Syntax (Part I)

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Colourless green ideas sleep furiously

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Introduction

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Introduction

“Did you notice our waitress’s nose ring?”

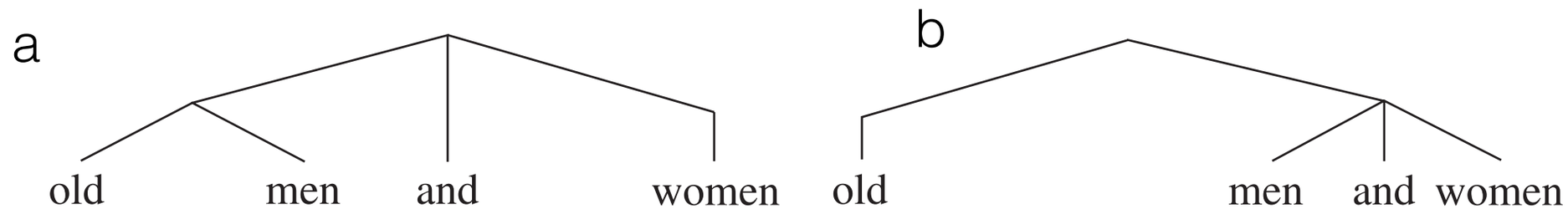
Despite the same elements and the same linear order of their arrangement, this sentence is ambiguous. Why?

This is because the same string of words can be the surface form of two internal structures. Here we need to rely on syntax to explain the source of structural ambiguity.

Introduction

A simpler illustration of structural ambiguity

old men and women



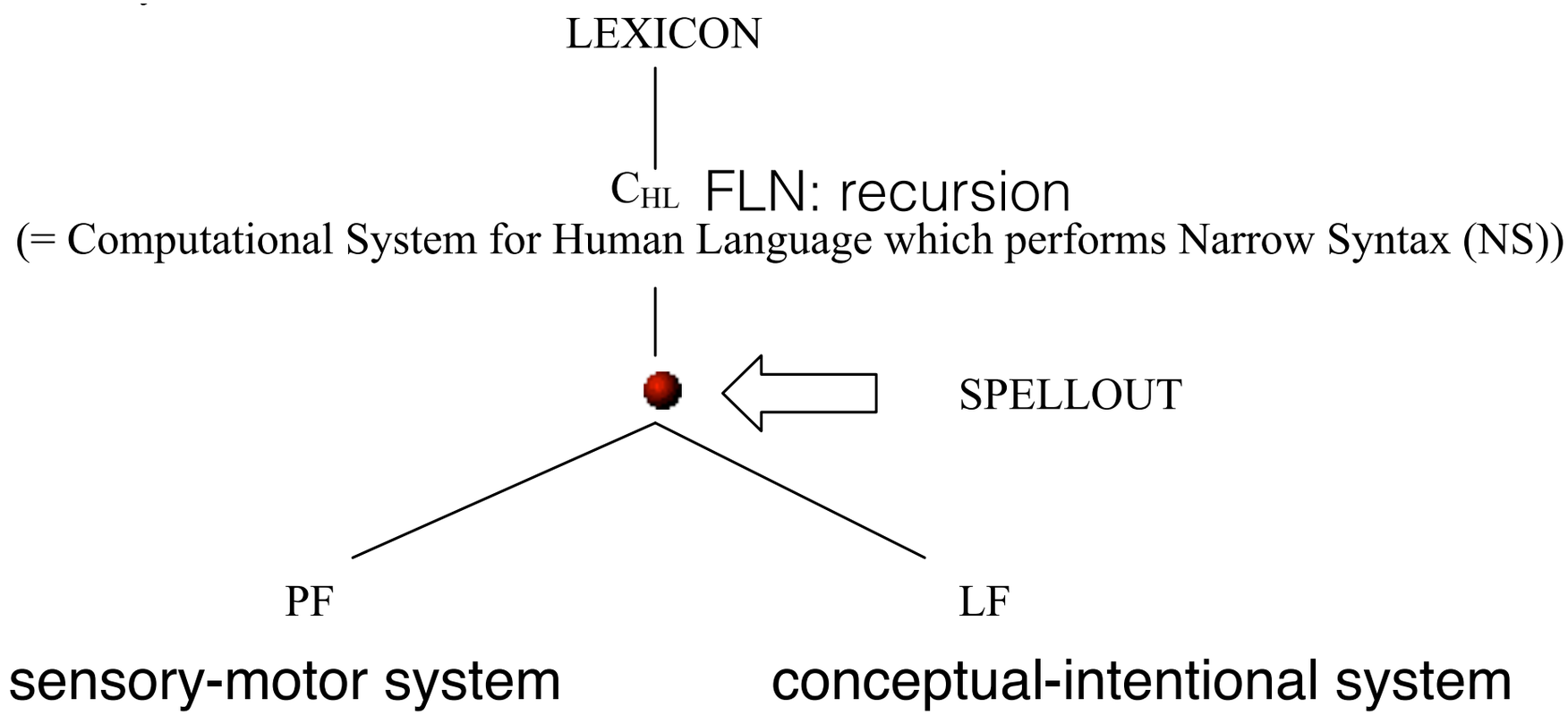
Fromkin et al, p 79

Surface word order is an illusion— we need a tool to look deeper into the structure, in particular, (i) which words are clustered together, and (ii) what is the order of their clustering.

Why Syntax?

- The faculty of language unique to humans is characterised by the property of recursion.
- Recursion specifically applies in syntax, i.e. the derivation of phrases and sentences.
- To investigate how recursion works, and shapes our language, we need to explore the domain of syntax.
- Our knowledge about grammatical and ungrammatical structures reveal our knowledge of language, i.e. UG. We figure out what's in people's minds by deducing it from the data they are exposed to and the behaviour they exhibit.

The Basic Model



"Homo sapiens conquered the world thanks above all to its unique language."
— the above model specifies what it means by unique!

Why Syntax?

Let's firstly take a look at the following sequence of words:

(1) Louis hopes that Wayne will be fit for the match.

There are 3,628,800 possible orders for this 10-word sentence, the vast majority of which are ungrammatical.

(2) *Hopes Louis that Wayne will be fit for the match.
(3) *Hopes that Louis Wayne will be fit for the match.

From such data, we conclude that language speakers' mind stored some patterns which can group small parts into grammatical sequences, and to reject the ungrammatical patterns.

Why Syntax?

You might argue why it is not the case that we have complete sentences stored in mind. Let's make a comparison between a talking doll and a human being.

Talking Doll:	Human
Small, fixed stock of utterances	Open-ended set of possible utterances showing creativity and novelty
Utterances have no internal structure; stored as wholes	Utterances have complex structure; produced online
Many exact repetitions	Few repetitions (aside from fixed social formulas)

Why Syntax?

- Human's linguistic capacity can produce ideally infinite collections of well-formed sentences:

(5) The horse behind John is bald.
The horse behind the horse behind John is bald.
The horse behind the horse behind the horse behind John is bald.
The horse behind the horse behind the horse behind the horse behind John is bald.
…

- The infinite size of such collections shows that unlike the doll's mechanism, our minds don't simply store the sentences that we produce and understand as separate units. So one way to explain the above data is to suppose that our mind has a basic stock of words and a basic pattern for combining them, which will be enough to produce an infinite set.

What Syntax Does

- Sentences are composed of discrete units that are combined by rules. This system of rules explains how speakers can store infinite knowledge in a finite space—our brains.

- The part of grammar that represents a speaker's knowledge of sentences and their structures is called **syntax**.

- Colourless green ideas sleep furiously.
  What does this sentence reveal about syntax?

How to DO syntax?

At the core of syntactic investigation are the rules that allow certain elements to be combined. To explore such rules, we need to study:

- the atomic elements which are the input of the initial combination
- the demarcation of the units in a sentence
- the structural relationship between the units

How to DO syntax?

- We should divid a problem into as many parts as admit of separate solution.

— Discourse on Method, p. 92

René Descartes (1596-1650)

Categories and Constituents

Let's reconsider the example in (1), repeated as (7):

(7) Louis hopes that Wayne will be fit for the match.

Intuitively, we know that the atomic elements *the* and *match* are certain categories, which are combined into a larger unit *the match*, and this unit is further combined with another category, *for*, forming a larger constituent *for the match*…

We now should go beyond the intuition: how do we know what the category of *the* is, how do we know that *the* and *match* form a unit, not *for the*? …

How to DO syntax?

Another example:
(8)
Fish
Fish fish
Fish fish fish
Fish fish fish fish
Fish fish fish fish fish

The word *fish*, in the above examples, takes different categories.

The different ways of arranging the internal hierarchical structure leads to the grammaticality of each sentence, and to the different meanings.

How to DO syntax?

The general strategy for capturing the knowledge of grammar is then as follows:

- Label the atomic elements depending on their different properties (category)
- Classify the objects into general small units (constituent)
- State the possible patterns that we observe as arrangements of the units (rules).

Categories

- **Categories** are the labels used to classify the objects in syntactic operation (simply speaking, combination).

- Two main types of categories (as introduced in the section of Morphology)

Lexical categories:

- N(oun), V(erb), Adj(ective), Adv(erb), P(reposition)
- open class (you can invent new ones)
- (near-) universal

Functional categories

- auxiliaries (must, be), determiners (the, a), complementisers (if, that, for), etc.
- closed class
- vary quite a lot from language to language

Categories

What is the nature of a category, like N, V and Adj.?

- While a category does exhibit its own morphological, semantic and sometimes phonological properties, studies on this issue are still going on.

- For the current purpose, we just take them as the labels of the atomic elements in structural combination: we might not know what exactly they are, but they do exist.

- There is ongoing research on the nature of categories in different frameworks of linguistics like generative syntax (Chomskyan syntax), Cognitive Grammar, Construction Grammar, among others.

Complex Categories

So far, our categories are labels given to atomic elements. Now consider the following examples:

a. <u>Water</u> evaporates.

b. <u>Mineral water</u> evaporates.

c. <u>All the mineral water in this bottle</u> evaporates.

- w*ater*, m*ineral water* and *all the mineral water in this bottle* are all nominal (i.e. taking the table of Noun.)
- Complex categories contain more than one word.
- A complex category contains a head, which determines the category, while other elements either “depend or modify the head in various ways”.
- Depending on the head’s category, we have NP, VP, A(dj.)P etc that label complex categories.
- What is the head of the above examples?

More on Constituent: What It Is & Why It Is Needed

We agree that a grammatical sentence is derived from the combination of the smallest units. But a linguistic expression is not formed by a one-time combination of all the single units via a single pattern. For example, consider the phrase

(11) the man in the room

Intuitively, this expression, let's say, a noun phrase (NP), is not formed by a rule that says:

(12) *NP → article + noun+preposition+ article + noun

More on Constituent: What It Is & Why It Is Needed

We have an intuition that *the man* is a unit, *the room* is a unit, *in the room* is also a unit, all such units being what we call **constituents**.

- Define constituents: Constituents are groups of words that function together as units.

- Why constituents?

The patterns we aim to explore are the rules that tell us how the smallest units can be combined to form larger constituents (phrases) and how larger phrases can be further combined to form new phrases, ***step by step.***

- Recall the "old men and women" example:

[old men] + [women]
old [men and women]

- Try to think about how the term "constituent" can help us explain the ambiguity of the "nose ring" example.

More on Constituent: How to Describe it

We already know that each word has a label, that is, a category. Now, to describe a constituent larger than a word, that is, a phrase, we need two elements: **label, and the structural relationship that shows how the components are related in the constituent.**

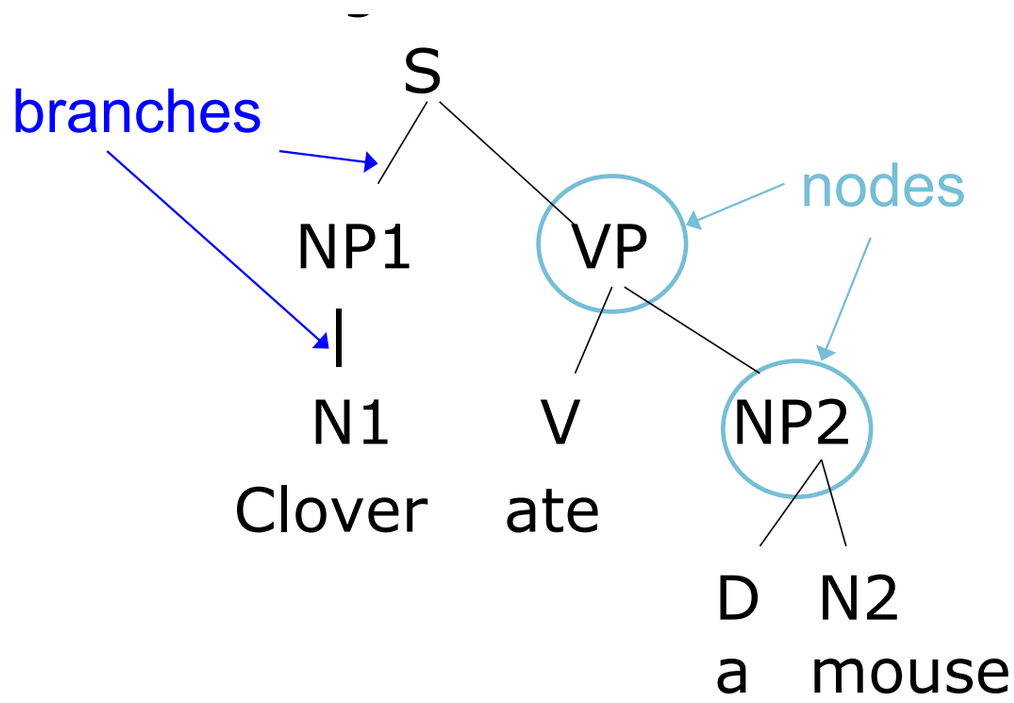
We come to label first. A constituent is a group of words (or a single word) that count as a category (simple or complex)

Noun Phrase (NP): noun + other words and phrases that depend on/modify that noun (articles, adjectives, Preposition Phrases, relative clauses, etc.).
Verb Phrase (VP): verb + other words and phrases that depend on/modify that verb (objects, adverbs, adverbial phrases, subordinate clauses, Prepositional Phrases, etc.).
Preposition Phrase (PP): preposition + NP

To show the structural relationship of the components within a constituent, we need **tree diagrams**.

More on Constituent: How to Describe it

Tree diagrams are taken by linguists to describe phrases. In a tree diagram, the relationship between constituents is transparent, and the labels help us to understand the nature of each constituent.



Question: Can you see how the above tree diagram help us understand the structure of the sentence?

This tree diagram shows the steps of combining constituents: for example, this tree diagram tells us that [ate] combines with the NP [a mouse], not [ate] firstly merges with [a] and then [ate a] merges with [mouse].

The right step
[ate [a mouse]]

The wrong step
[[ate a] mouse]

That is, [a mouse] is a constituent, and [ate a mouse] is also a constituent, but [ate a] is not.

Now we can give a formal definition of constituent in terms of tree diagrams:
Constituent: The set of nodes exhaustively dominated by a single node

- Note that tree diagrams only represent, but NOT dictate, the constituent structure.

- So from the tree we can clearly see that [a mouse] is a constituent, but [eat a] is not.

Question: how can we know that some elements can be combined to form a constituent, but some cannot?

Phrase Structure Rules

To answer the above question, in theory we have two possibilities:

(i) our memory stores the information that [eat a] is not a constituent, but [a mouse] and [eat a mouse] are constituents.

(ii) We do not store such information. Instead, we have abstract rules/patterns, which are part of our tacit knowledge of language.

Which stance should we choose, and why?

Phrase Structure Rules

If we choose hypothesis 1, then we have the following problem: our memory has a limit, but the combinations of words is infinite.

If we choose hypothesis 2, it means that our mind is endowed with a limited set of abstract rules, which can enable us to create infinite sentences. This is the stance taken in modern linguistics.

Phrase Structure Rules

- **Phrase Structure Rules** (PS Rules) are formal devices which generate constituent structures, by specifying all and only the possible ways in which categories can combine:

i. S → NP VP
(“Rewrite the symbol S as the sequence NP VP”)

ii. VP → V (NP) (PP)

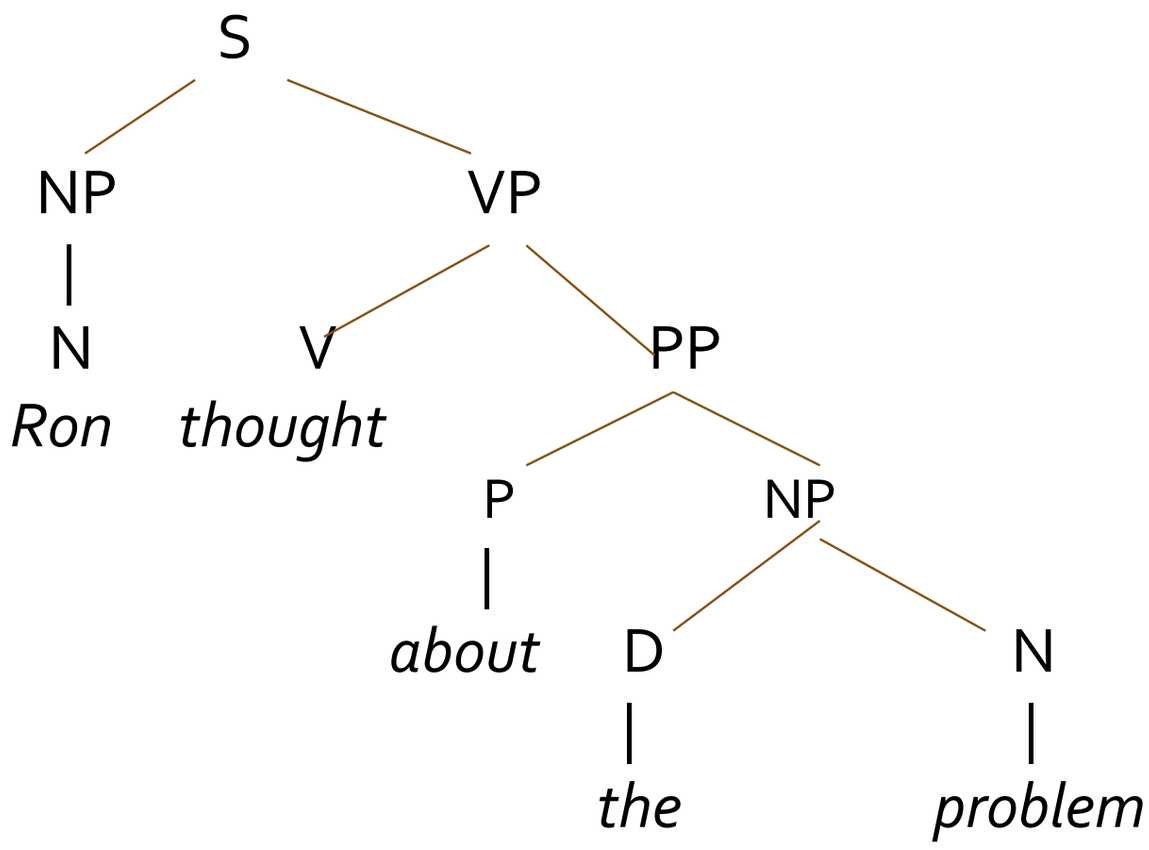
iii. NP → (D) N (PP)

iv. PP → P (NP)

- These rules can generate the tree diagrams we saw just now and similar ones.
- If the aforementioned tree diagram is correct, can you tell what PS rules are involved?

Phrase Structure Rules

A sentence



i. S → NP VP
ii. VP → V (NP) (PP)
iii. NP → (D) N (PP)
iv. PP → P NP

Explaining Ungrammaticality

What's wrong with these sentences?

(5) a. *Spoke John.
b.*Hopes Louis that Wayne will be on form.
c.*Loves the Leader of the Opposition his wife.

Explanation: constituents generated by wrong PS rules.

i. S → NP VP
ii. VP → V (NP) (PP)
iii. NP → (D) N (PP)
iv. PP → P NP

Subordinate Clauses

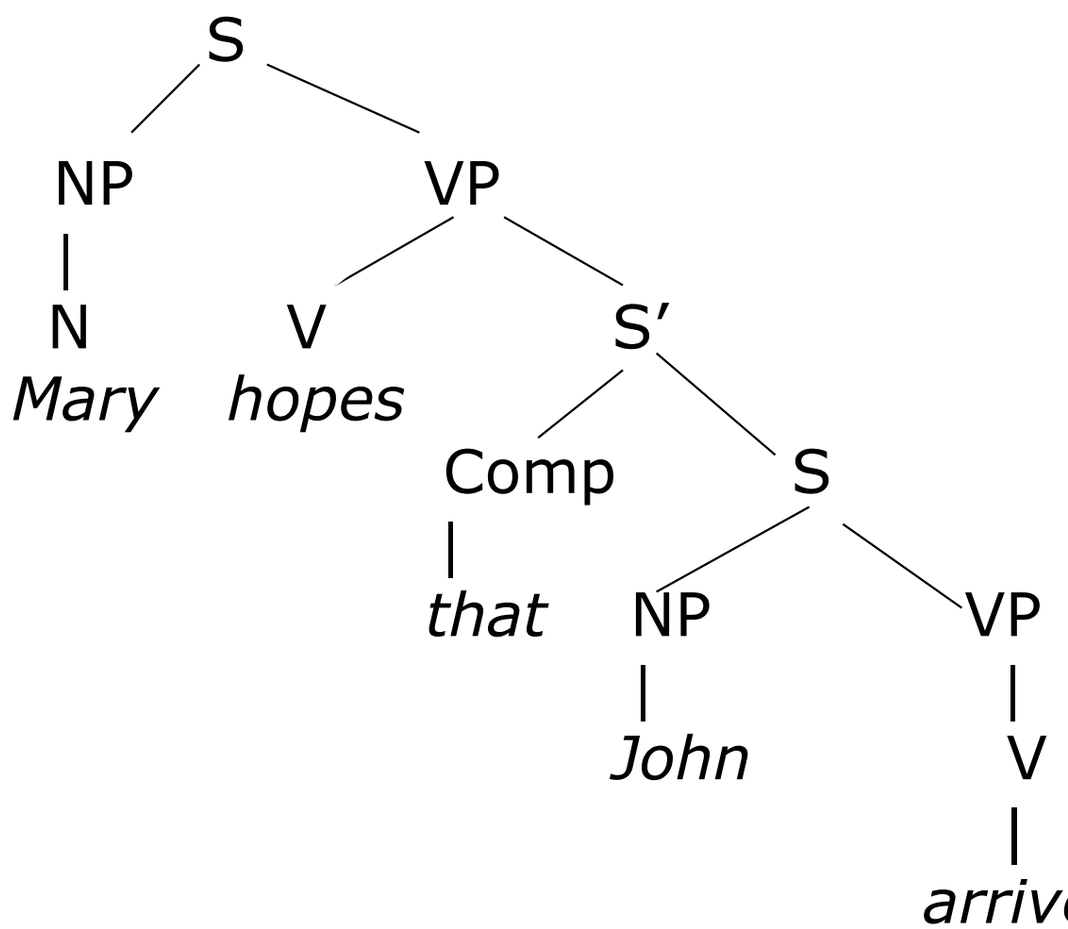
Mary hopes [that John arrived].
PS Rules
(i) VP → V S'
(ii) S' → Comp S

- "Comp" is the "complementiser", an element which introduces a subordinate sentence.
- Question: how many subordinate clauses are possible?

(8)Mary hopes that John expects that Pete thinks that Dave said that ...

The tree looks like this:

(9)



- i. VP → V S′
- ii. S′ → Comp S

So far, we have got these PS rules

i. S’ → Comp S

ii. S → NP VP

iii. VP → V (NP) (PP) (S’)

iv. NP → (D) N (PP)

v. PP → P (NP)

- These rules give three kinds of information:

- hierarchical relations (Constituents in a sentence are embedded inside other constituents.)
- linear relations
- categories

Assignment:

Draw trees for:

a. fish fish.

b. fish fish fish

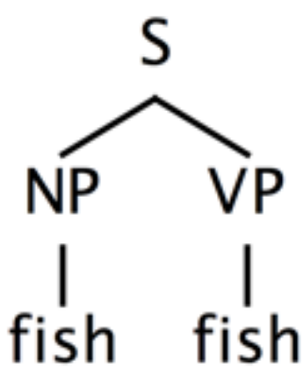
c. fish fish fish fish.

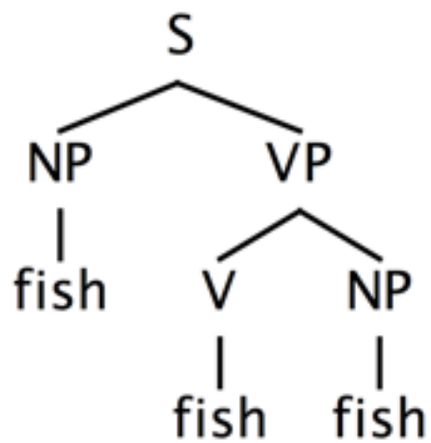
Tips

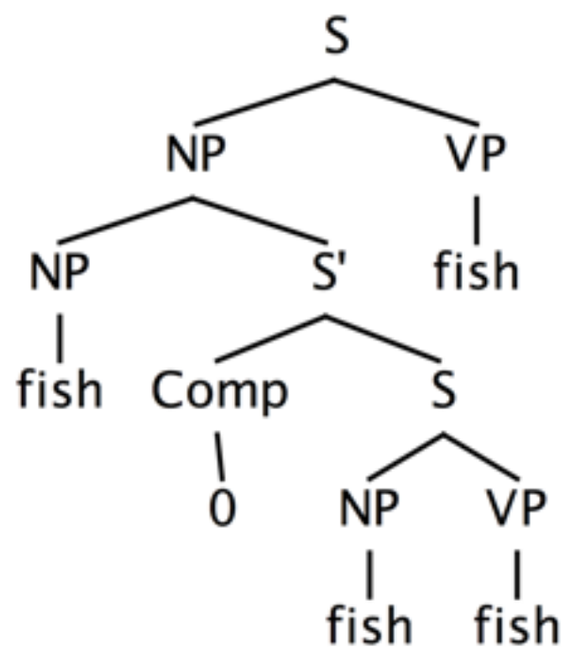
- use S’ to label a relative clause.
- use Comp to label relative pronouns like “that” and “which” as well as the phonologically null relative pronoun.

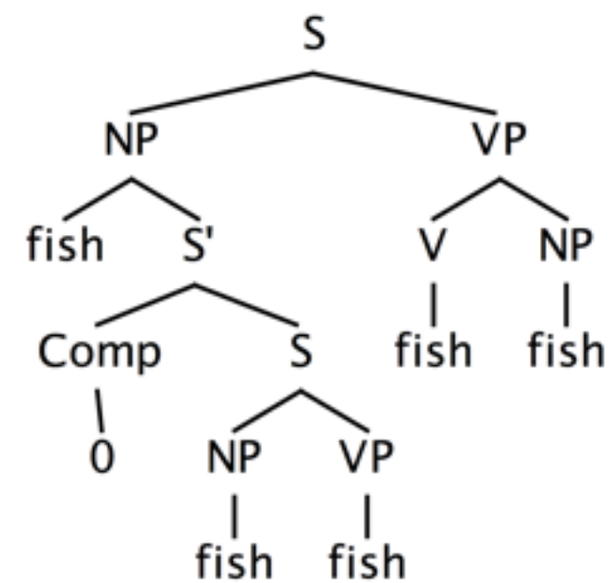
Let’s draw trees!

Fish fish
Fish fish fish
Fish fish fish fish
Fish fish fish fish fish









So far, we have got these PS rules

i. S’ → Comp S

ii. S → NP VP

iii. VP → V (NP) (PP) (S’)

iv. NP → (D) N (PP)

v. PP → P (NP)

- These rules give three kinds of information:

- hierarchical relations (Constituents in a sentence are embedded inside other constituents.)
- linear relations
- categories

Structural Ambiguity

- Questions: We have seen that a tree diagram can represent the hierarchical structure of a sentence which appears to have a linear order. So is it possible that a certain sentence with a single linear order might have different hierarchical structures? What will be the consequence?

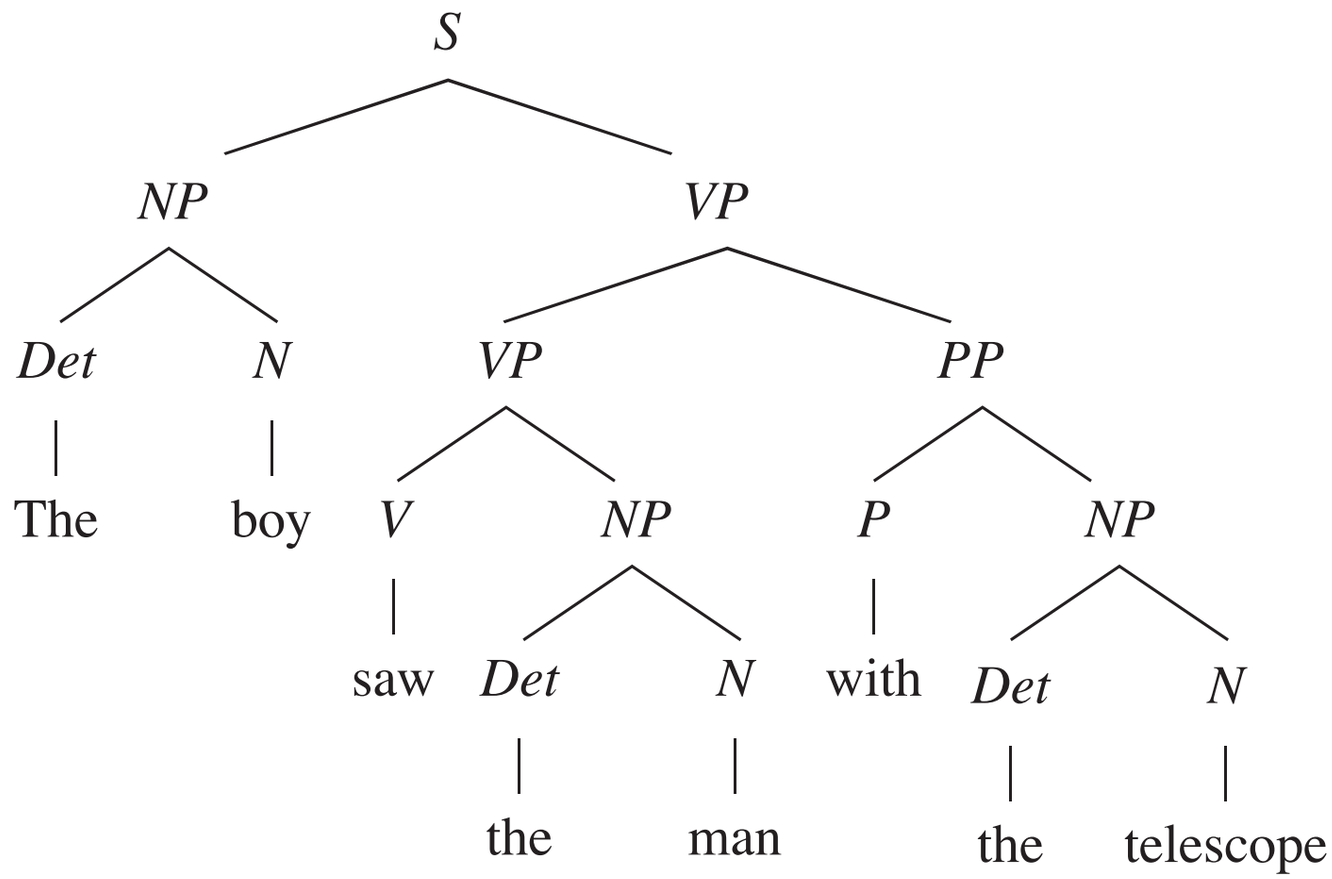
- The answer to the first question is yes as long as PS rules allows for it. The answer to the second question is that ambiguity will arise.

The boy saw the man with the telescope.

- What reading(s) can you get?
- Are the readings generated from the same structure?
- Can you use tree diagram to indicate the underlying reason for the ambiguity?

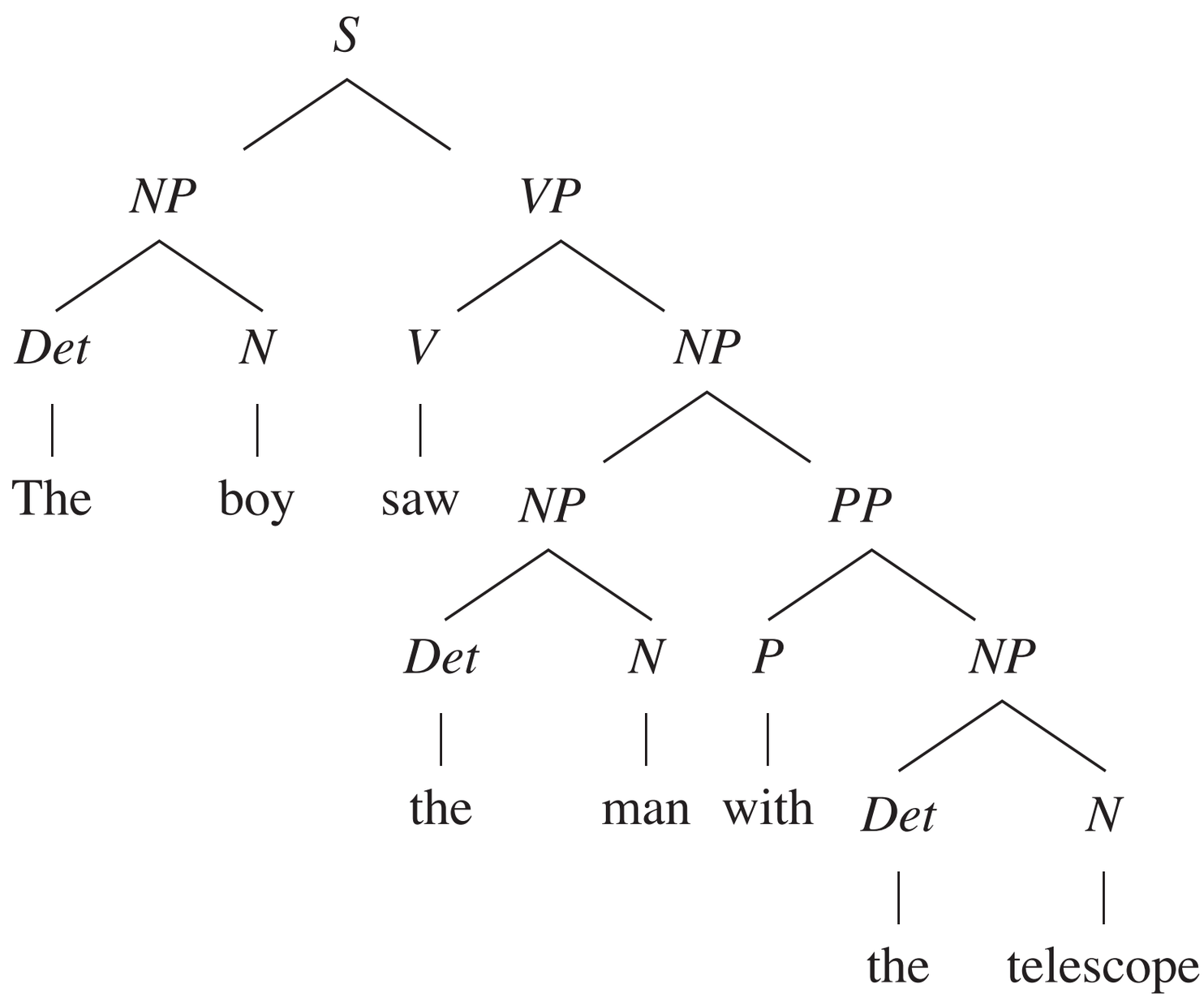
Structural Ambiguity

1.



Structural Ambiguity

2.



Why Do We Know this?

S → NP VP

- Sequence of words: N_{subj} V N_{obj}
- We say this is grouped as $[_{NP}$N] $[_{VP}$V N], but theoretically it could be $[_{VP}$N V] $[_{NP}$N]
- This would mean that the subject and the verb form a phrase/constituent: $[_{S}$ $[_{VP}$ John likes] $[_{NP}$ cake]] What is wrong with this?
- The PS-rule VP→V NP generates the sequence V NP, but does not generate NP V. However, we do find this sequence:
  [NP The Minister] [V denied] the allegations.
- Why don't we say that NP and V form a constituent here?

- Similarly, the NP P sequence in (a) or the N A sequence in (b):

a. They gave [NP the book] [P to] Mary.
b. They gave $[_{NP}$ Mary] $[_{A}$ sweet] cookies.

Constituency Test

- When a generalisation is made, we simply need evidence to support the generalisation on the one hand, and rule out the other alternatives.
- In our current case, we need evidence from tests that V+NP forms a constituent, and NP+V is not a constituent.
- Various operations only affect constituents. These are the constituency tests (for English):
  - passivisation
  - clefting
  - pro-forms
  - WH-questioning
  - fronting

Passivisation Test

a. [John] visited [several towns].
agent patient

- Passivisation switches position of thematic roles:

  b. Several towns were visited (by John).

- Passivisation must apply to whole NPs:

  c. *Towns were visited several (by John).

NB: A phrase that goes through the passivisation test is a constituent, but this does not mean that all the NP constituents can always be passivised.

- Can all constituents be passivised?

- John believes that it will rain.
- John laughed at the film.
- John regrets that it is raining.
- John lacks a car.
- The bottle contains lemonade.

- Important: the fact that a given sequence fails a constituency test does not mean it is not a constituent!

So, here we see the logic of designing a test.

Clefting Test

a. The Party Chairman sent a present to John. ➔
b. It was to John that the Party Chairman sent a present t.
c. It was the Party Chairman that t sent a present to John.
d. It was a present that the Party Chairman sent t to John.

- Constituents:
  ‘to John’, ‘the Party Chairman’ and ‘a present’

e. *It was the Party Chairman sent that t fruit to John.
f. *It was a present to that the Party Chairman sent t John.

- What to infer from the ungrammaticality of e/f?

Pronoun Substitution Test

How we use pronouns as a constituency test:

- Pronouns, despite their name (pro-nouns), stand for NPs:

a. [$_{NP}$ The man who wears glasses] hopes that he will win.

b. * The he who wears glasses hopes that he will win.

Pronoun Substitution Test

- Other categories have pro-forms too. Most VPs can be replaced by ‘do so’ (in formal speech):

a. John [$_{VP}$ sent the professor a card], and Mary did so too.

- The whole VP must be replaced:

b. * ... , and Mary did so the professor too.
c. *..., and Mary did so a card too.
d. *..., and Mary did so the professor a card too.

- Question: what can we infer from (a-d)?

Fronting Test

- This operation ‘highlights’ phrasal constituents:

a. Mary hopes that John will like her friends.

b. Her friends, Mary hopes that John will like t.

c. That John will like her friends, Mary hopes t.

d. (Mary hoped that John would like her friends) ...

... and [$_{VP}$ like her friends] he did.

Structural Ambiguity Again

I shot an elephant in my pyjamas.

a. I shot [$_{NP}$ an elephant [$_{PP}$ in my pyjamas]].

b. I shot [$_{NP}$ an elephant] [$_{PP}$ in my pyjamas].

- How can we show ambiguity by using some of the above tests?
- The key: we need some tests to show whether [in my pyjamas] and [an elephant] form a constituent.

Structural Ambiguity Again

- Fronting:

An elephant in my pyjamas I shot. (Reading A)

An elephant I shot in my pyjamas. (Reading B)

- Clefting:

It was an elephant in my pyjamas that I shot. (Reading A)

It was an elephant that I shot in my pyjamas. (Reading B)

- Passivisation

An elephant in my pyjamas was shot by me. (Reading A)

An elephant was shot by me in my pyjamas. (Reading B)

- do-so

I shot an elephant in my pyjamas, and Mary did so in her T-shirt. (Reading B)

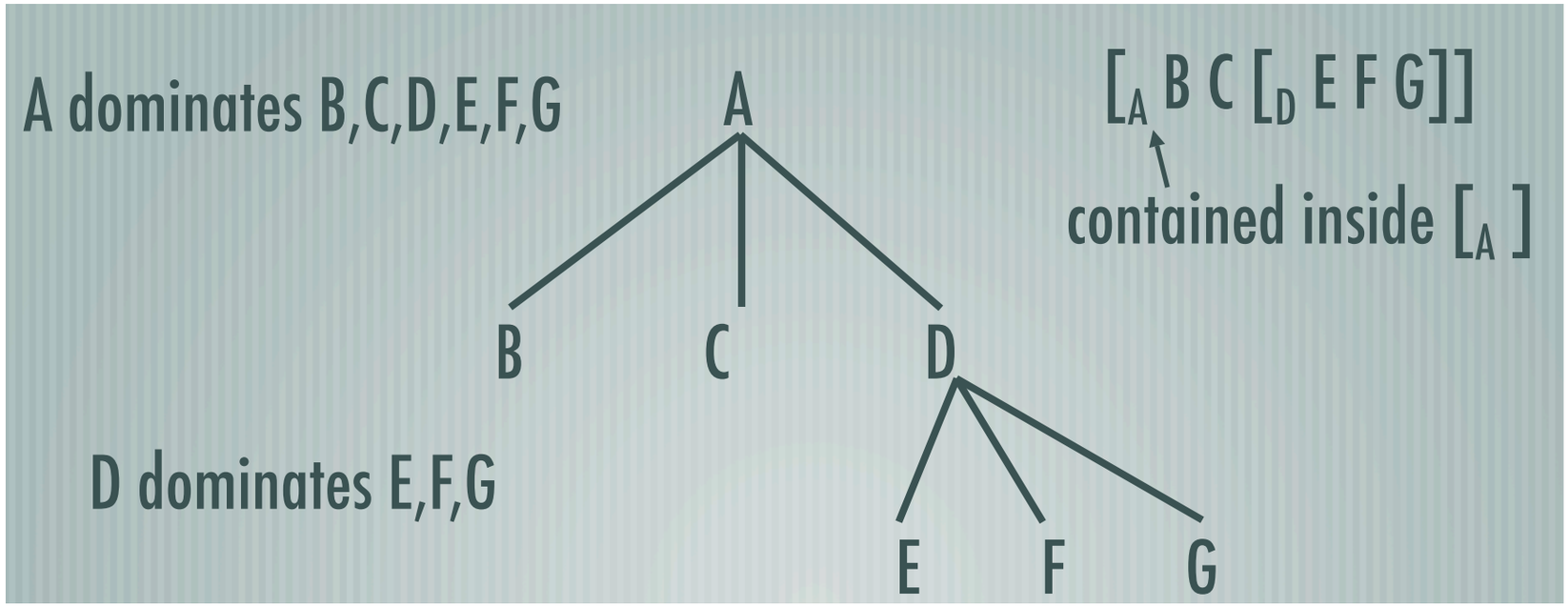
I shot an elephant in my pyjamas, and Mary did so too. (Reading A)

Structural Relationship:

Dominance

Intuitively, if a node contains another, then it dominates it.

Formally, a category A dominates another category B just where A is both higher up in the tree than B and can trace a line to B that goes downward.

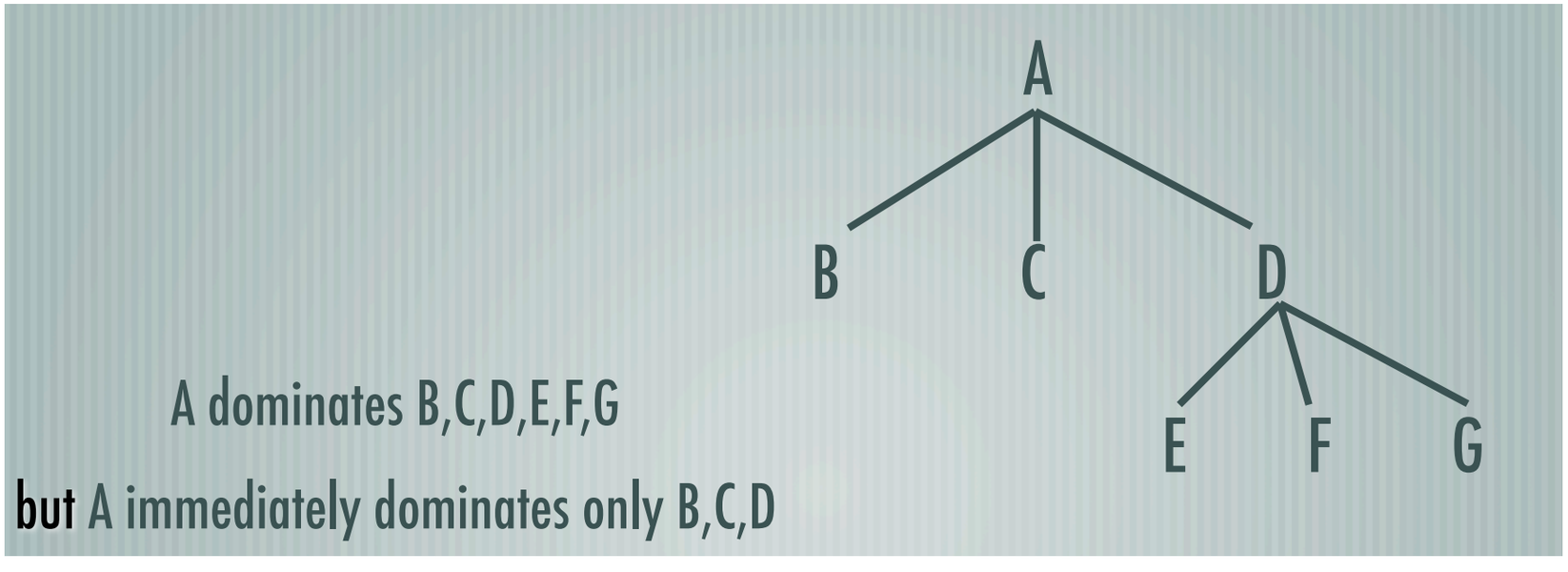


The above tree is from Andrew Carnie's (2006) slide

Structural Relationship:

Immediate Dominance

A *immediately* dominates B if A dominates B and no node intervenes on the downward path from A to B. That is, A is the first node that dominates B.



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Structural Relationship

Constituency and immediate constituency

- Dominance and constituency are inverse relations.
- If A dominates B, then we say B is a constituent of A.
- If A immediately dominates B, then we say B is an immediate constituent of B

Structural Relationship

Constituent and Constituent of

NB: Constituent and “constituent of” are different things.

In terms of the tree diagrams, a formal definition of constituent can be as follows:

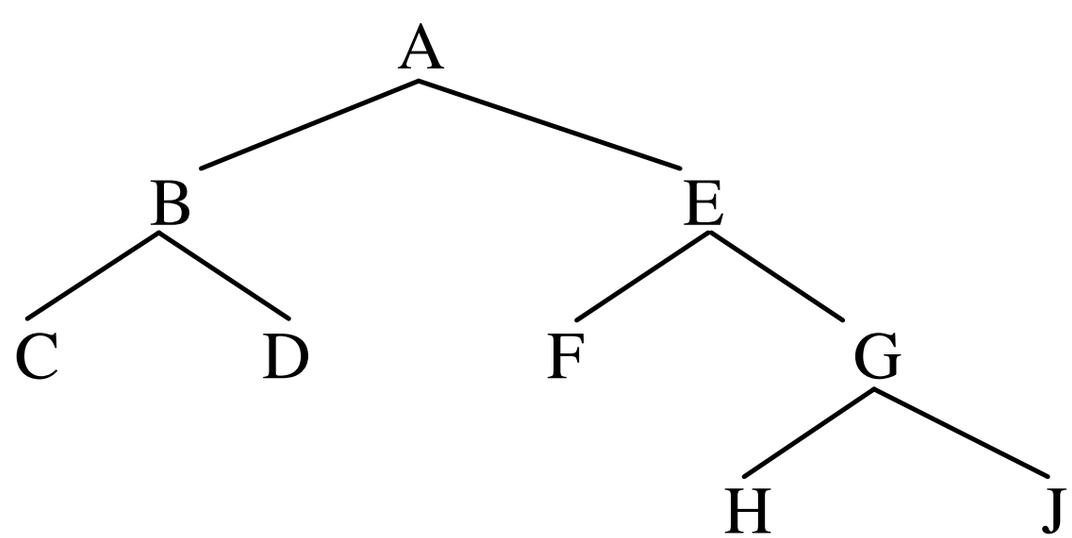
A constituent consists of all the nodes dominated by a single node.

Structural Relationship:

C-command (C stands for constituent)

A constituent X c-commands its sister constituent Y and any constituent Z dominated by Y. That is, c-commanding is a relationship between a node and its sister and all the daughters of its sister.

Can you tell the c-commanding relations between the nodes in the following tree? Does A c-command B and E? Does C c-command D? Does C c-command F/G, etc.? Does B c-command E/F/G/H/J?



Structural Relationship:

(Textbook P73-74)

C-command: How it is applied in syntactic analysis

C-command is one of the most important structural relationships widely used in various types of syntactic analysis. Here we focus on binding, which involves how the value of an anaphor, like reflexive (e.g. himself) and reciprocal (e.g. each other), has to be determined by an antecedent in a phrase.

John$_i$ blamed himself$_i$.

They$_i$ hated each other$_i$.

A friend of John$_i$ blamed himself$_i$.

Enemies against them$_i$ hated each other$_i$.

What is implicated by the above examples concerning anaphoric binding?

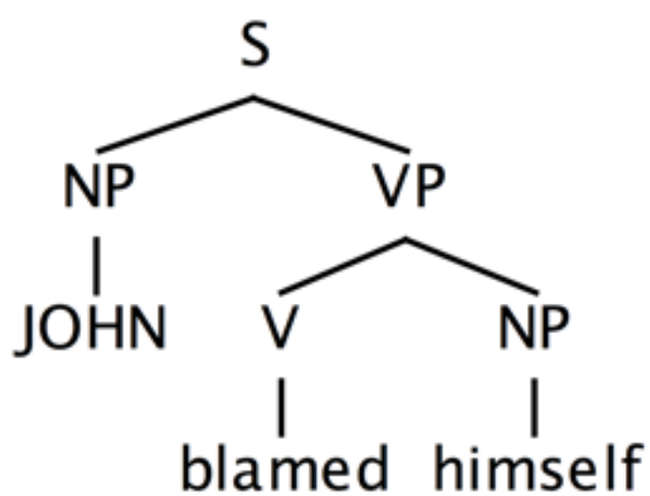
Structural Relationship:

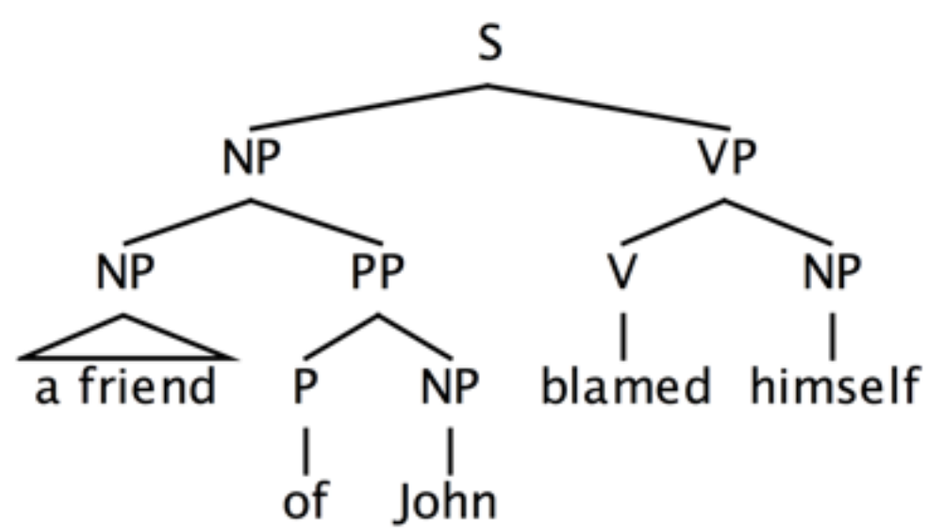
(Textbook P73-74)

C-command: How it is applied in syntactic analysis

Implication: A legitimate antecedent of an anaphor does not imply precede the anaphor, but should take a special hierarchical relationship with the anaphor. This hierarchical relationship is c-command!

If an anaphor X is bound by an antecedent Y, X must be c-commanded by Y.

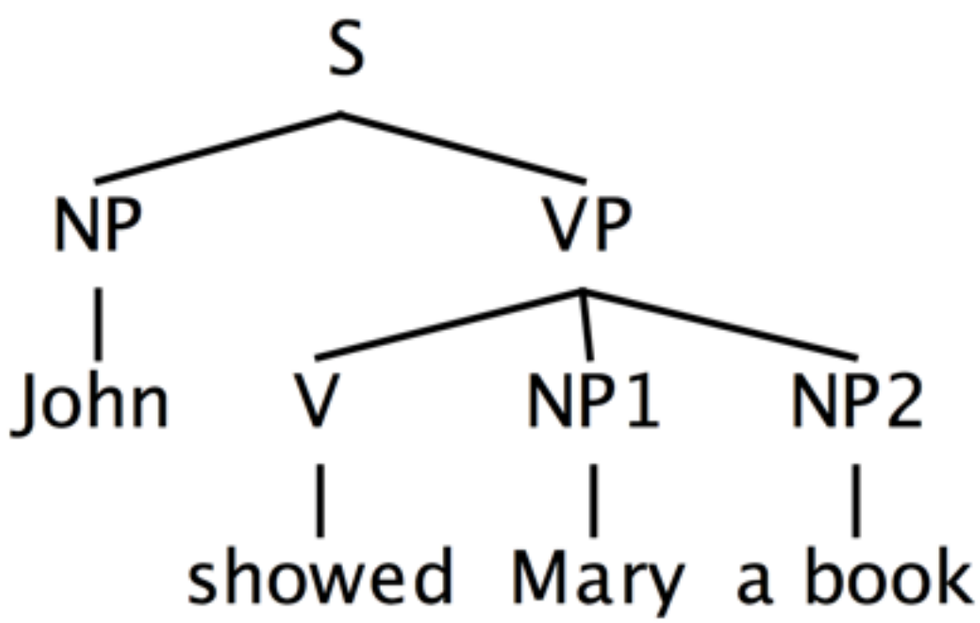




Structural Relationship:

The power of c-commanding test:
Do you think the following structure for the double object construction is reasonable? Ignore whether “binary branching” is a must for a tree!

To be honest, it’s hard to make the judgment. We need some solid and explicit evidence.



Structural Relationship

C-command: How it is applied in syntactic analysis

What conclusion about the double object construction can you draw from the following examples?

a. John showed Mary$_i$ herself$_i$.

b. *John showed herself$_i$ Mary$_i$.

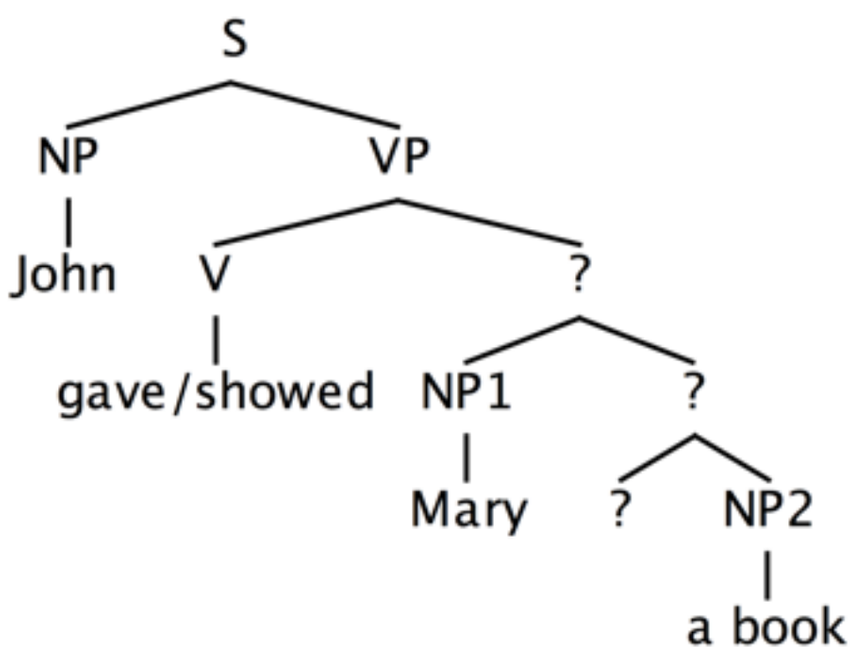
Structural Relationship:

C-command: How it is applied in syntactic analysis

What conclusion about the double object construction can you draw from the following examples?

The above examples show that in the structure of a double object construction, the first object should be structurally higher than the second one because the former c-commands the latter.

Abstracting away technical details, the structure should be as follows (ignoring where the verb should be placed):



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Part of the slides on constituency test are based on Prof. Ian Roberts' Cambridge Lectures of Meaning and Structure.