition.* ***Volume I***. Berlin: Language Science Press.

Thank You.

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