X-Bar Theory

Unit 6

Objectives

1. Explain the motivation for simplifying the PSRs into X-bar theory.
2. Apply the notation of X-bar theory using variables.
3. Be able to draw a tree in X-bar theory.
4. Apply tests to distinguish complements from adjuncts.
5. Draw trees correctly placing modifiers as complements, adjuncts, and specifiers.
6. Describe the notion of a parameter.
7. Be able to correctly set the complement, adjunct, and specifier parameters for any foreign language data.

What PSRs do well

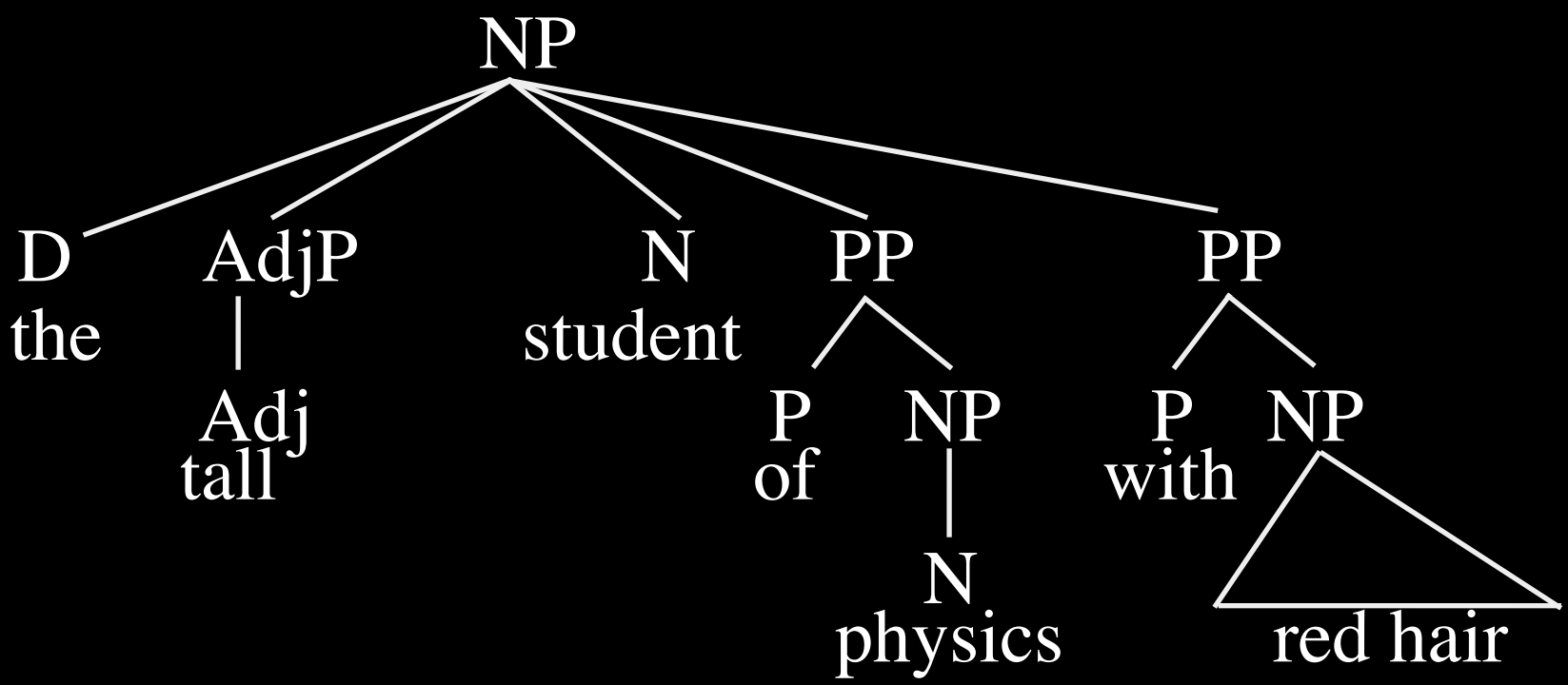
- Capture constituency relationships
- Explain distribution and order of categories
- Explain modification relationships (including ambiguity)
- Capture structural relations like c-command necessary for capturing relations like binding facts.

Quick Review

- There are important linguistic units called constituents, which can be tested for.
- Constituents are created by rules
- Constiuents are subject to the principle of modification (attach stuff in so that modifiers are sisters of the head that they modify)
- The geometry (domination, precedence, c-command) matters.

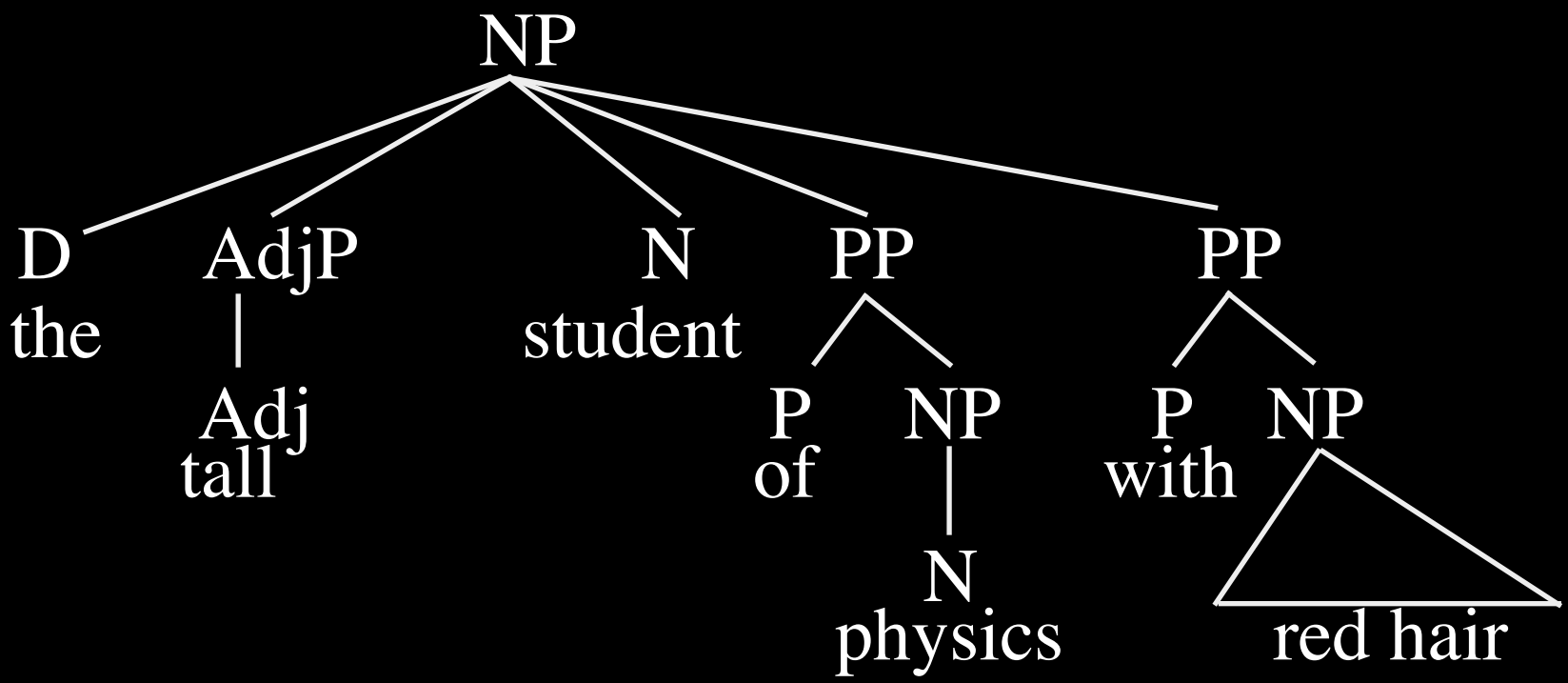
Flat Structure

- NP→(D) (AdjP+) N (PP+)



Flat Structure

- I saw the tall [student of physics] with red hair not the short [one] with brown hair.



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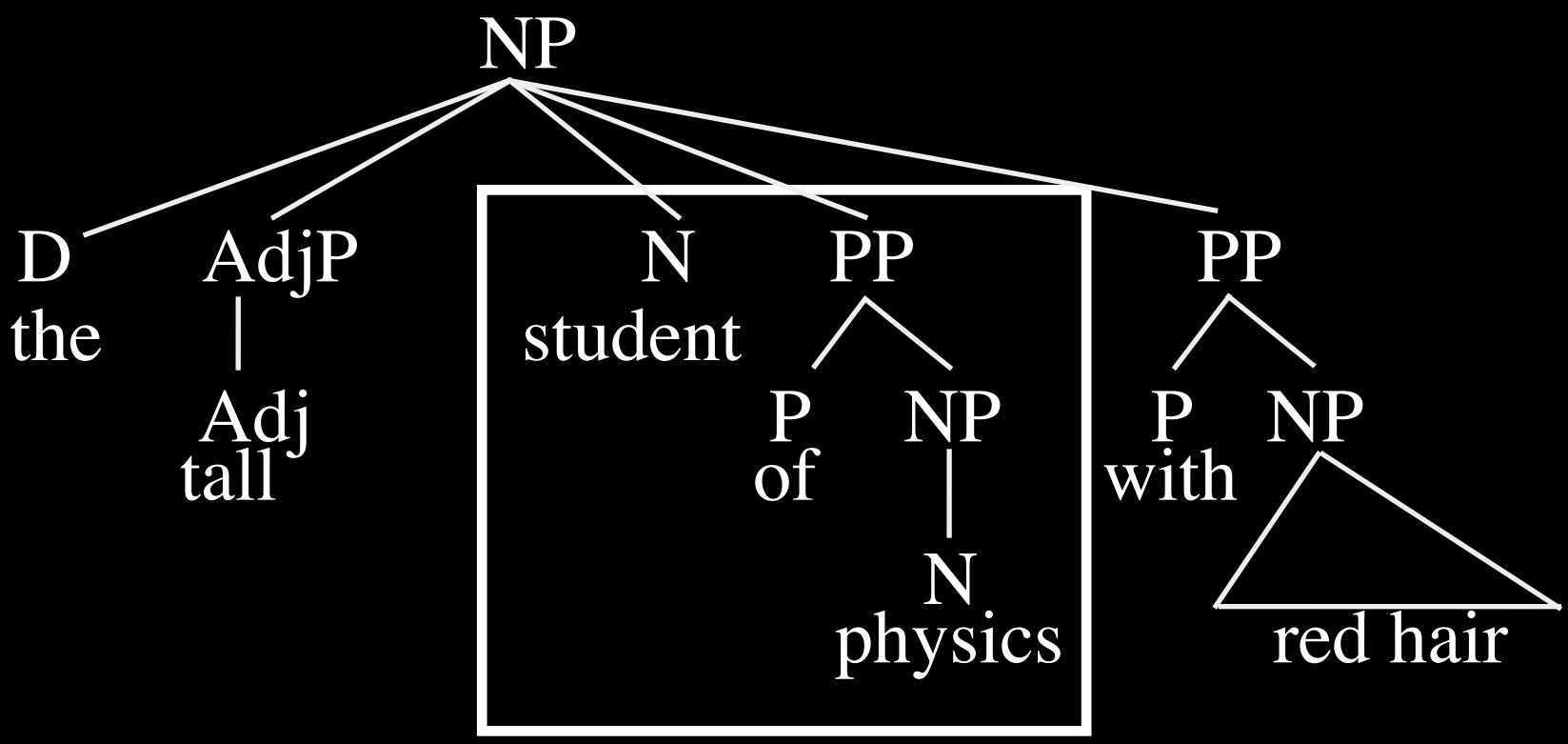

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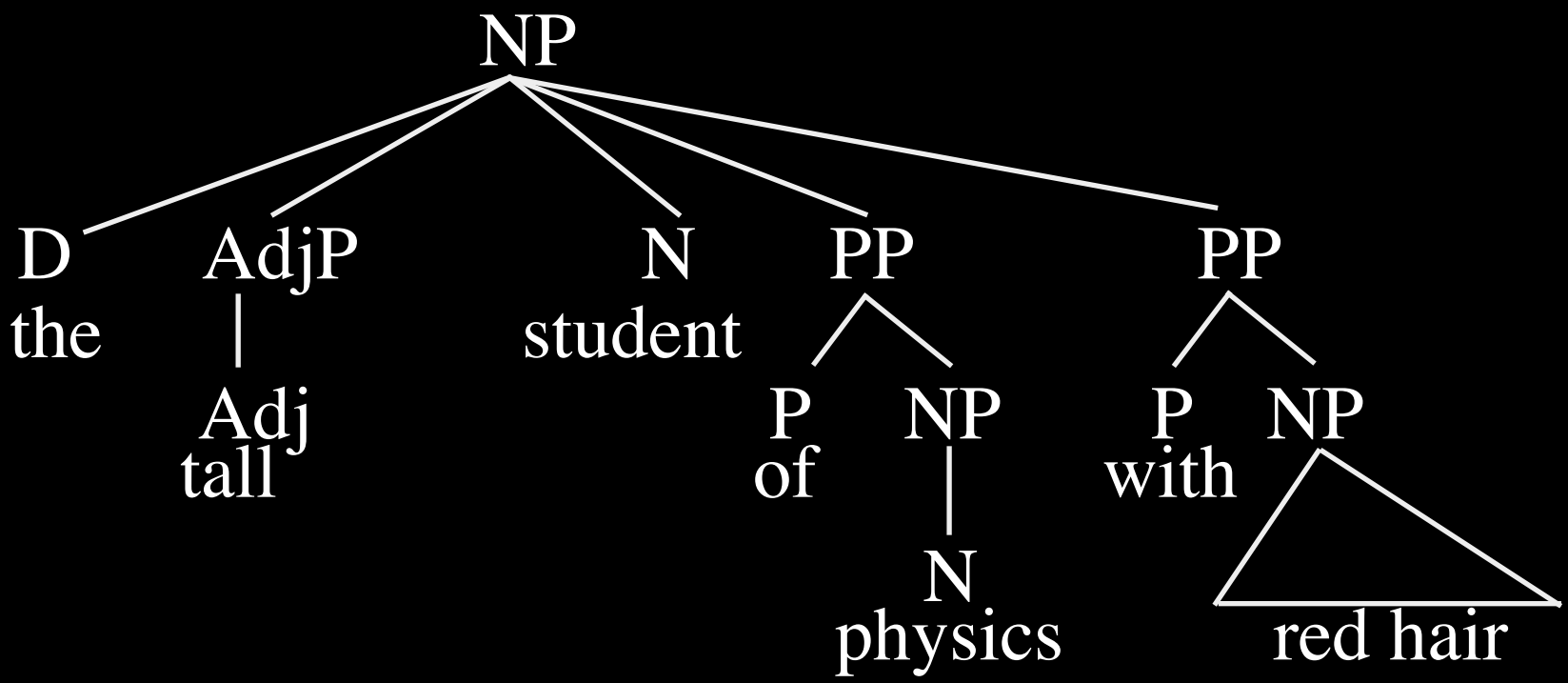

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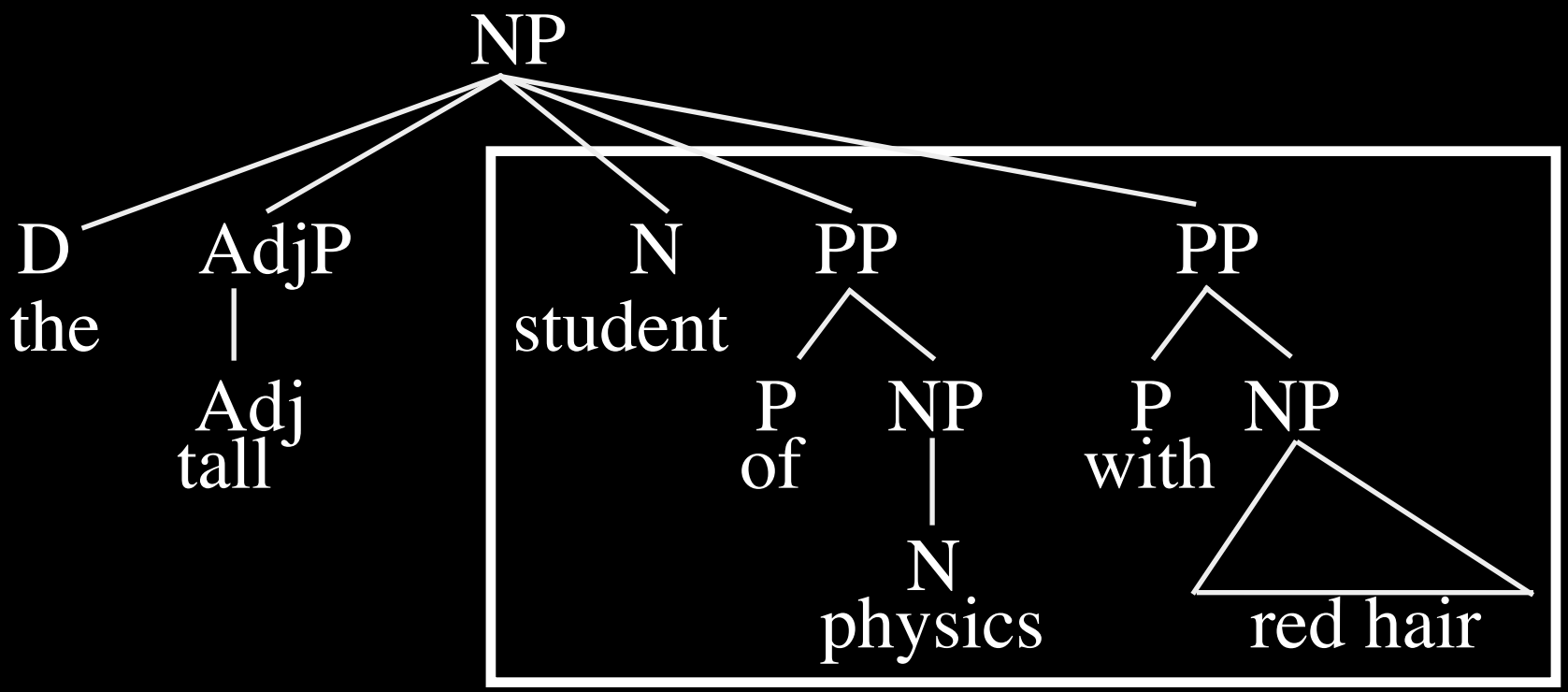

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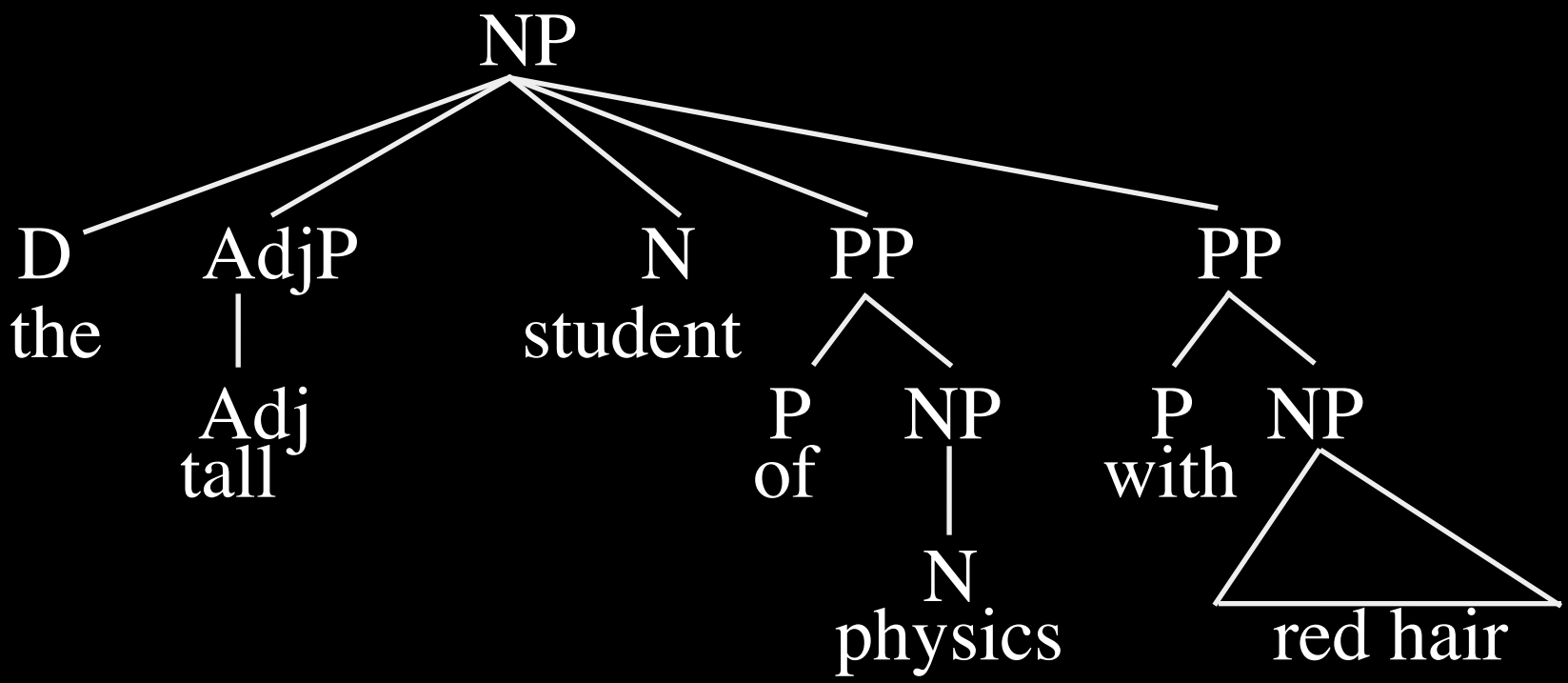

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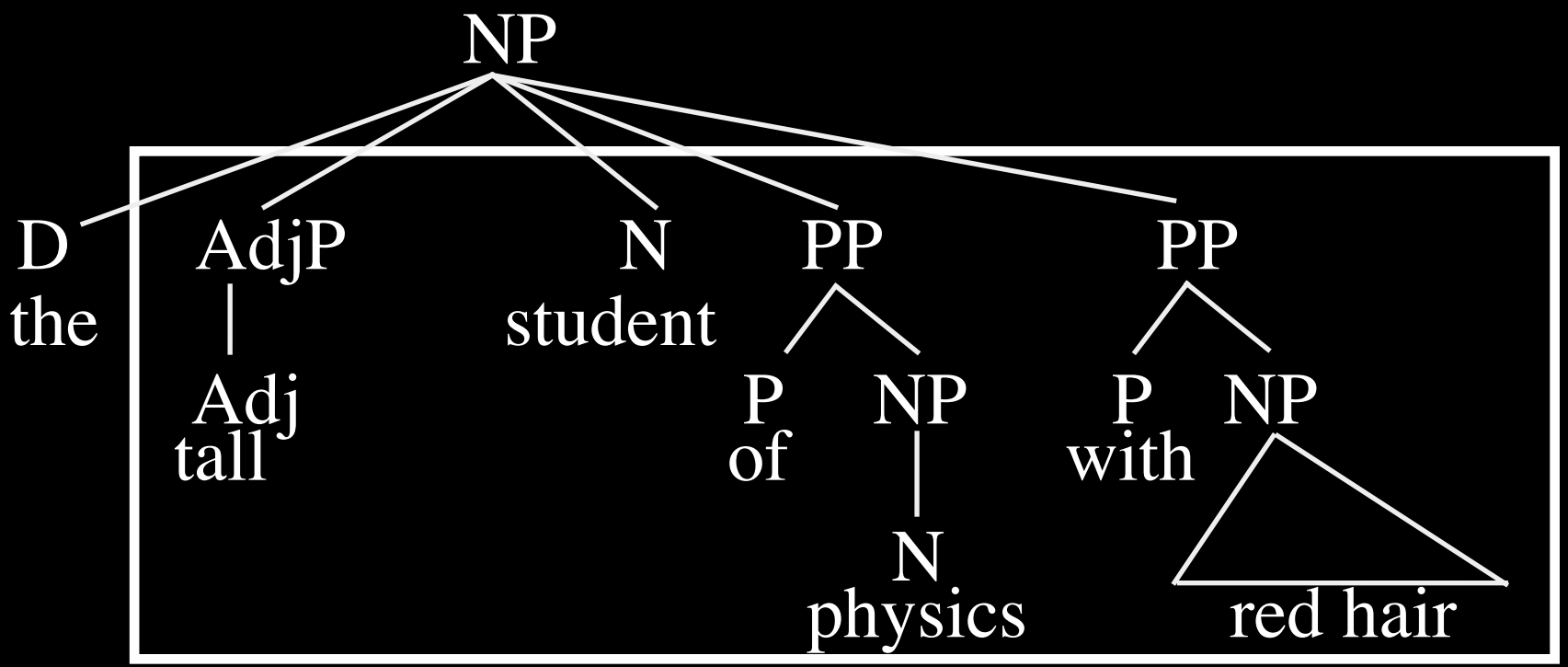
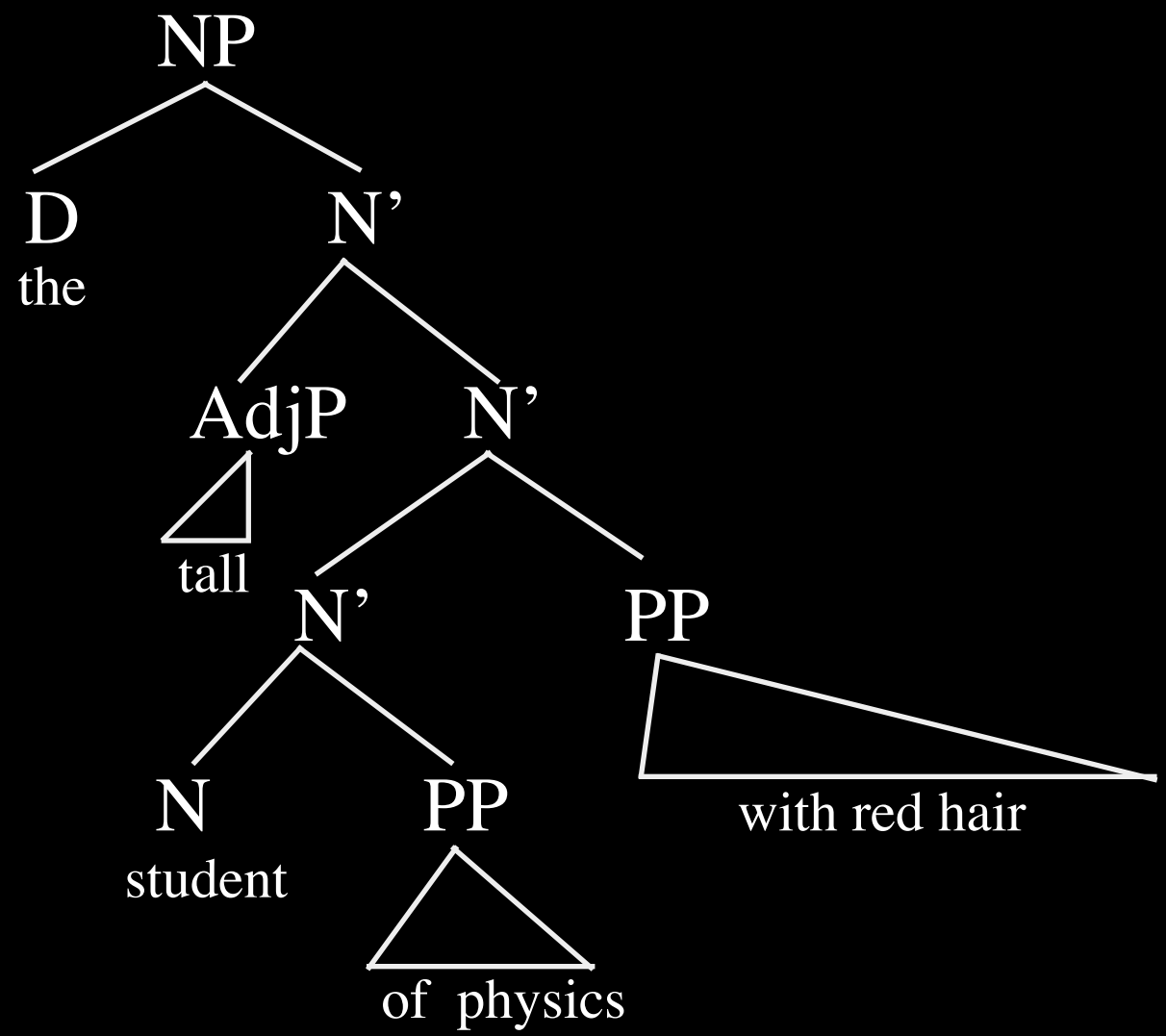


N' Structure



N’ rules

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- NP → (D) N’

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An iterative (self-recursive) rule: can apply as many times as needed

One-Replacement

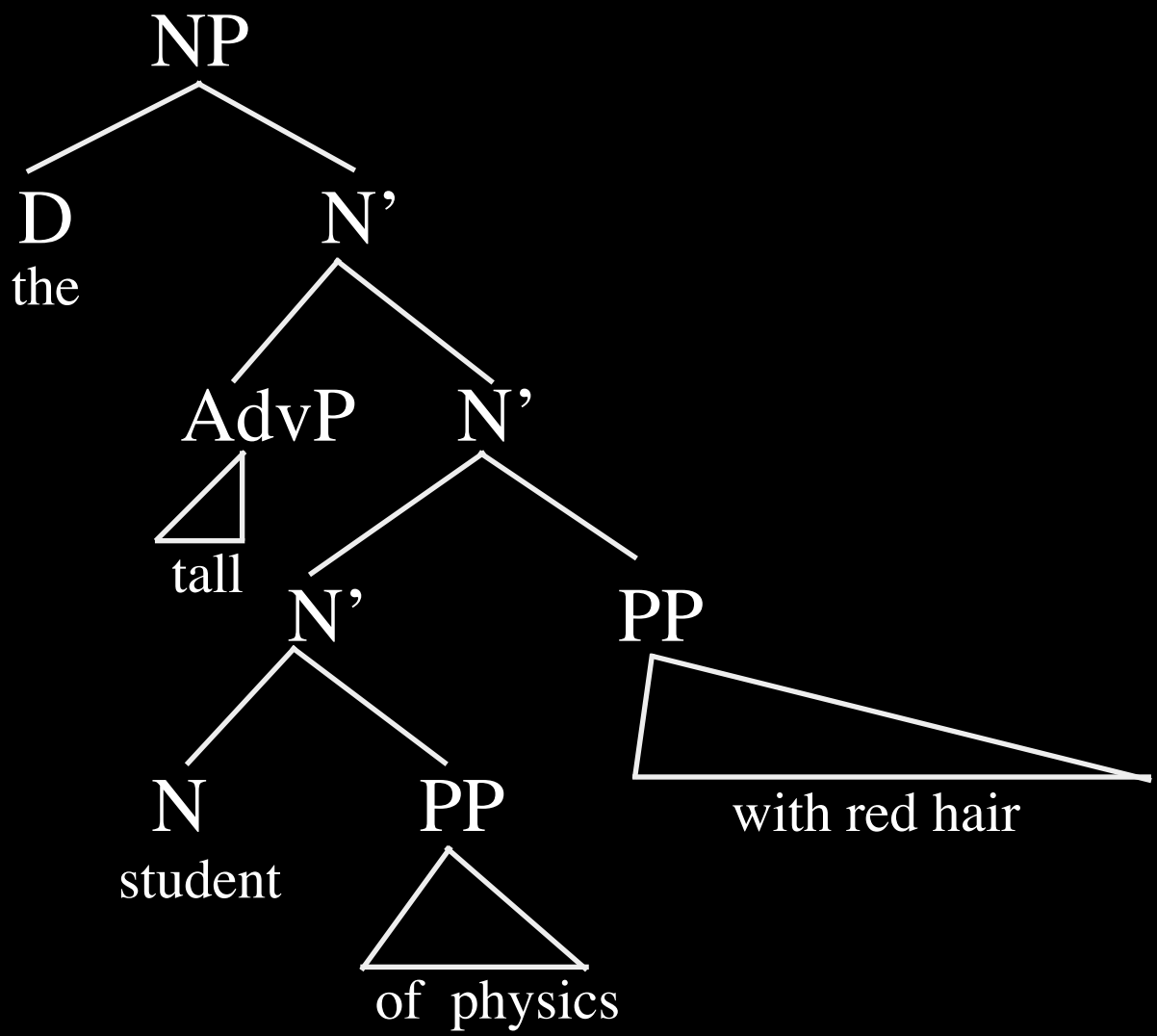
Replace an N’ node with [one]

One-Replacement

Replace an N' node with [one]

not N, not NP

One replacement



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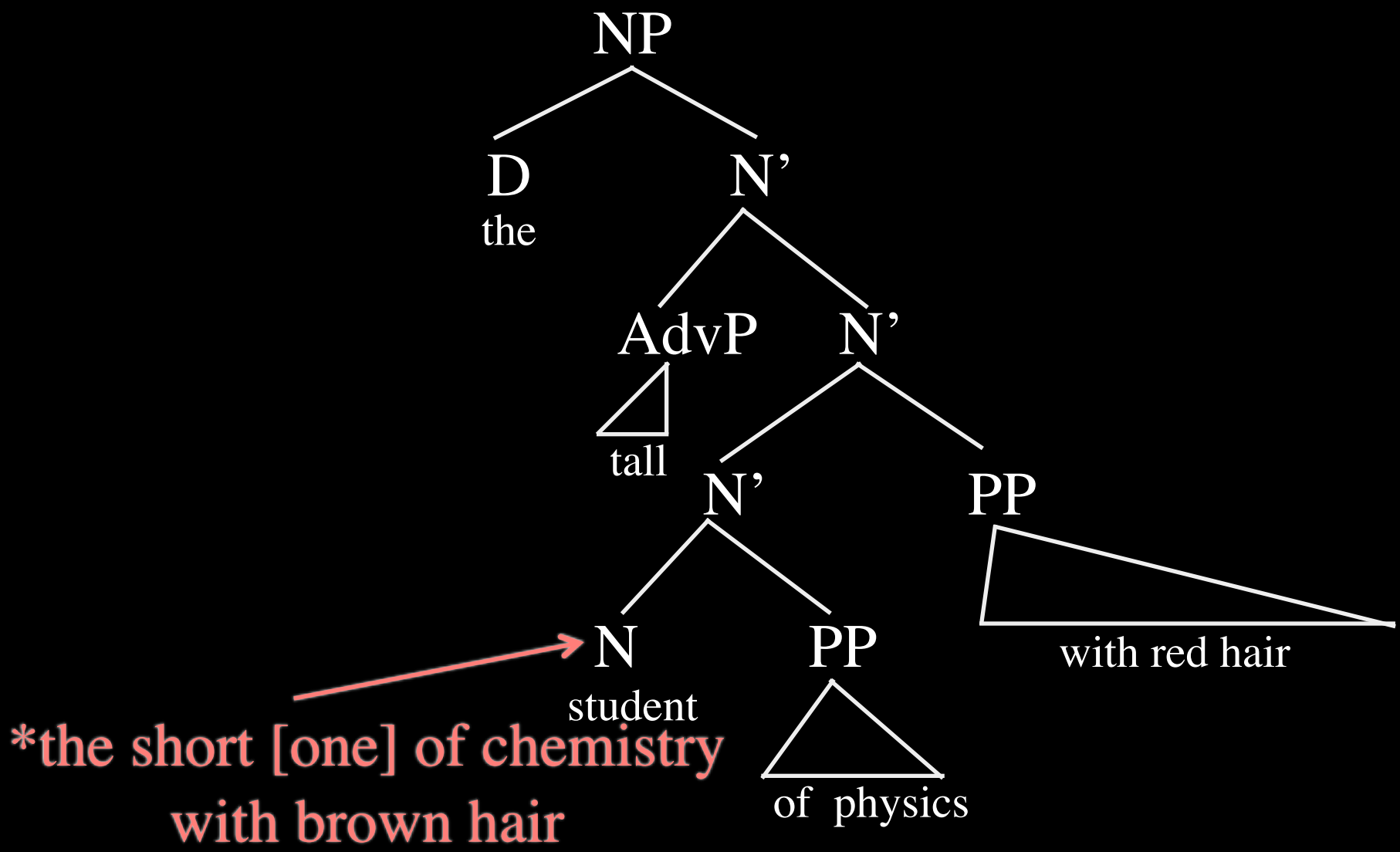
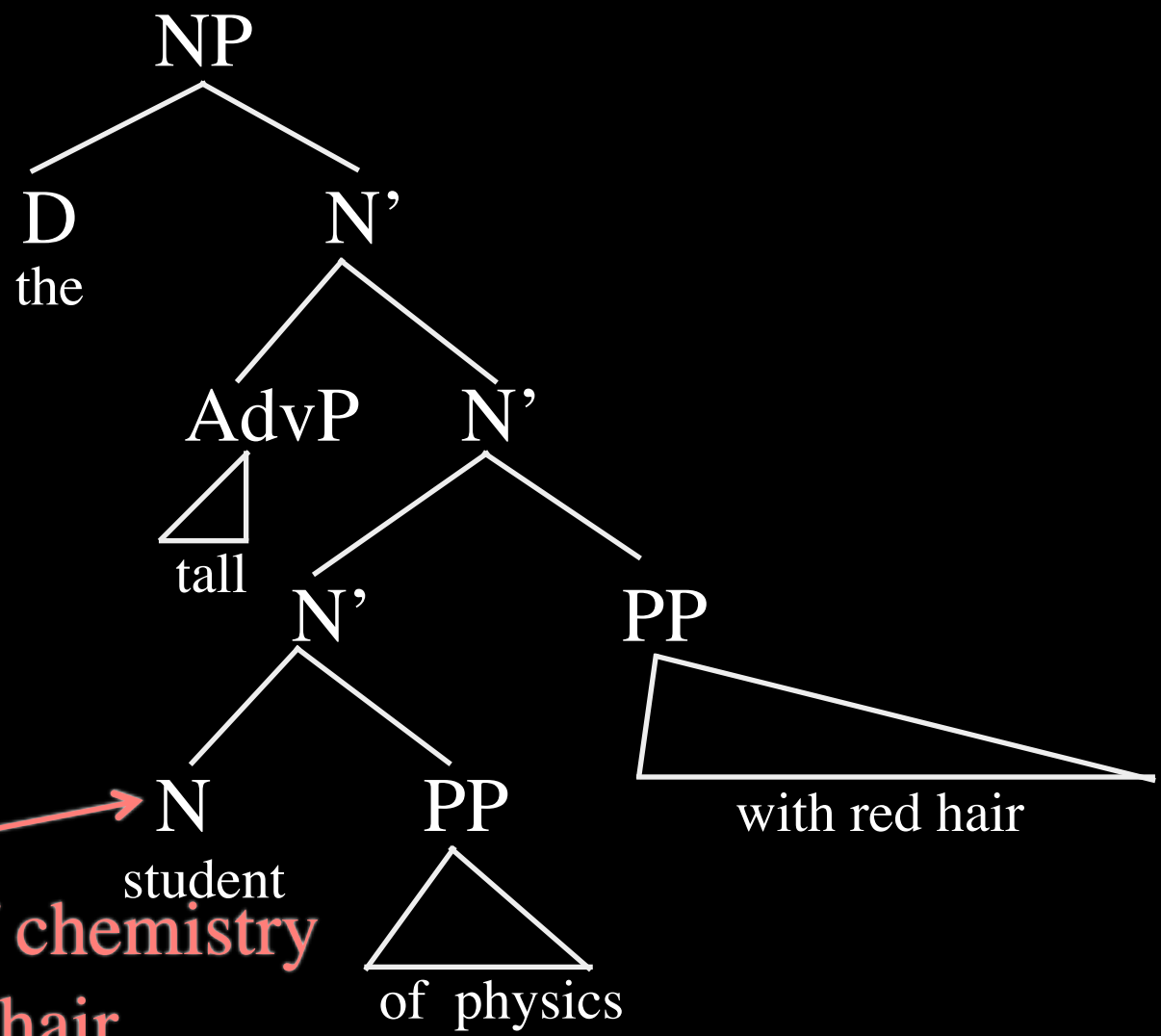


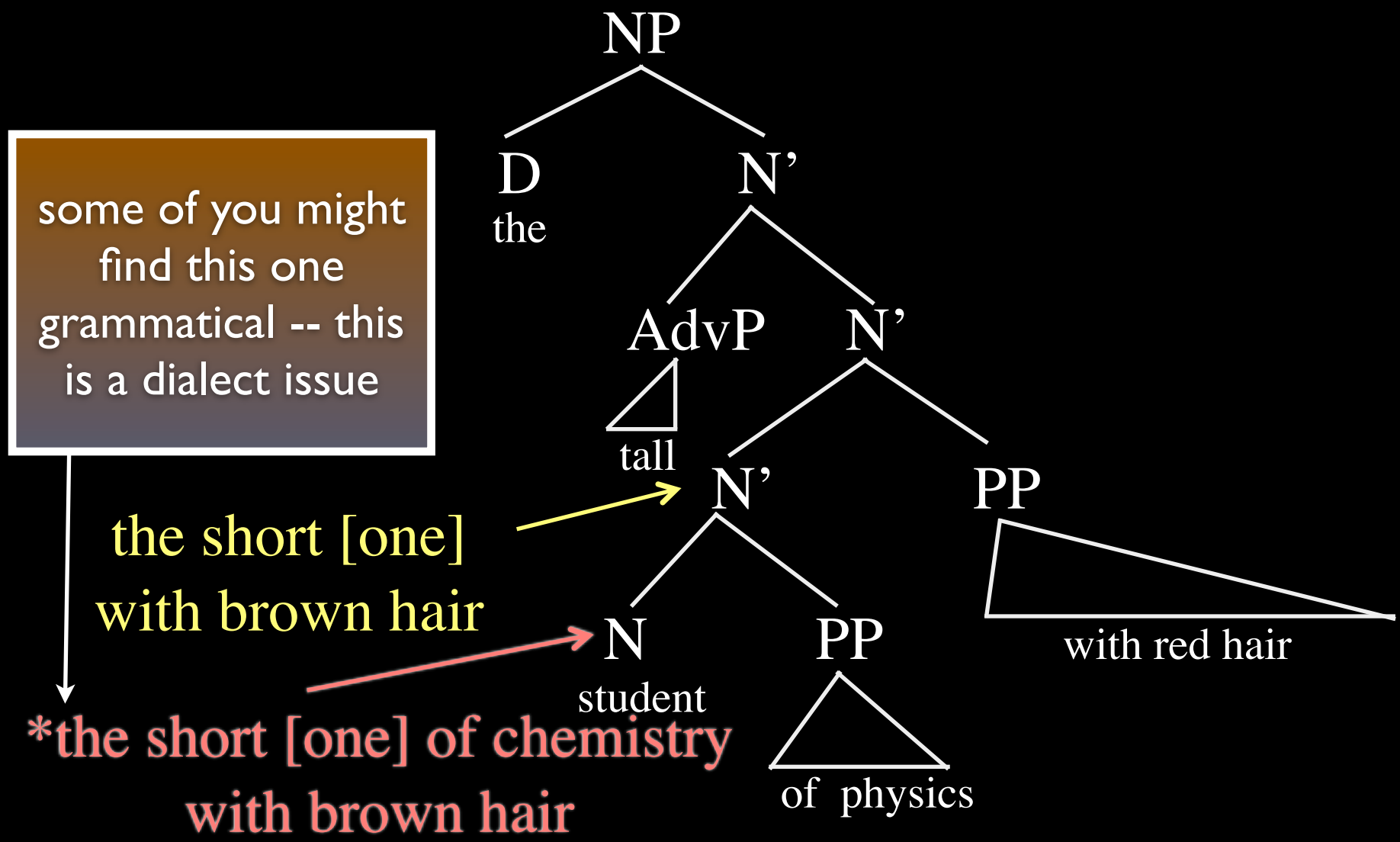
One replacement

some of you might find this one grammatical -- this is a dialect issue



*the short [one] of chemistry with brown hair

One replacement



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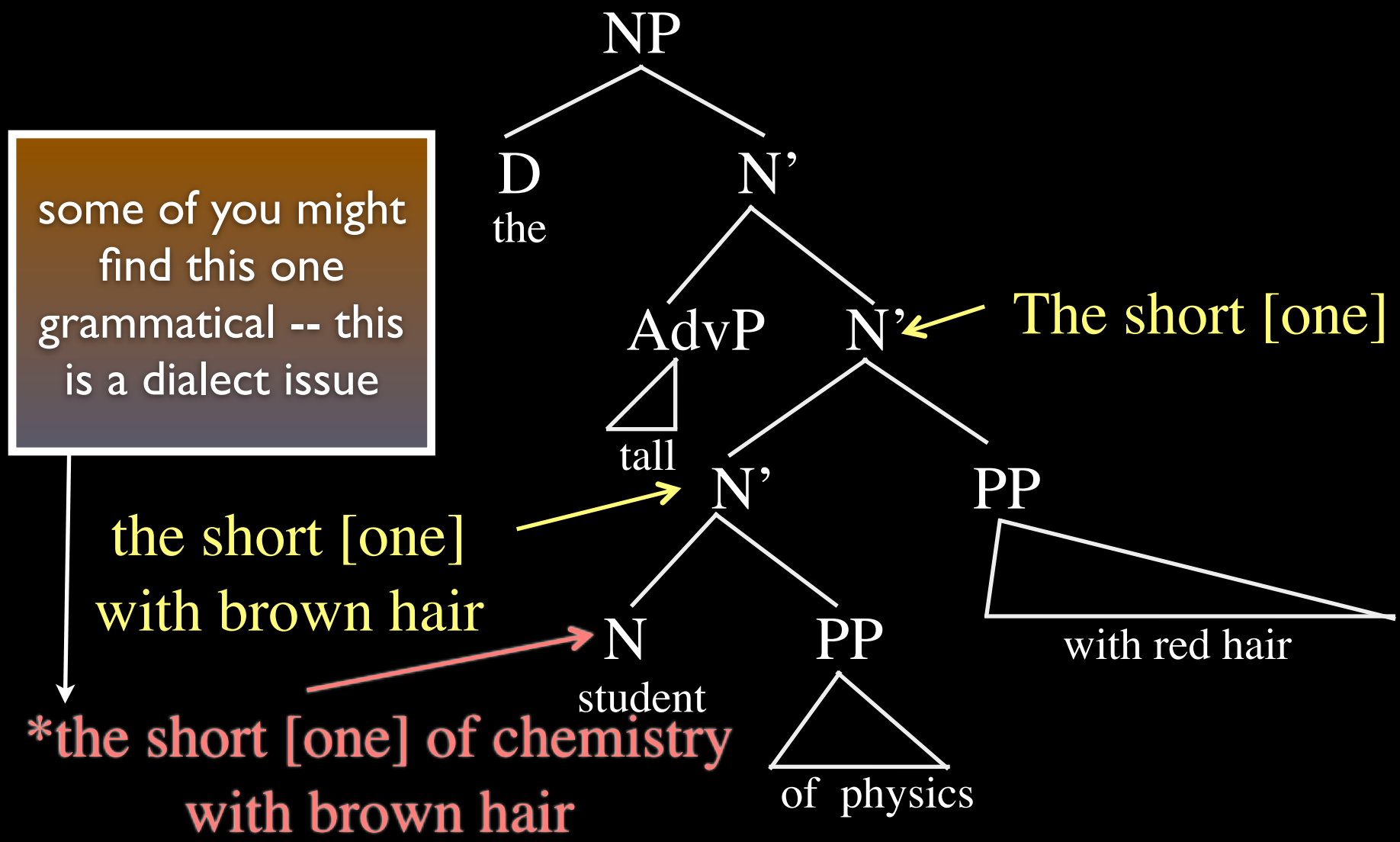

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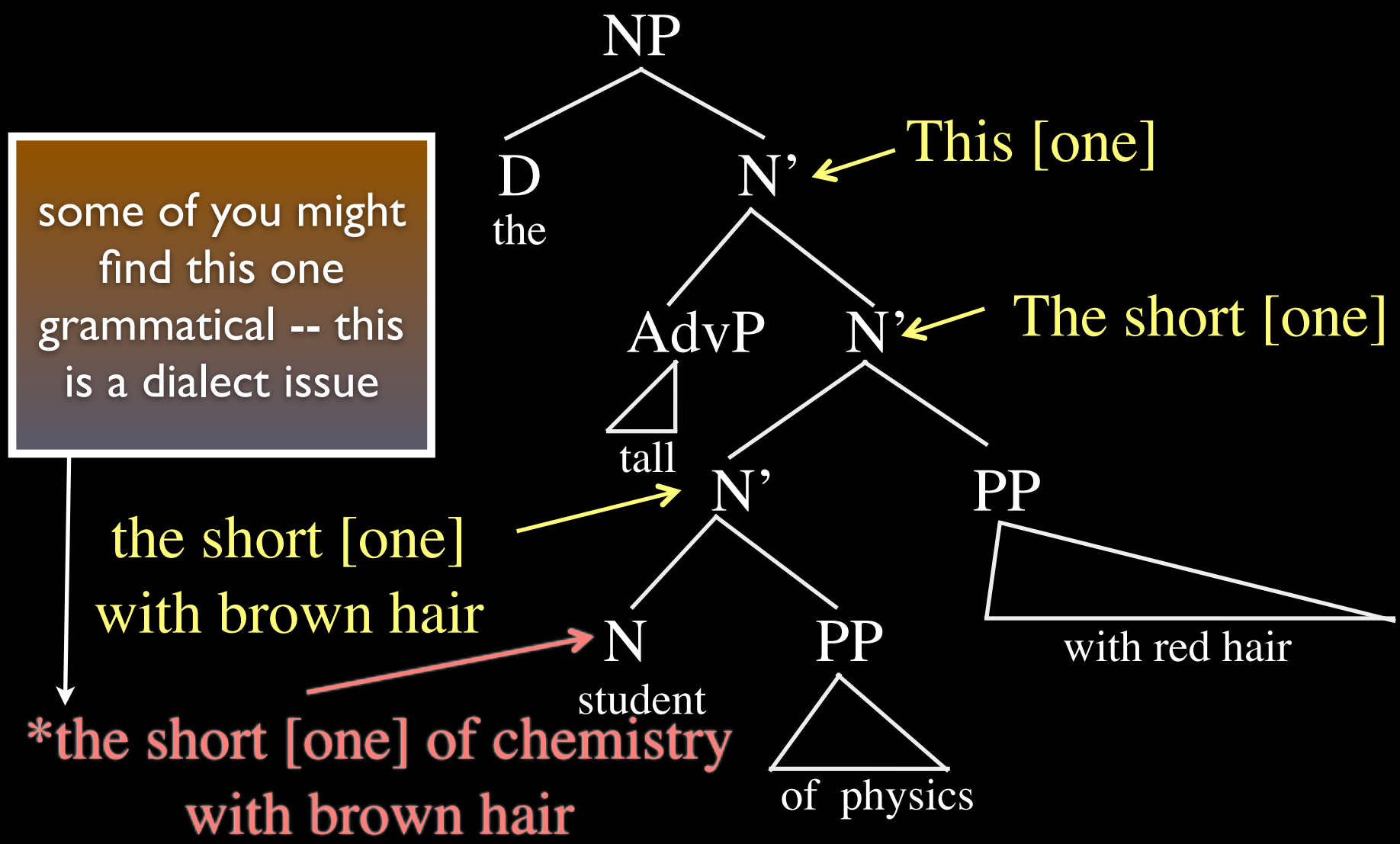

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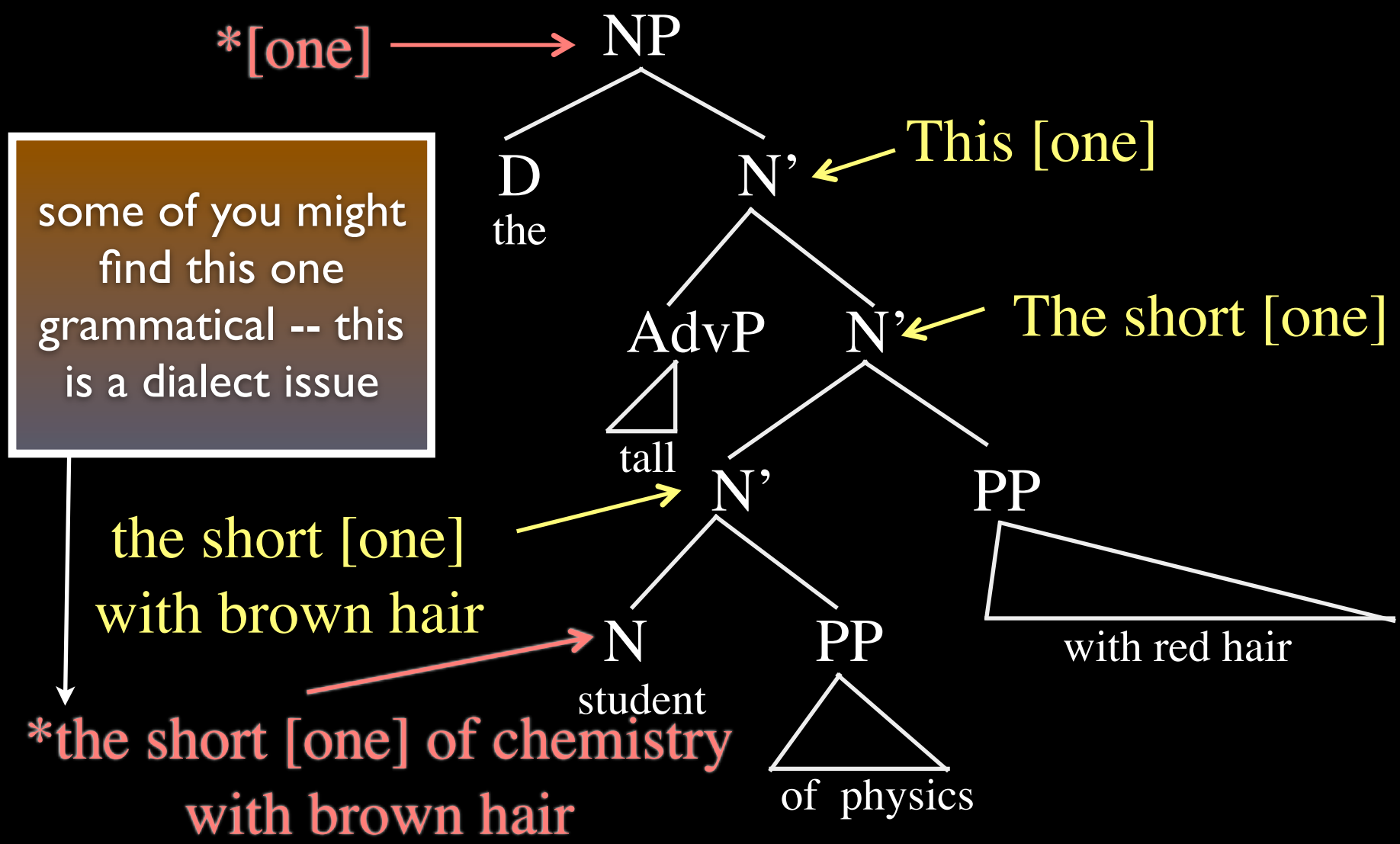
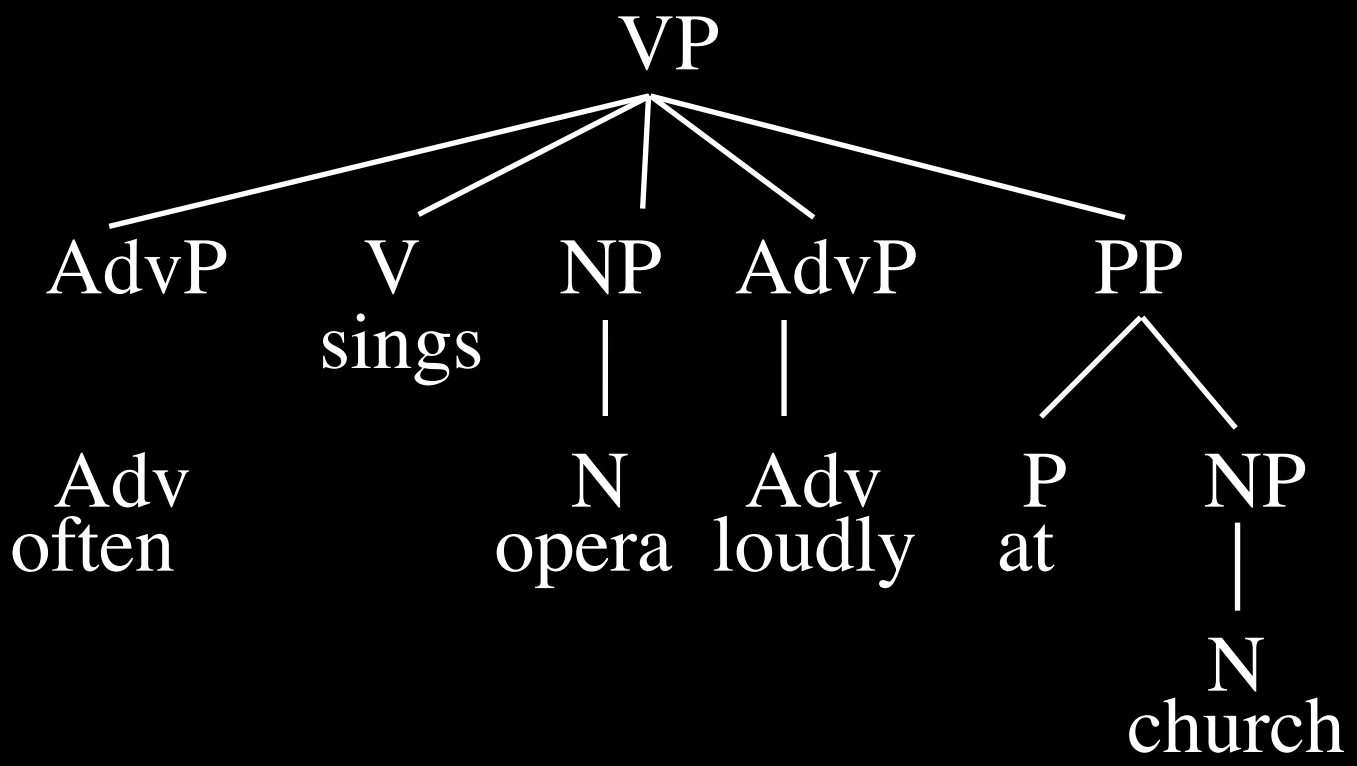


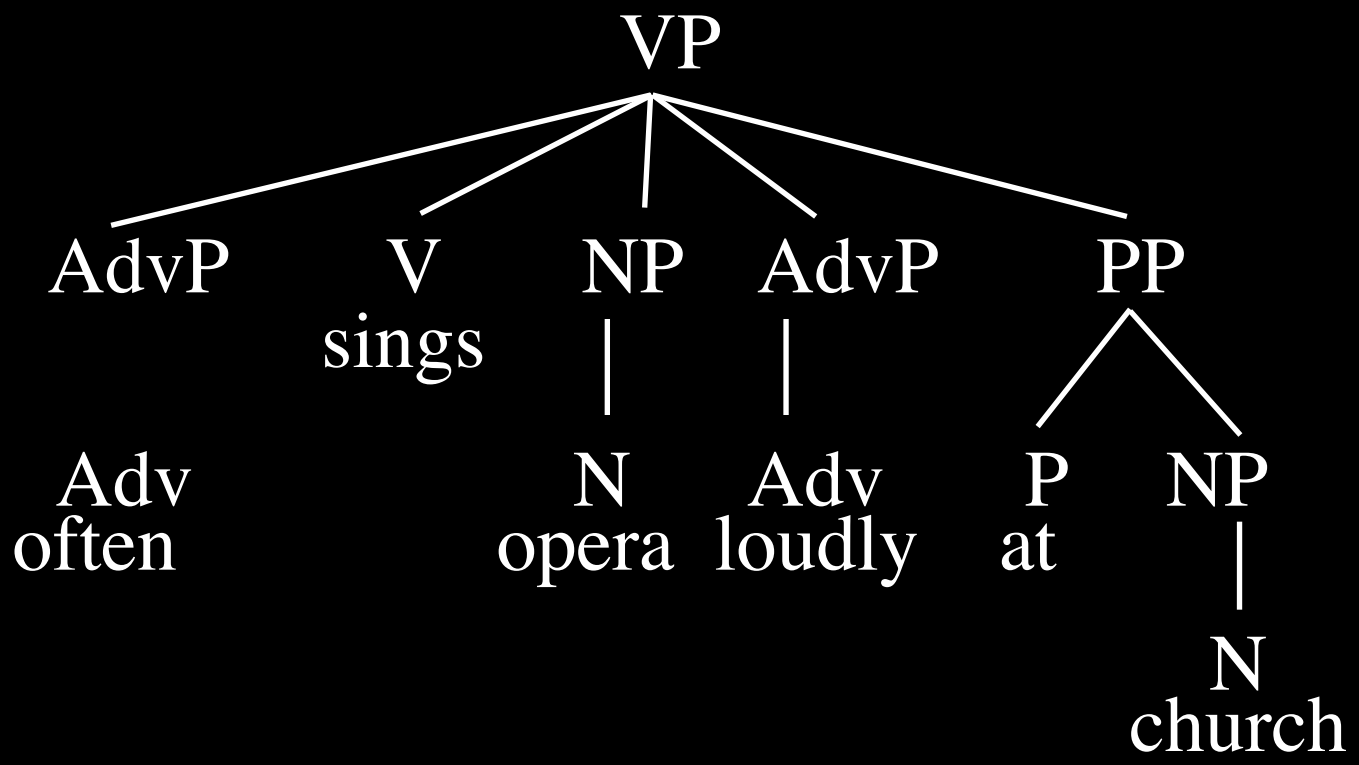
Flat Structure in VPs

- VP→ (AdvP+) V (NP) (AdvP+) (PP+) (AdvP+)



Flat Structure in VPs

- John often sings opera loudly at church and Mary [does so too].



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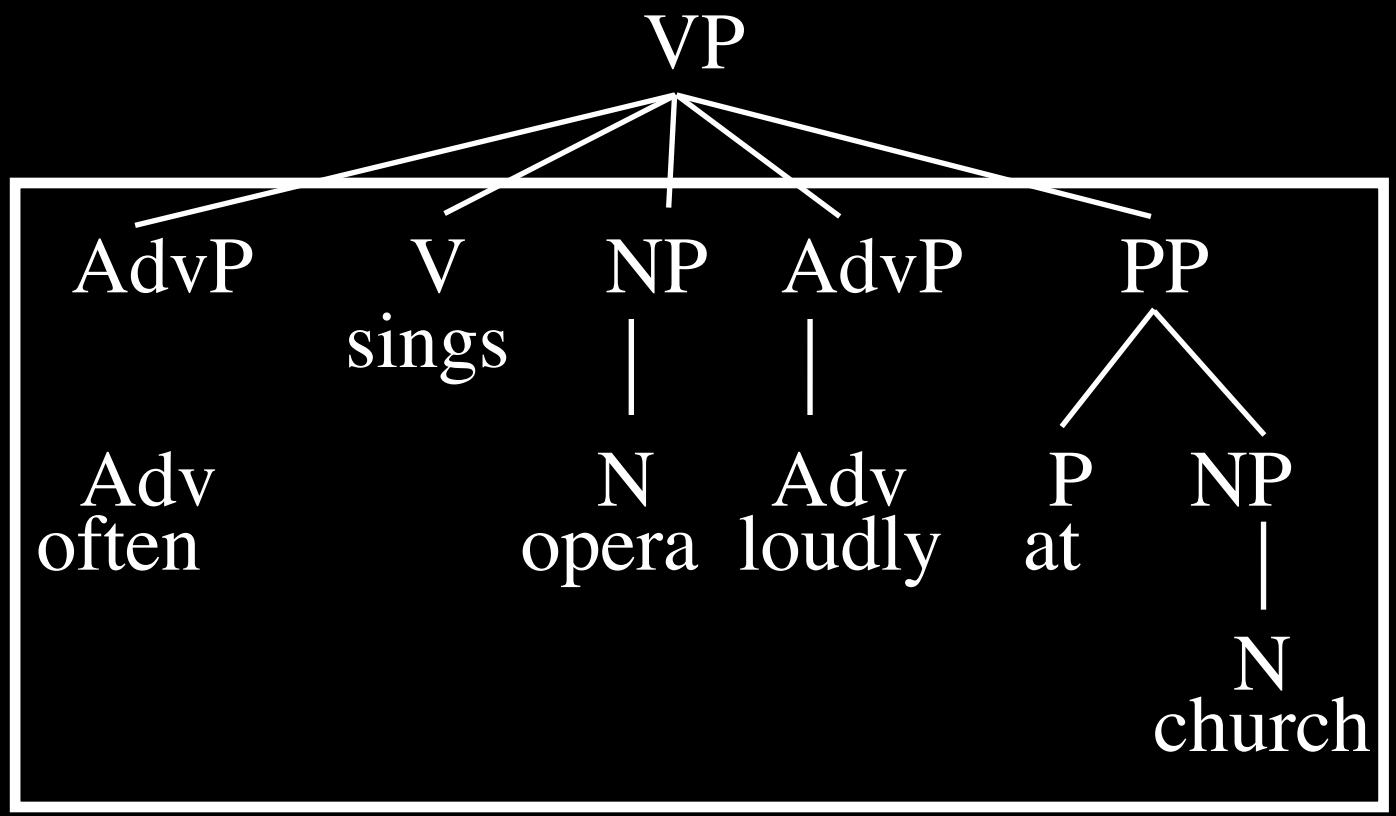

Flat Structure in VPs

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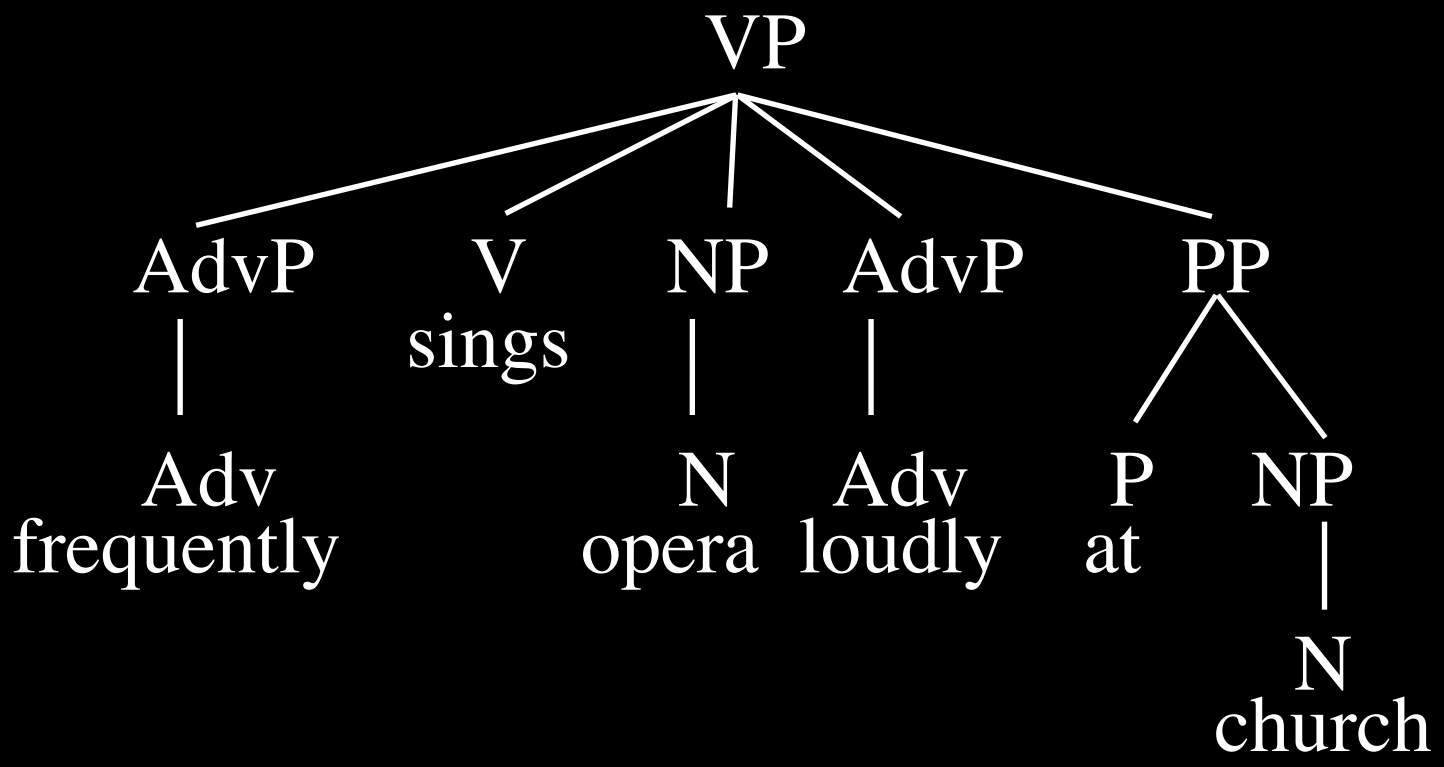

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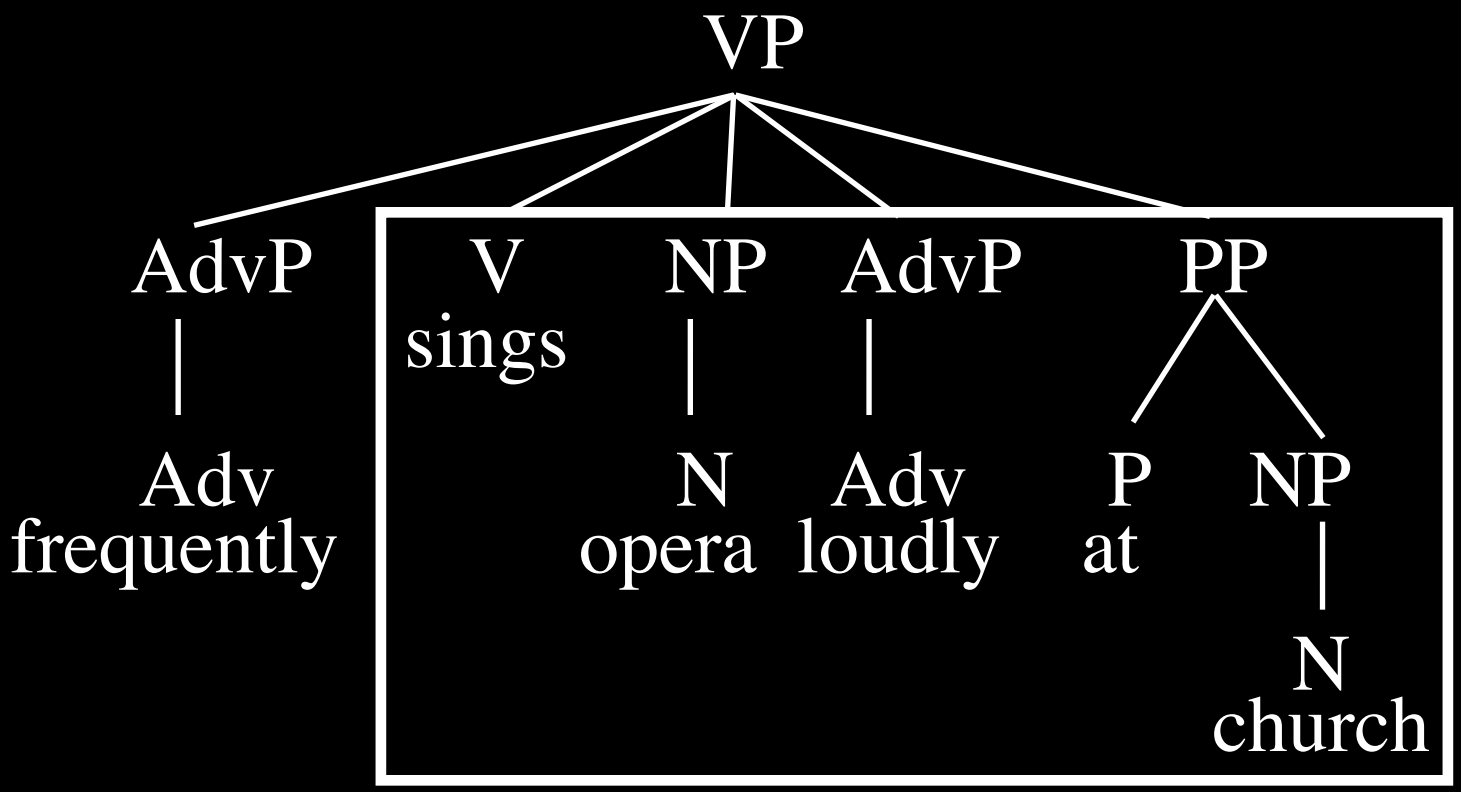

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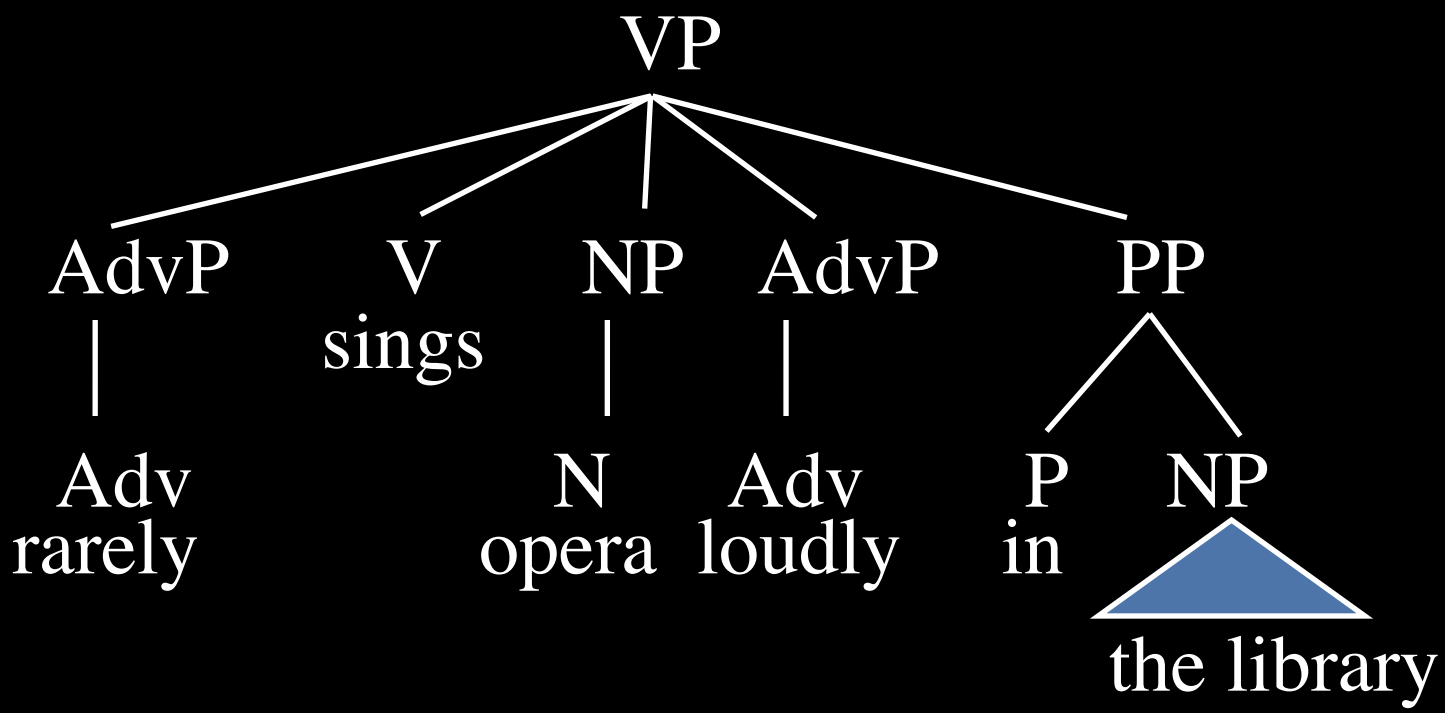

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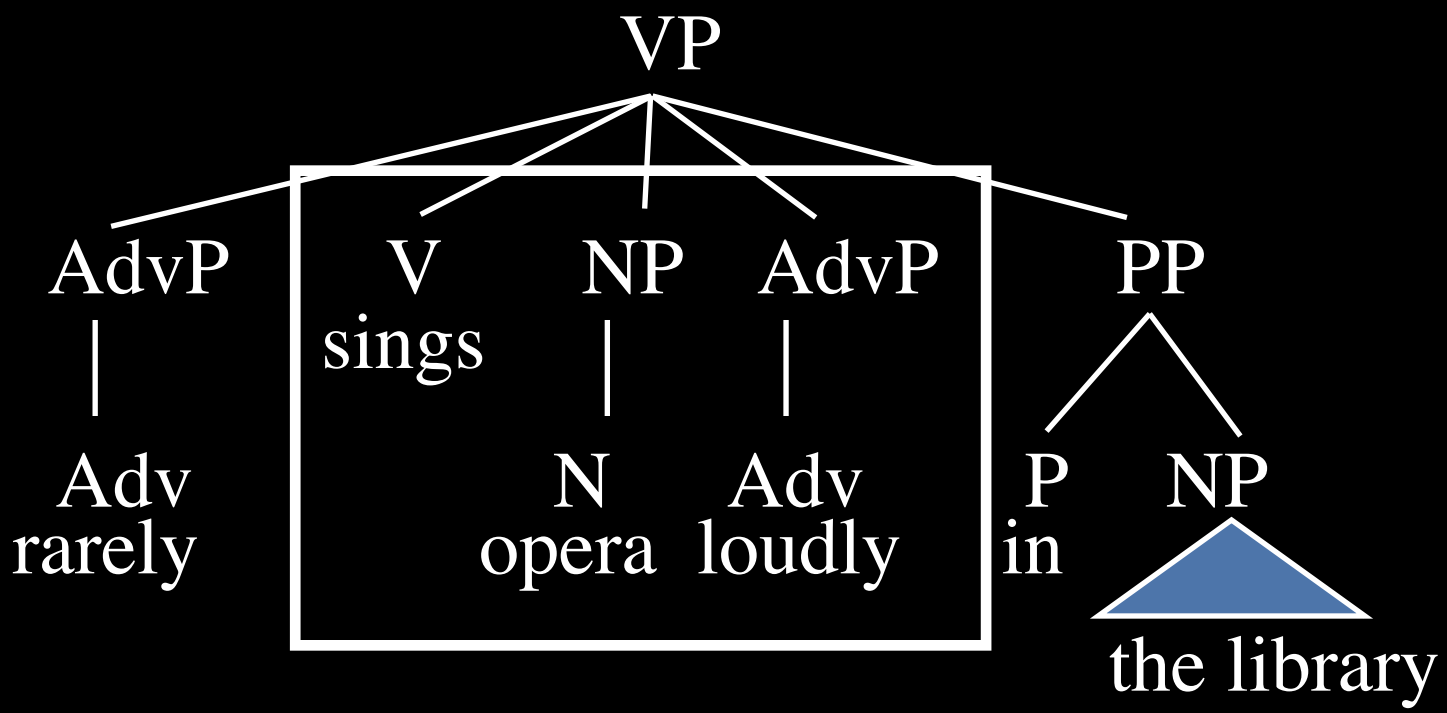

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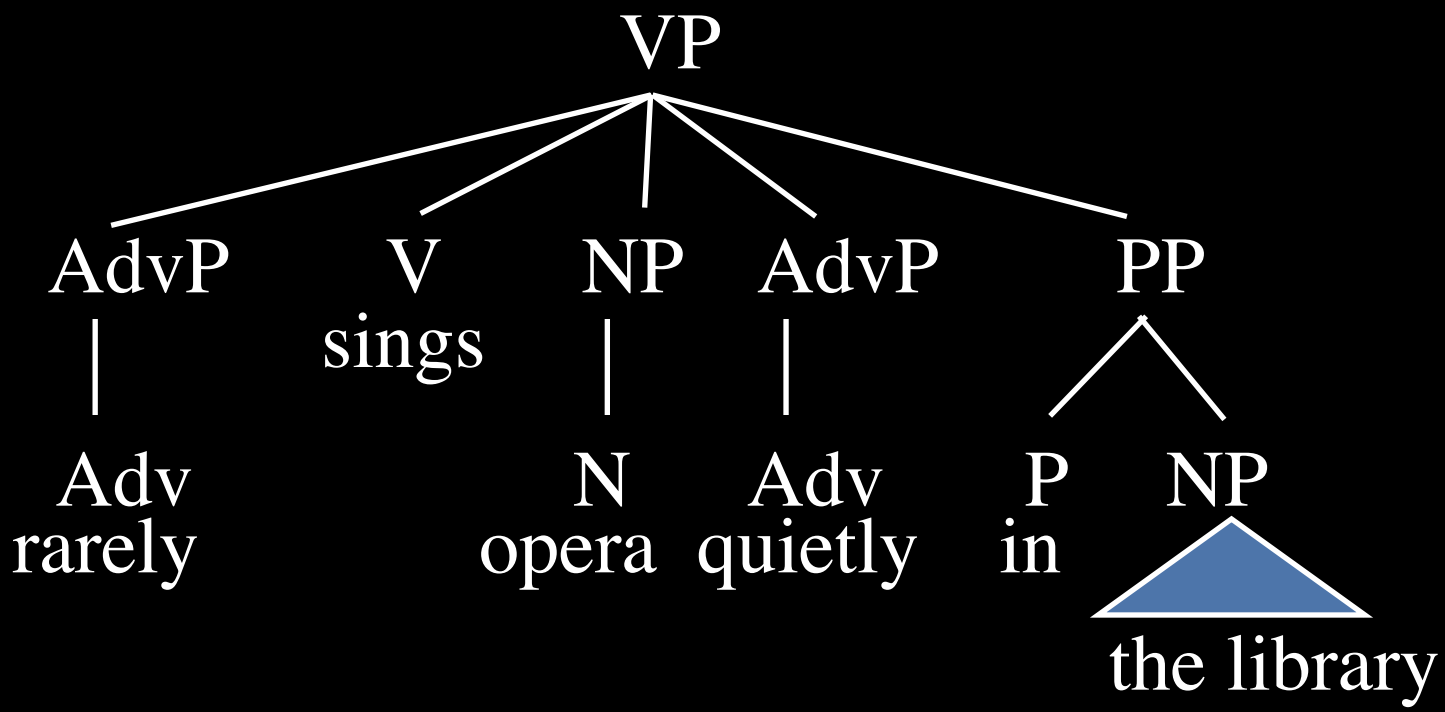

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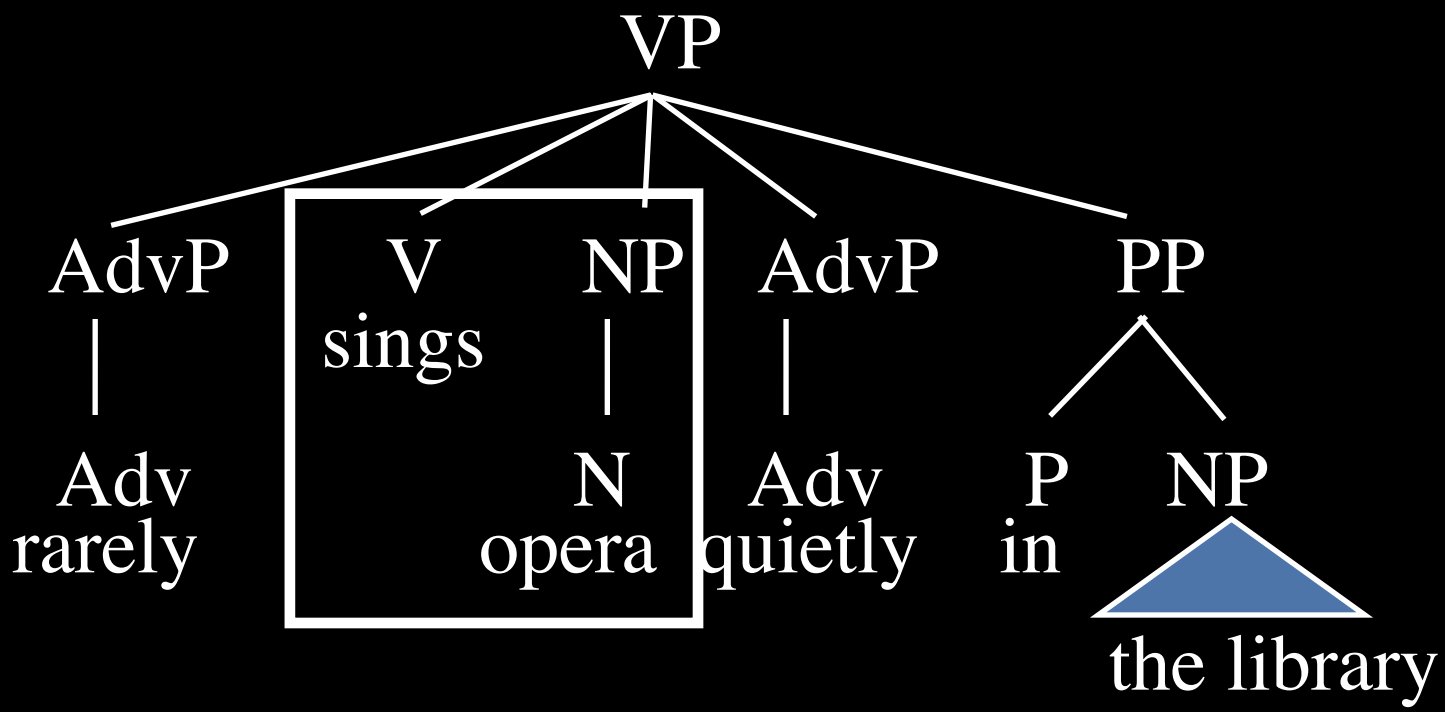
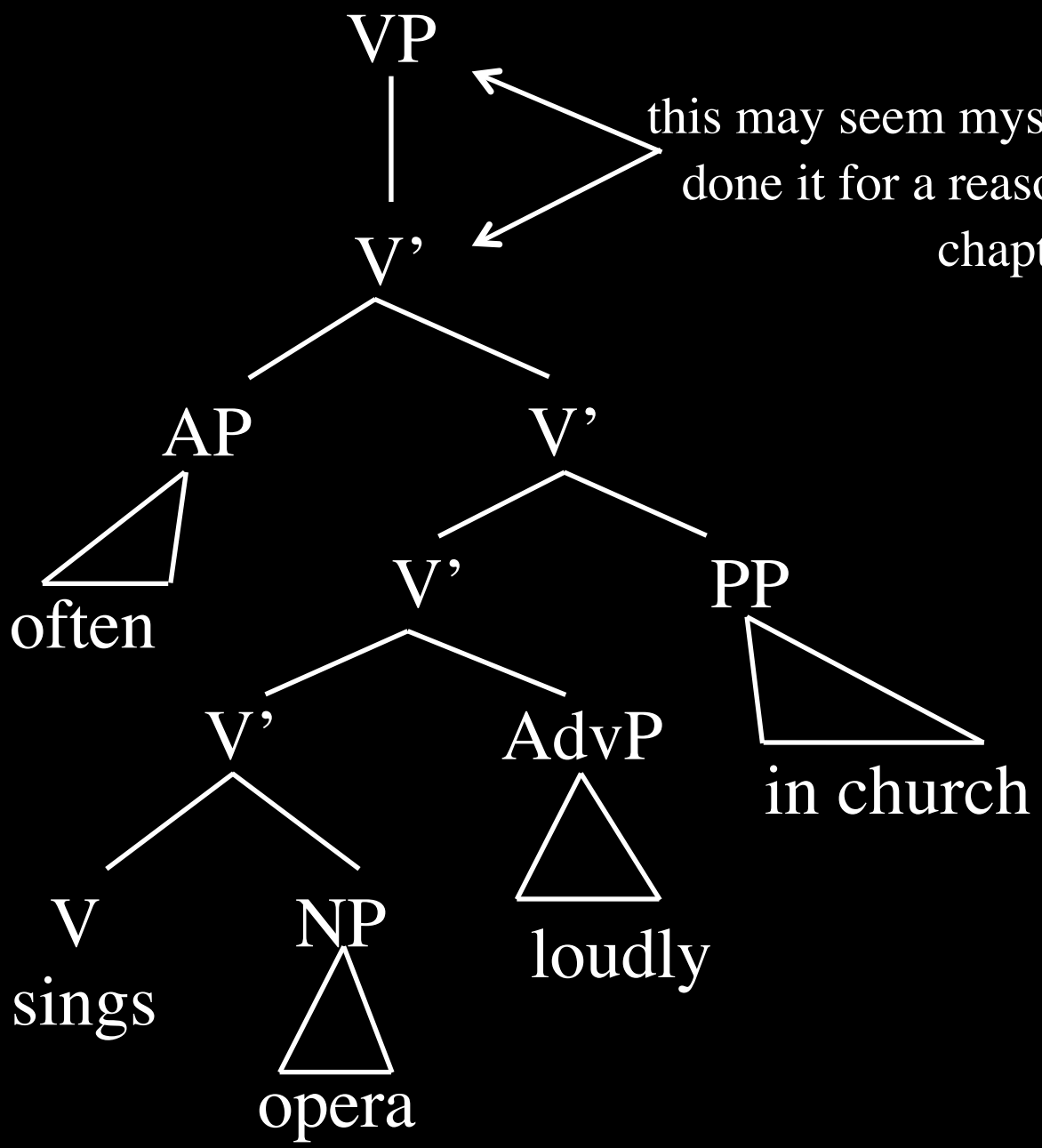


V' Structure


VP
this may seem mysterious, but we've done it for a reason -- we'll see in chapter 8
V'
AP
V'
often
V'
PP
V'
AdvP
in church
V
sings
NP
loudly
opera

V’ rules

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- VP → V’ (a vacuous rule)

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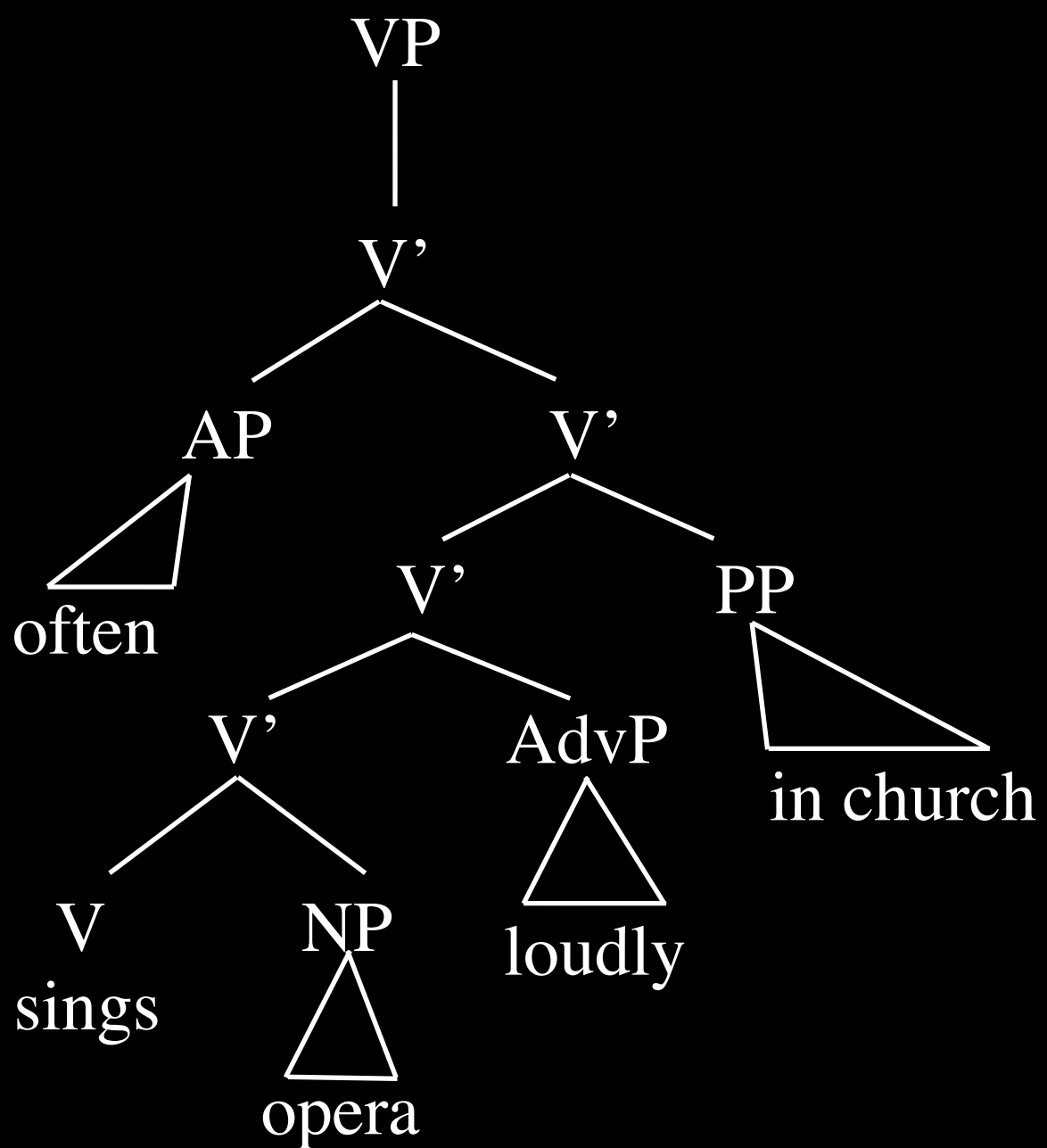
An iterative (self-recursive) rule: can apply as many times as needed

Do(so)(too) replacement

replace a V' node with [did (so) (too)]
not VP, not V

John often sings opera loudly in church and/but Mary ...



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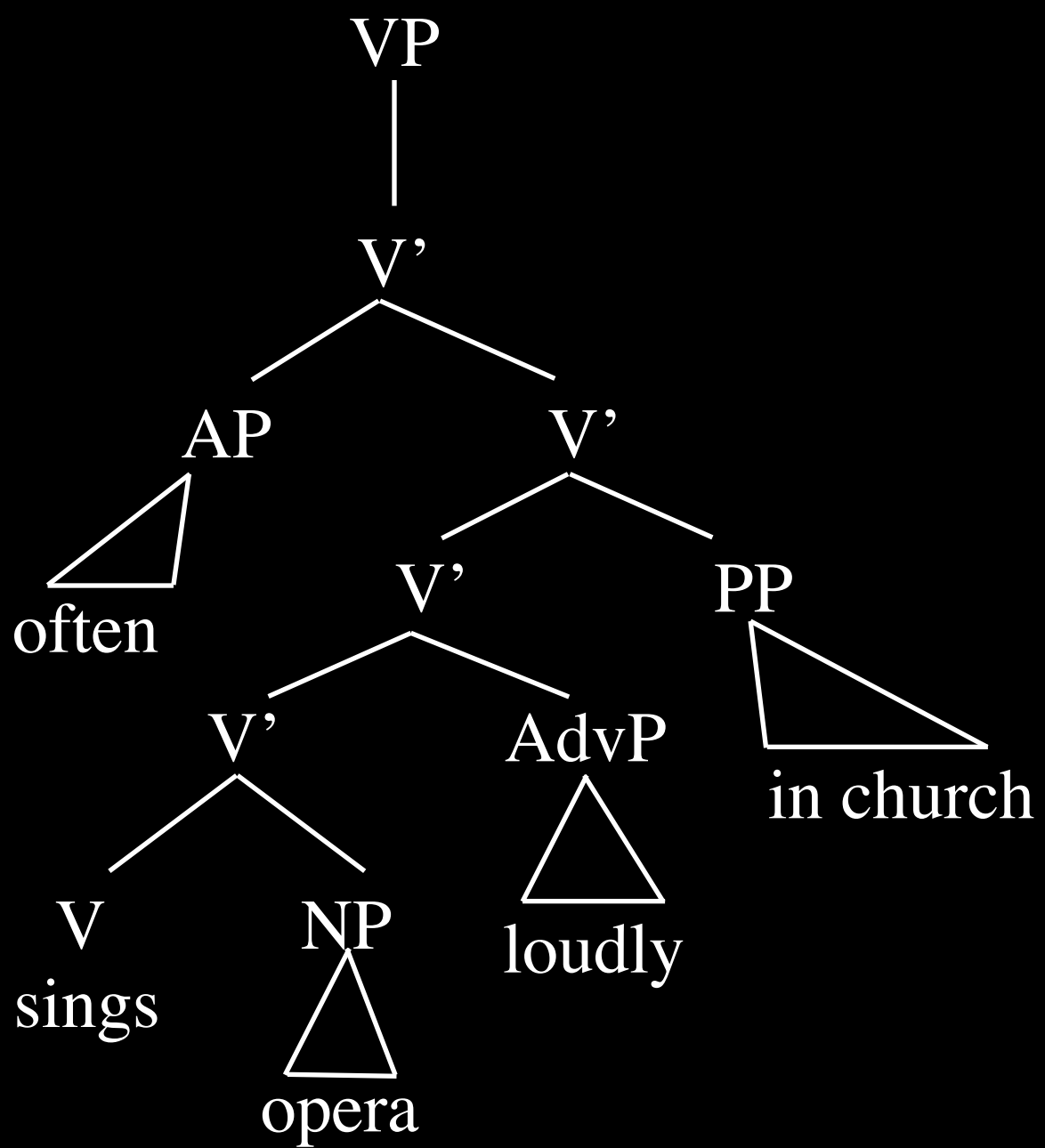

*seldom does so folksongs quietly in the library

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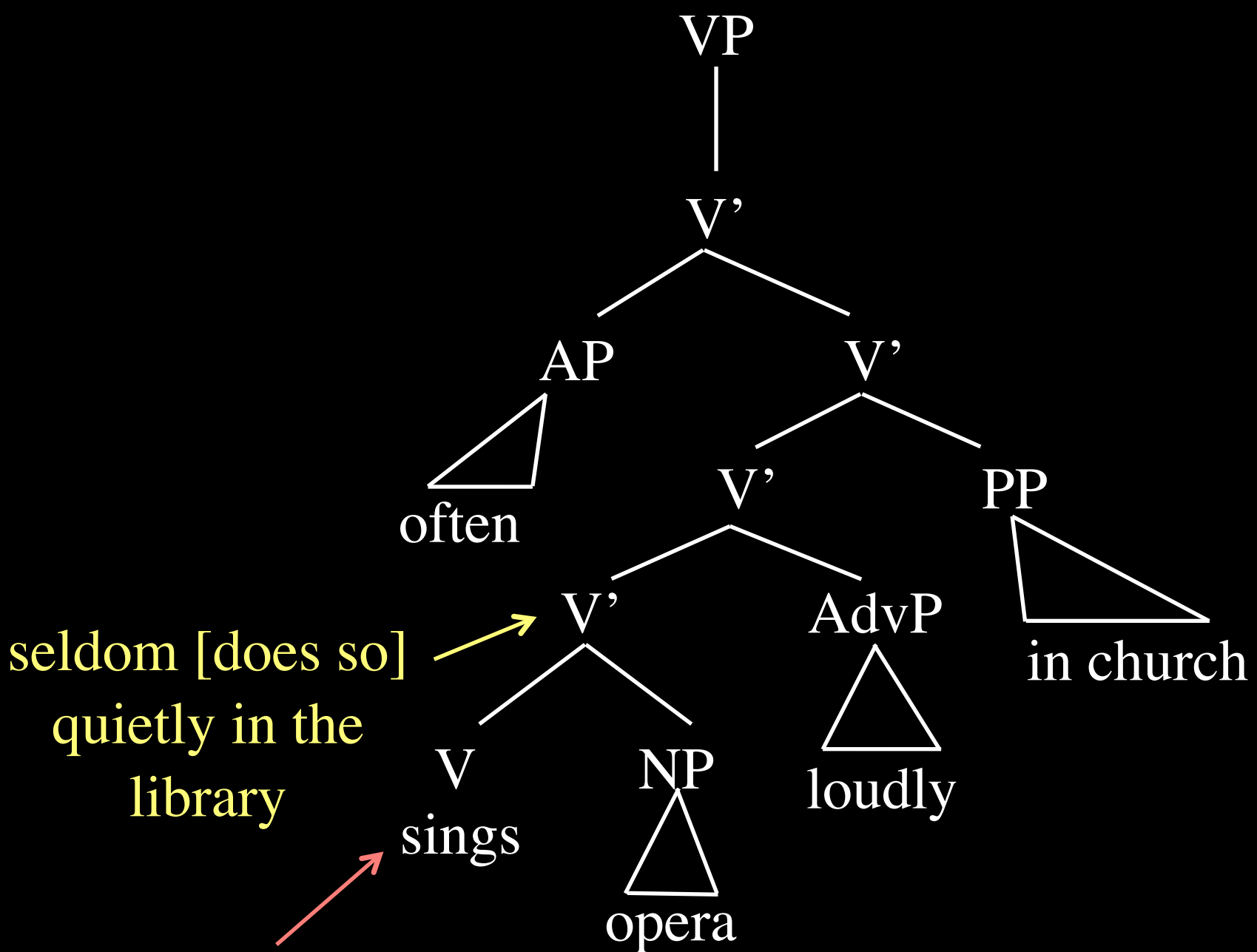

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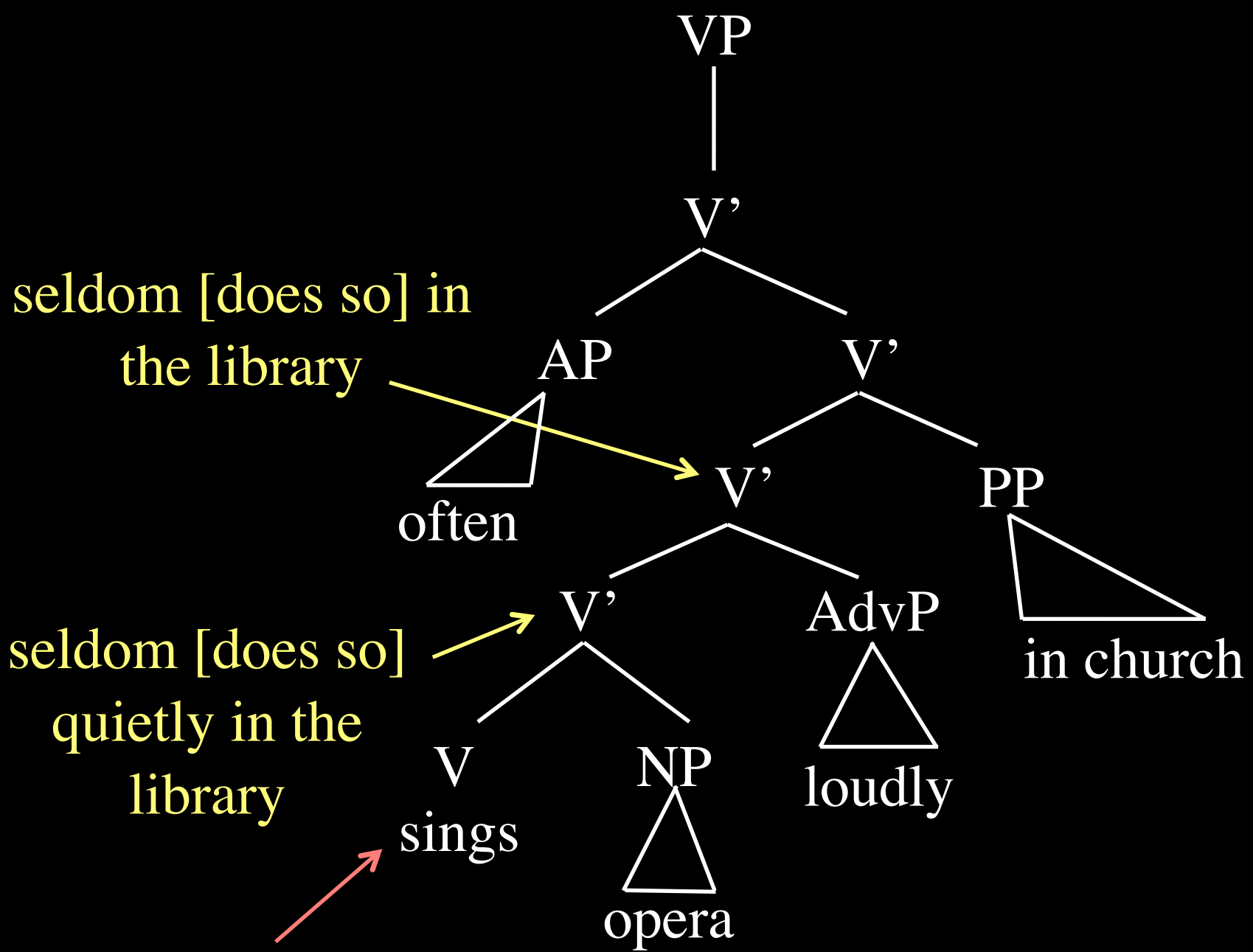

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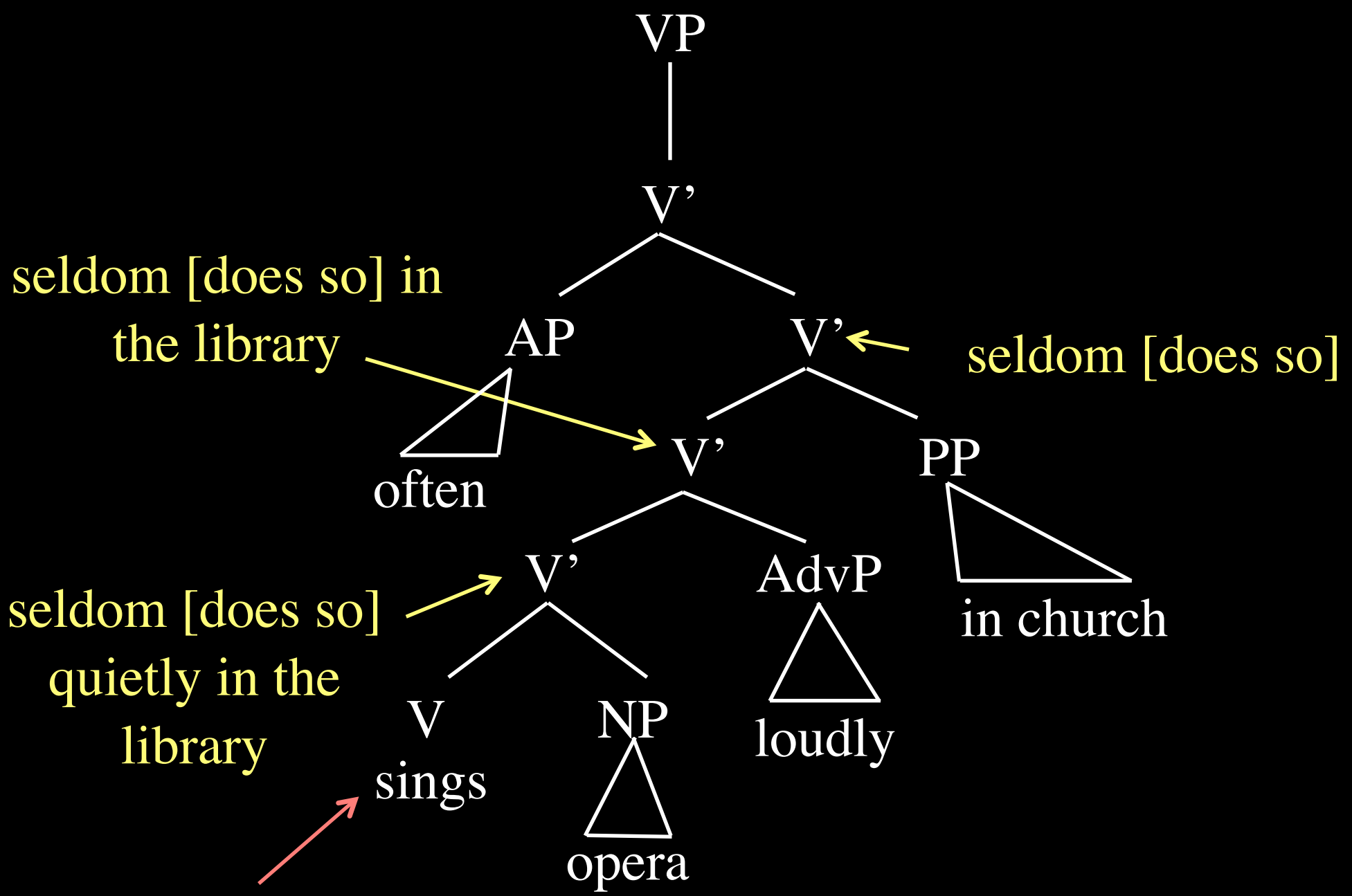

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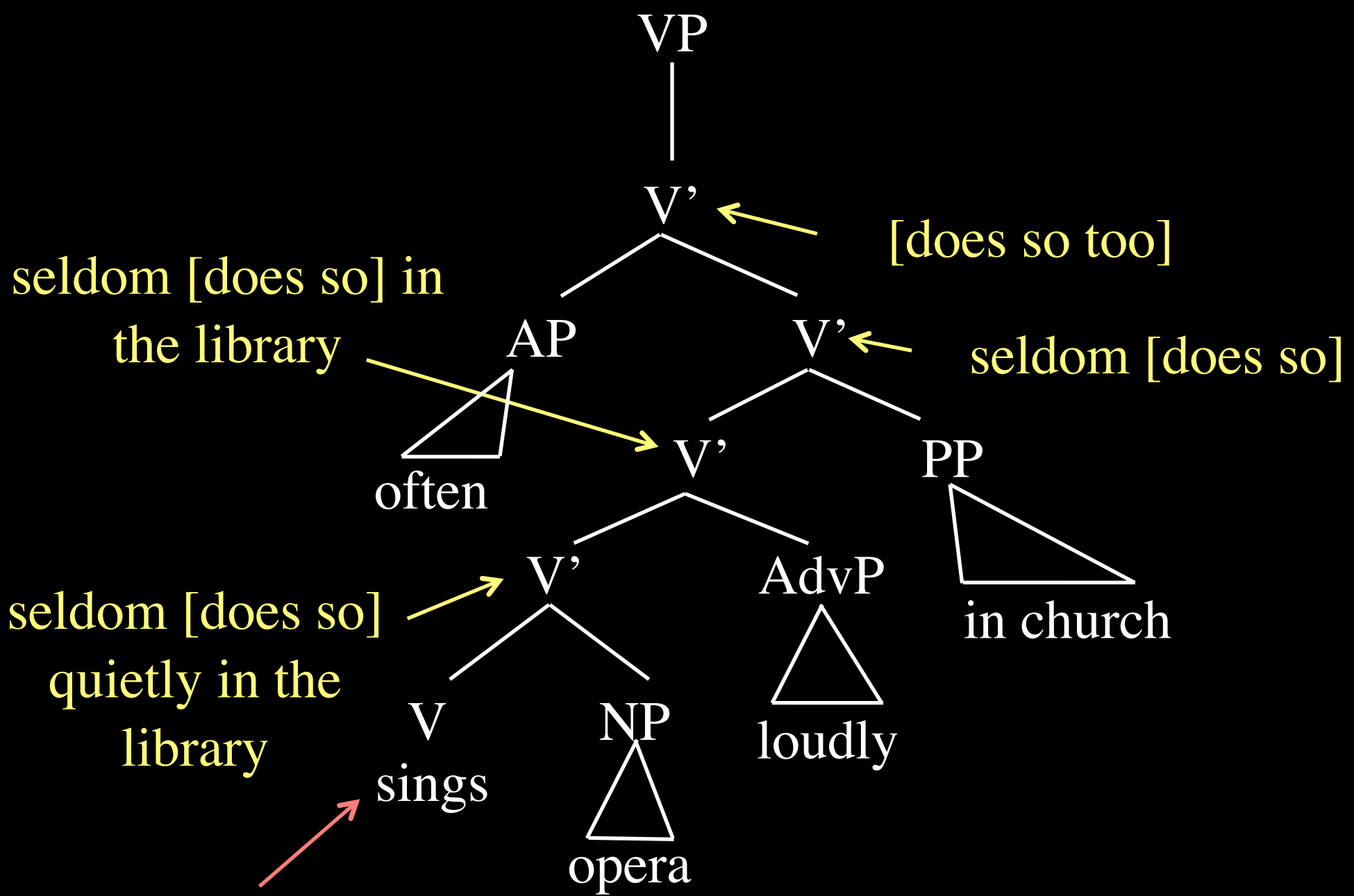

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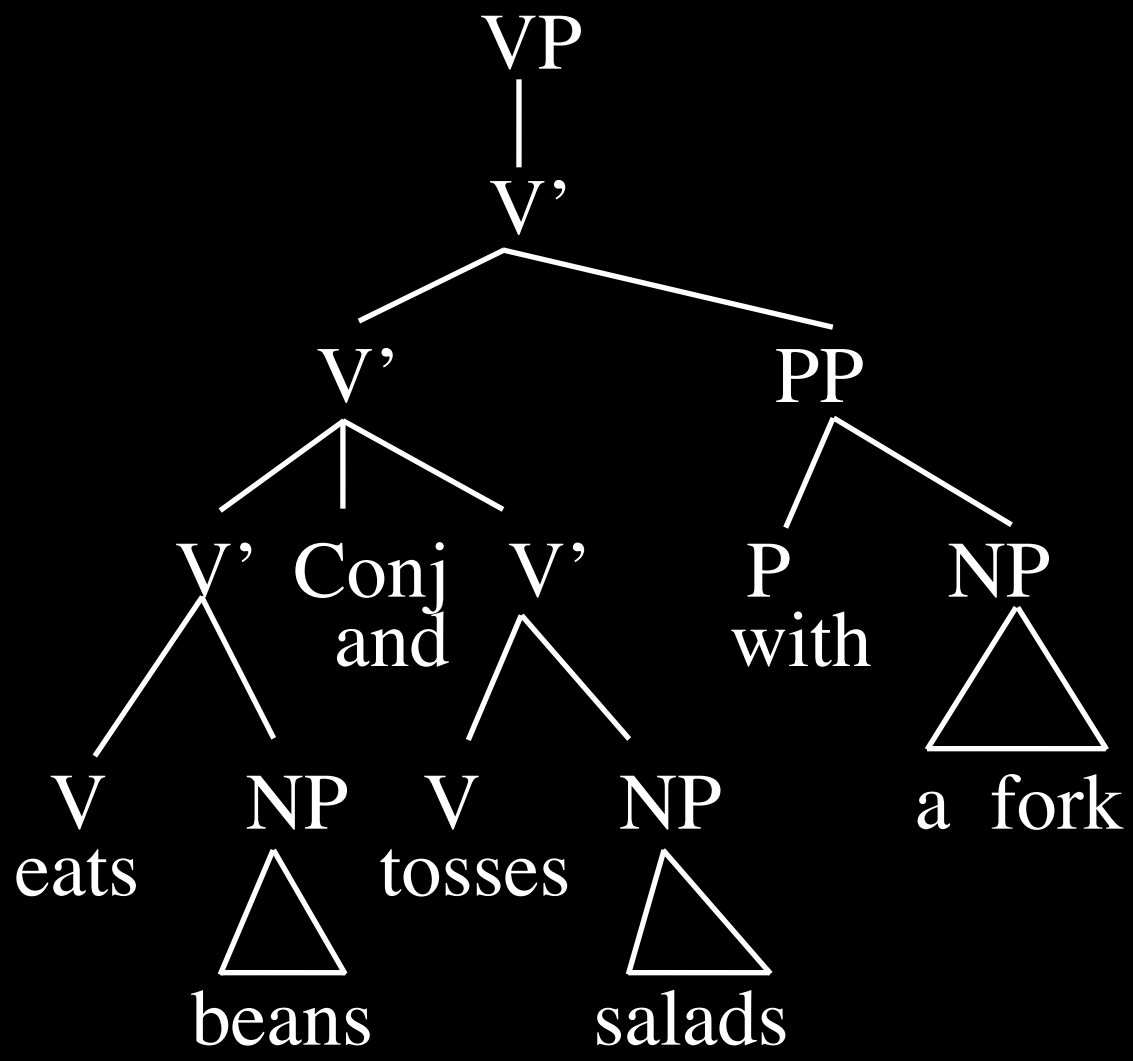
Further Evidence for V’



Flat Structure in PPs

- P → P (NP)
  - Tara is very in love with her boss
- PP →(AdvP) P (NP) (PP)

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ok, this only shows up with the idiom “in love” and fixed expressions like it… So I’m giving you a hokey story here.

Flat Structure in PPs

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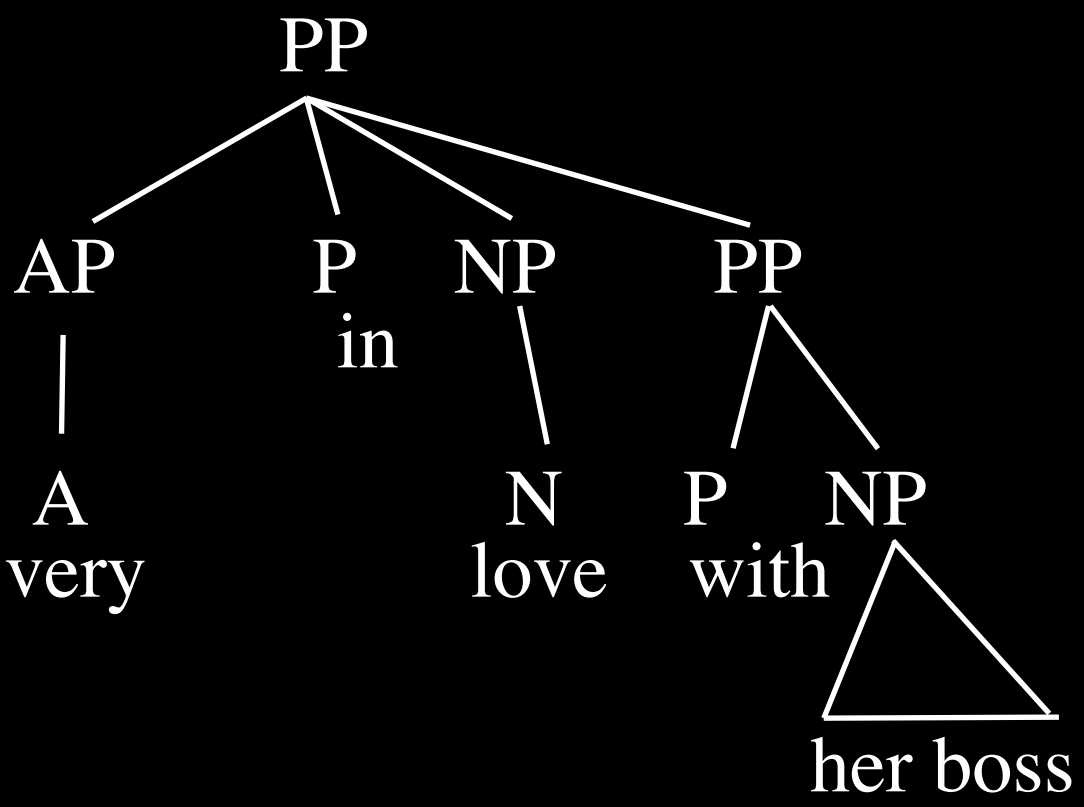
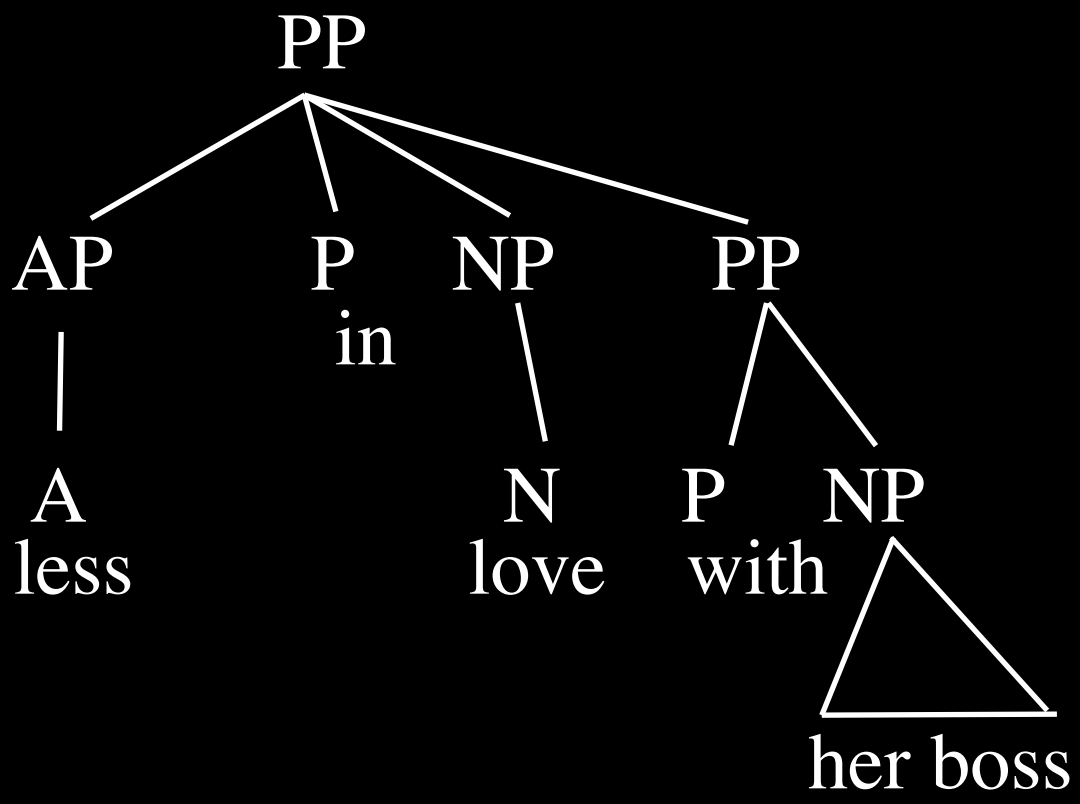


Flat Structure in PPs

- Mary was very in love with her boss, Susanna was less [so]



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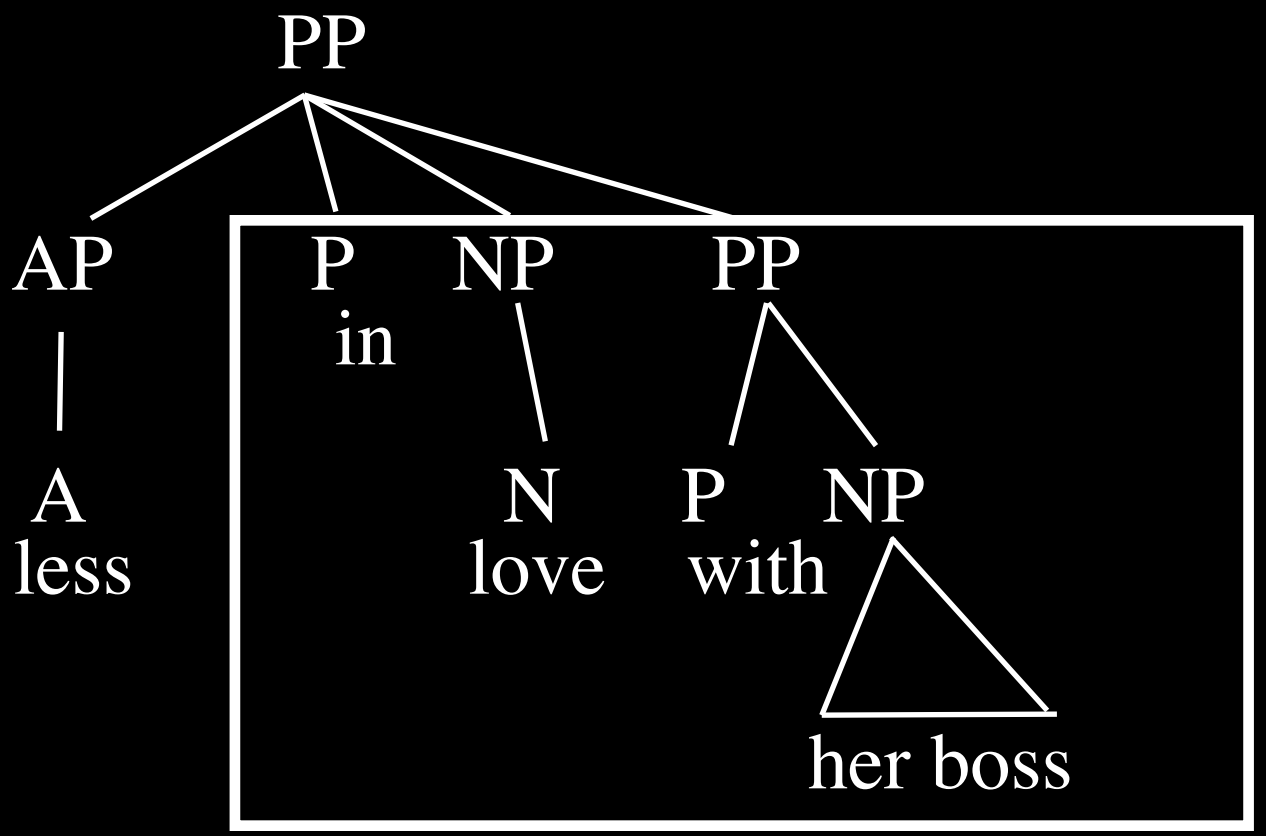

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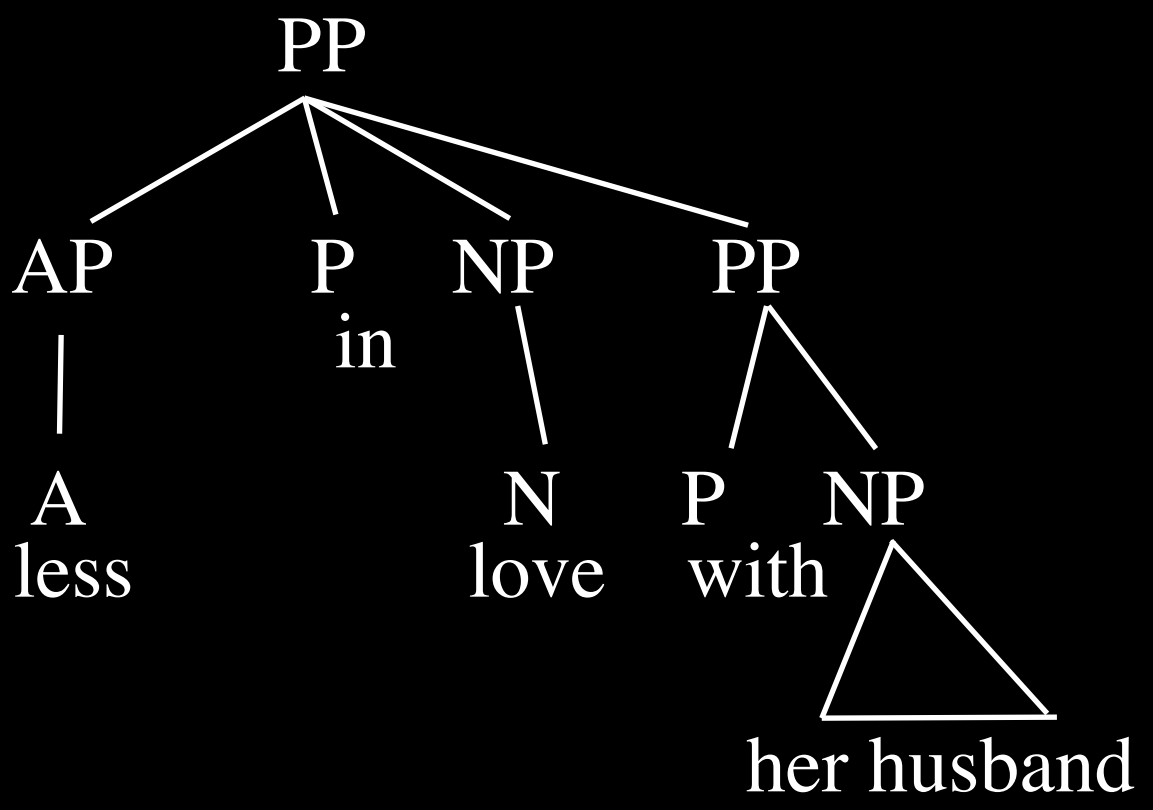

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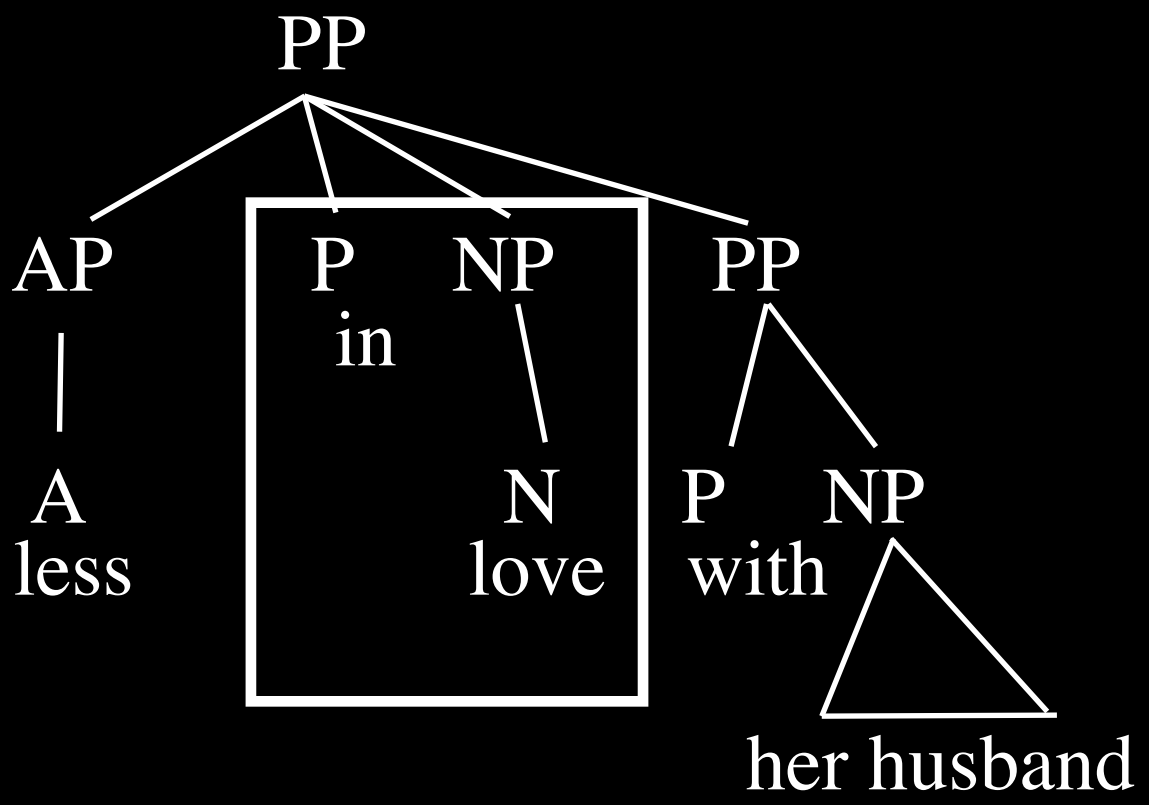

P’ rules

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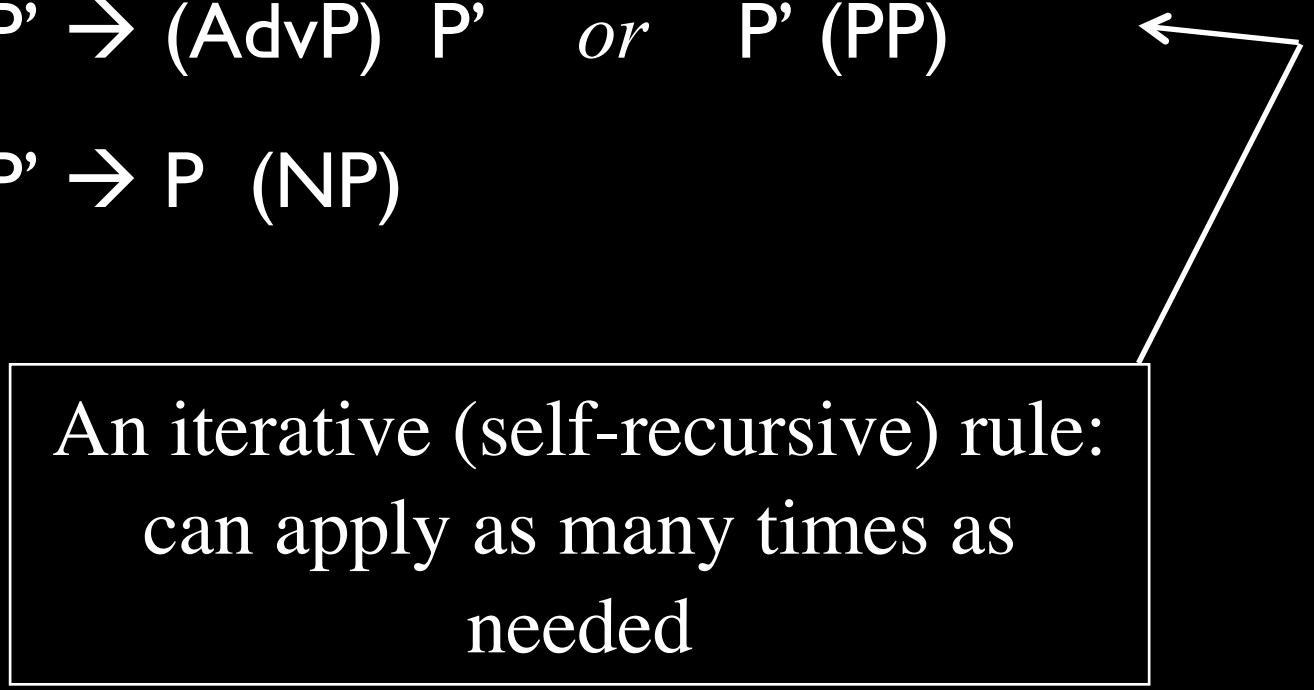

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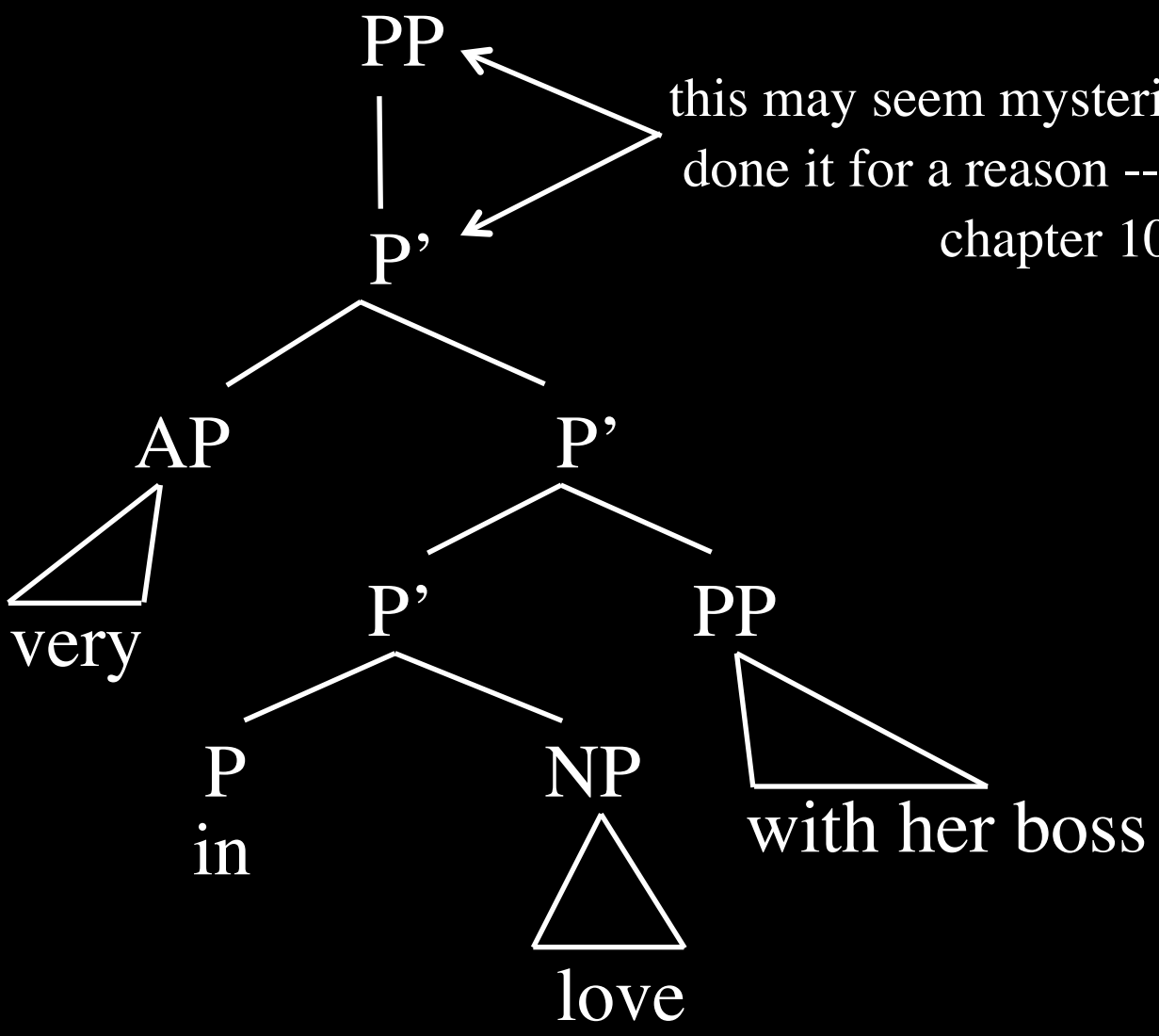

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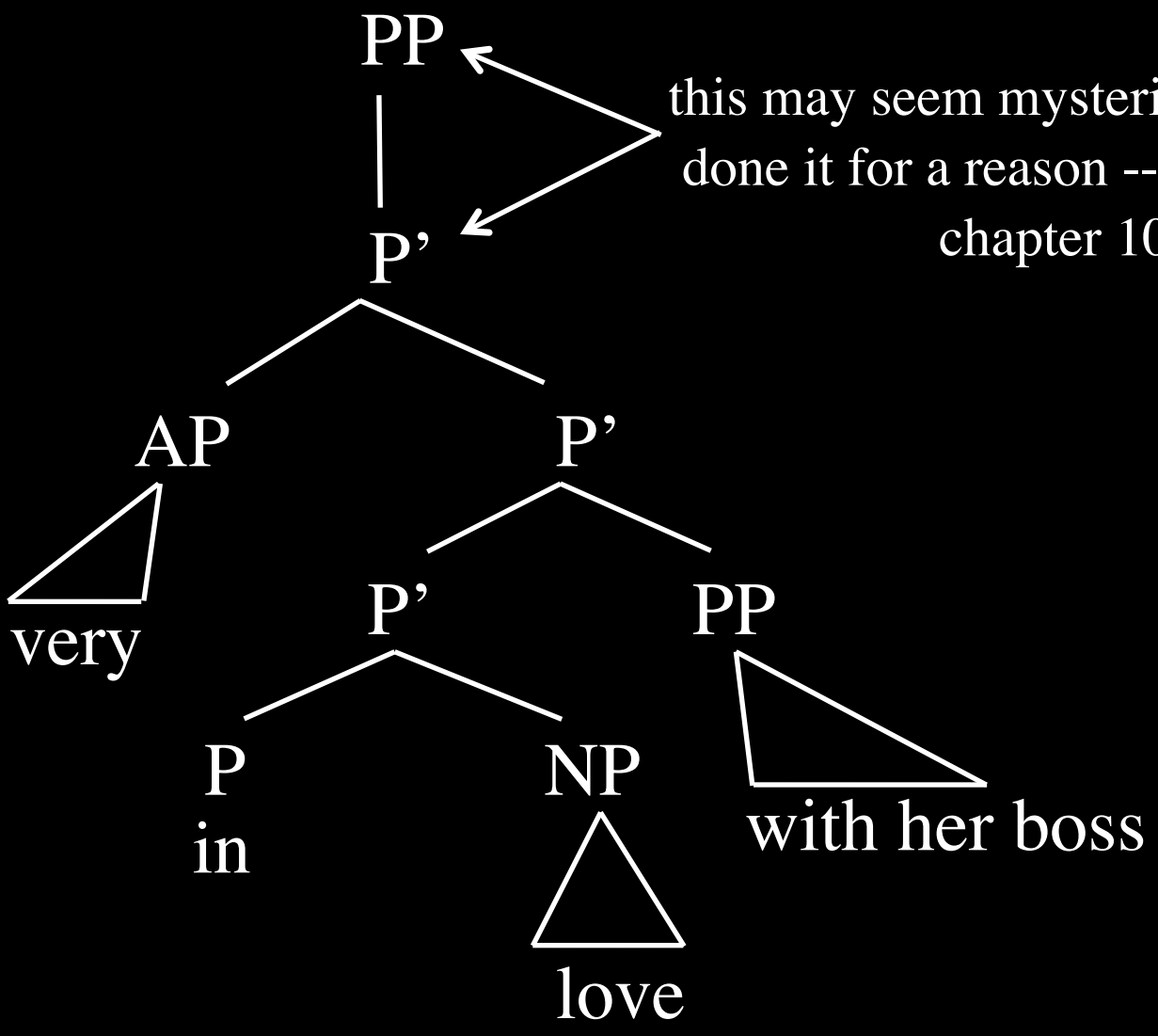
P' Structure



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There is less evidence for this

What about AdjP and AdvP

- Is there intermediate structure in AdjP and AdvPs?
- There certainly are adjuncts:
  - Lynn is interested in syntax but less [so] in phonology
- What about complements? There is a problem set on this (Challenge Problem 4) that you can try.

What about AdjP and AdvP

- For parsimony reasons, we will assume the following rules
  - AdjP → Adj' (a vacuous rule)
  - Adj' → (AdvP) P' *or* Adv' (PP)
  - Adj' → Adj (PP)
- And the equivalent set of rules for Advs

The New Rules (to be revised)

- NP → (D) N′
- N′ → (AdjP) N′ or N′ (PP)
- N′ → N (PP)
- VP → V′
- V′ → (AdvP) V′ or V′ ({AdvP/PP})
- V′ → V (NP)
- AdjP → Adj′
- Adj′ → (AdvP) Adj′
- Adj′ → Adj (PP)
- PP → P′
- P′ → (AdvP) P′ or P′ (PP)
- P′ → P (NP)

YIKES! Is there a simpler way?

Are we missing any generalizations??

Generalization 1: 3 types of rules

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  - A rule that iterates: N' → (AP) N'

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Specifier rule

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Specifier rule

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Specifier rule

Adjunct rule

Complement rule

Generalization 2: Headedness

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Generalization 2: Headedness

- In each rule the only item that is obligatory is the item that gives its category to the node that dominates it:
  - NP → (D) N'
  - N' → (AP) N'
  - N' → N (PP)
- There are no rules of the form NP → V AP. (this is called endocentricity)

Generalization 3: Optionality

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- With the exception of determiners (more on that in chapter 6), all non-head material is both phrasal and optional

Generalization 3: Optionality

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  - N' → N (PP)

Goals of X-bar theory

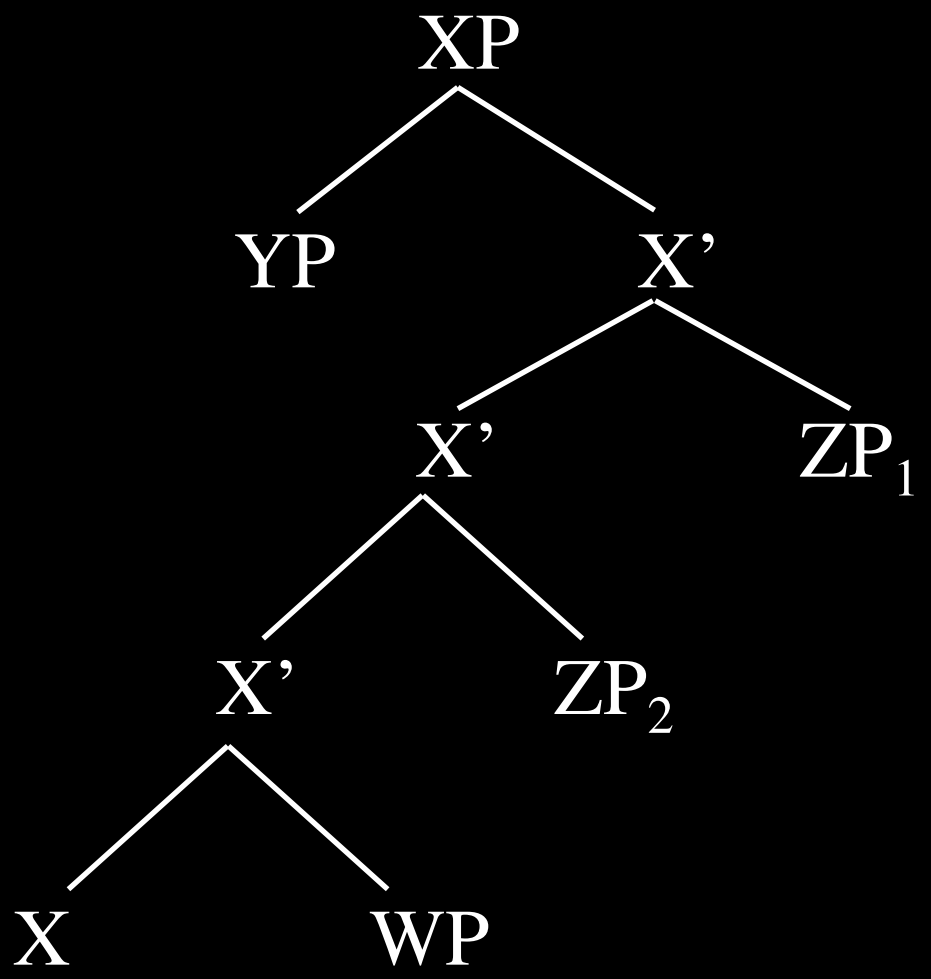
- Simplify the system of rules
- Capture intermediate structure
- Capture the cross-categorial generalizations.
- We will use VARIABLES to do this. A variable is a category that can stand for any other category.
  - X, Y, W, Z are variables that can stand for ANY of N, V, A, P

The X-bar Rules (to be slightly revised)

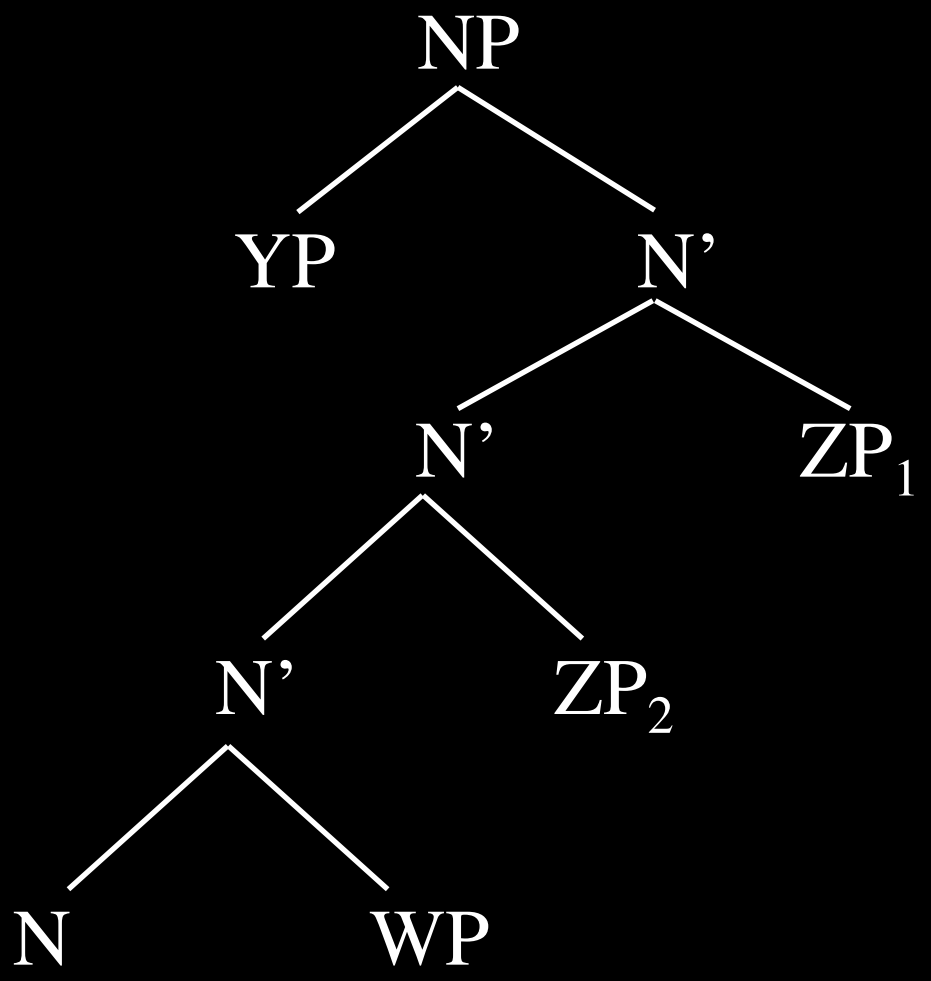
- Specifier Rule: XP → (YP) X'
- Adjunct Rule: X' → (ZP) X' or X' → X' (ZP)
- Complement Rule: X' → X (WP)

where X can stand for any category (N,V, Adj, Adv, P). X must be consistent through the 3 rules.

X-bar Structures



X-bar Structures



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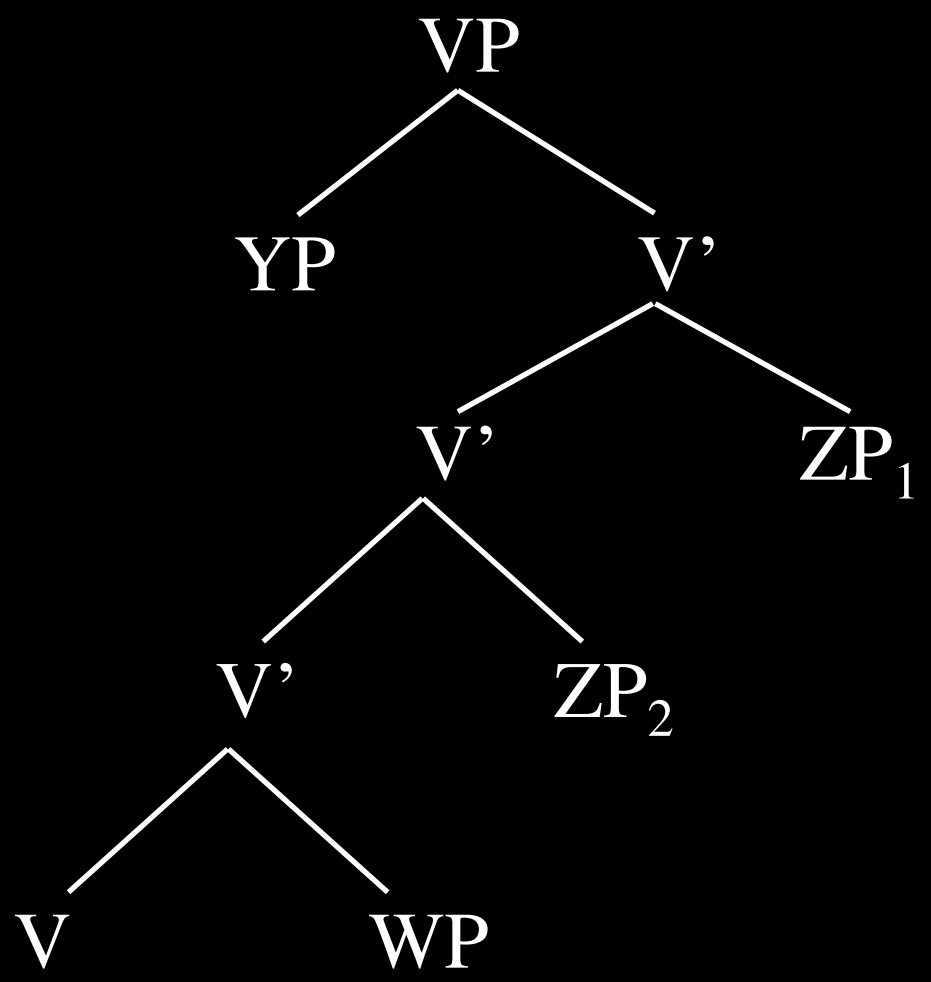
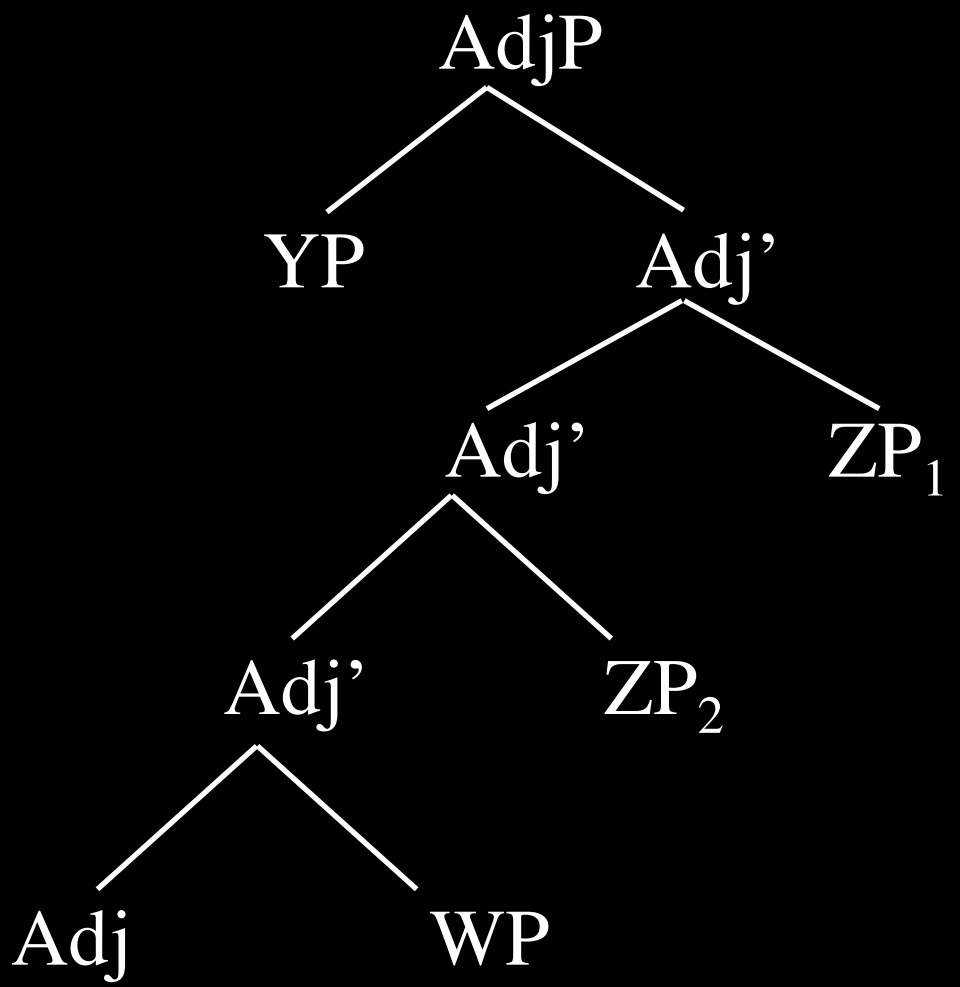


X-bar Structures



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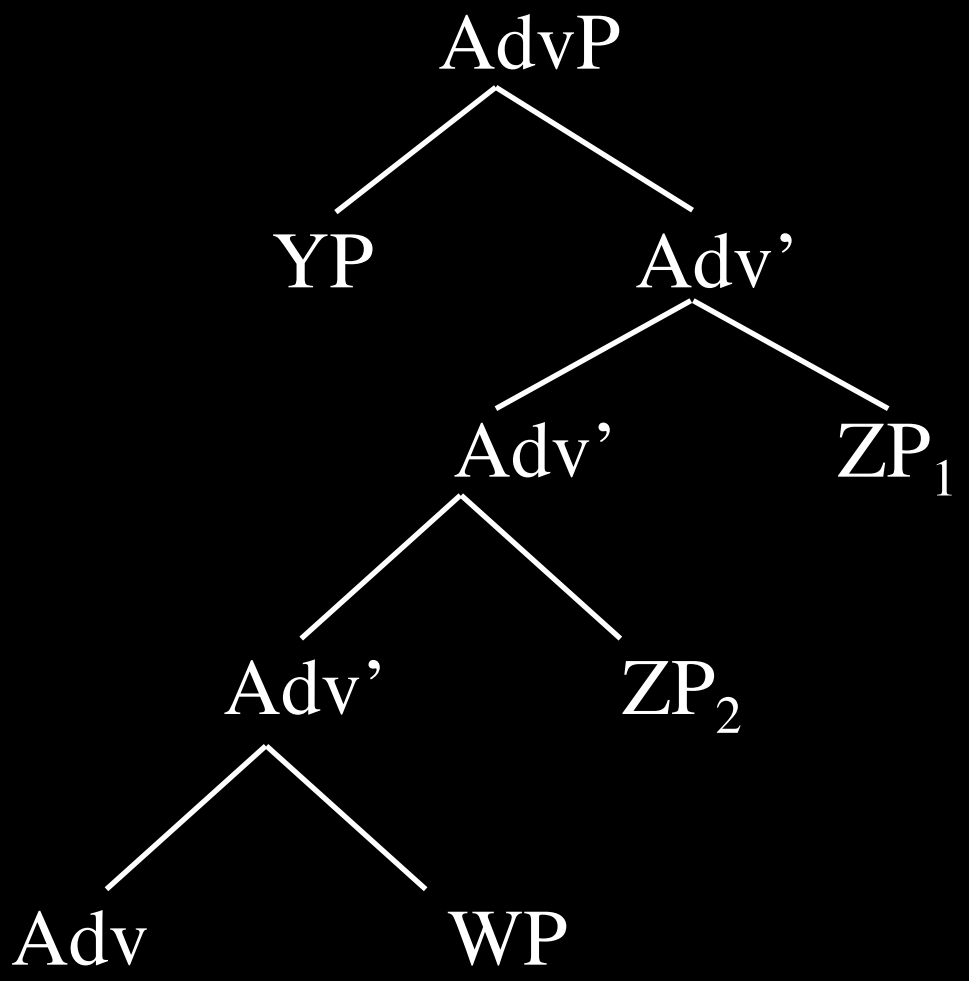

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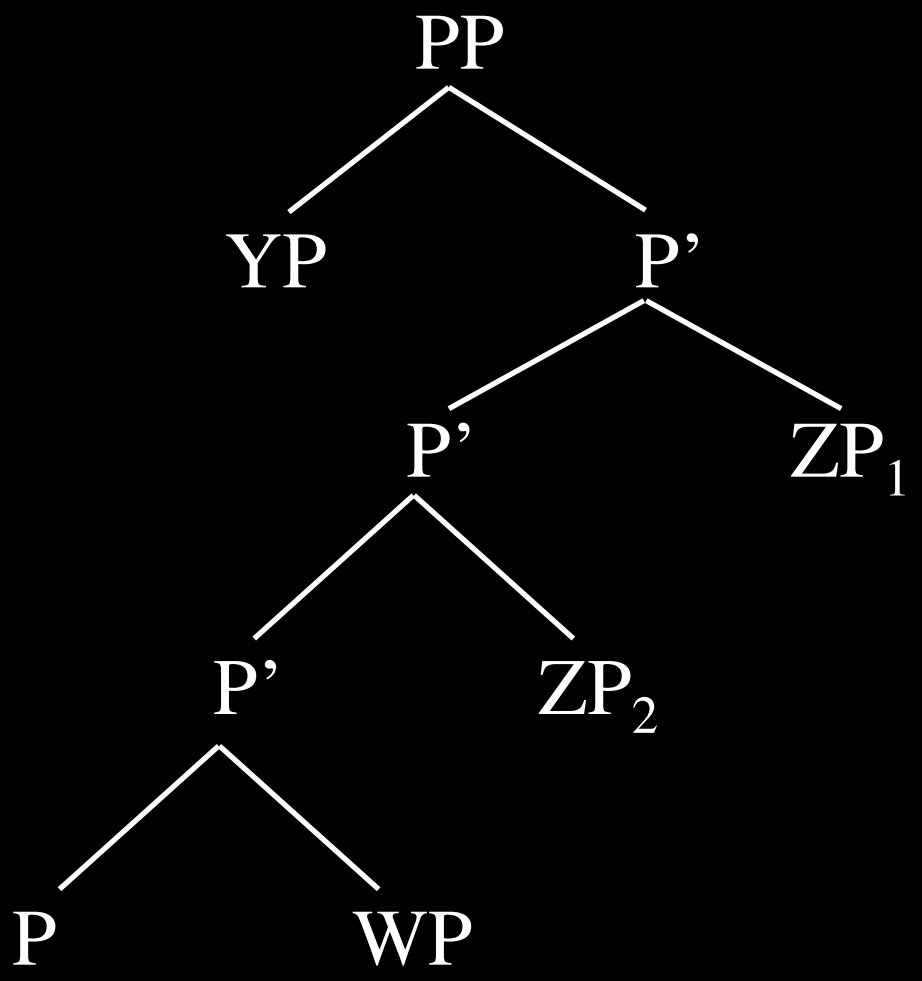

Summary

- Constituency tests show us there is intermediate structure in phrases. (evidence varies in strength)
- There are cross-categorial generalizations to be made:
  - 3 rules: Specifier, adjunct, complement
  - Headedness & Endocentricity
  - Optionality of modifiers

Summary

- X-bar rules:
  - Specifier Rule: XP → (YP) X'
  - Adjunct Rule: X' → (ZP) X' or X' → X' (ZP)
  - Complement Rule: X' → X (WP)
- This is still pretty messy. To do:
  - discuss the differences between the specifier/complement/ adjunct rules
  - Account for cross-linguistic variation
  - tidy up some ugly loose ends (like the lack of motivation for the specifier rule, the fact that determiners aren't phrases , and the fact that the TP rule doesn't fit into the system.)

Properties of X-bar

Complements, Adjuncts
(& Specifiers.)

X-bar theory

X-bar theory

- Specifier Rule: XP →(YP) X’

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Predictions?

Predictions?

- Propose three different kinds of modifiers:

Predictions?

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  - specifiers

Predictions?

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Predictions?

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Predictions?

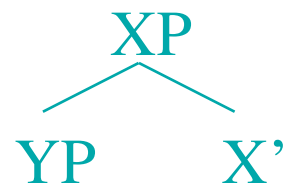
- Propose three different kinds of modifiers:
  - specifiers
  - complements
  - adjuncts
- Is this valid? Are there really three different kinds? Do they have different properties

Formal Definitions

Formal Definitions

Specifier: Daughter of XP, sister to X'

XP → (YP) X'



Formal Definitions

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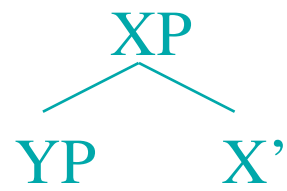
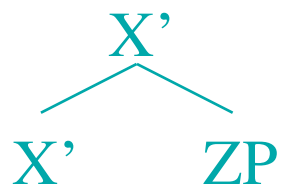


Adjunct: Daughter of X', sister to X'

X' → (ZP) X' or X' → X' (ZP)



Formal Definitions

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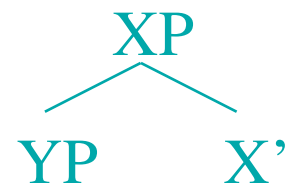

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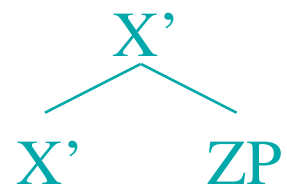
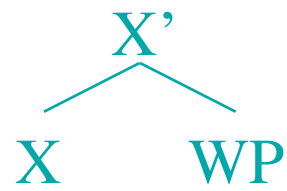
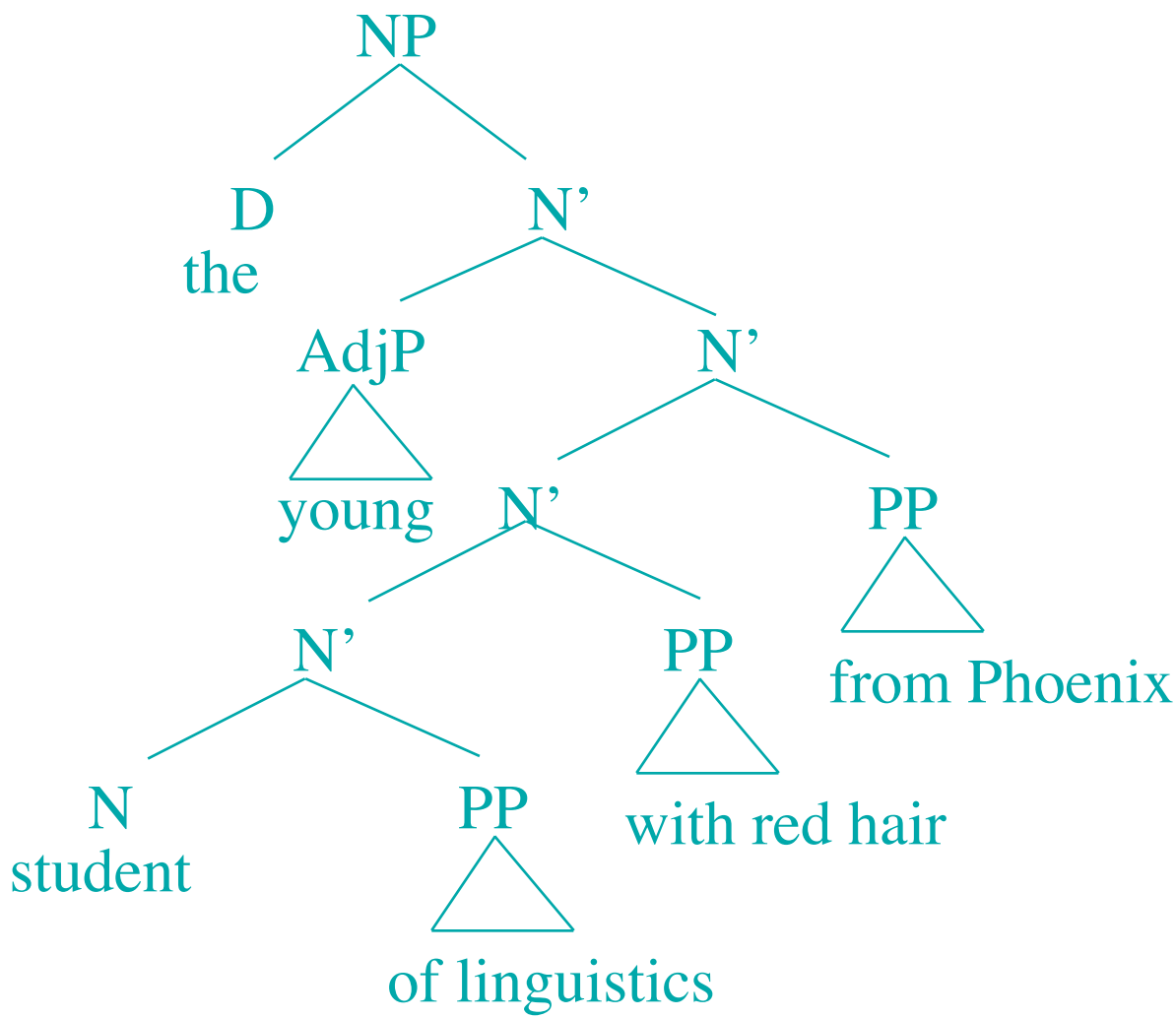
X' → (ZP) X' or X' → X' (ZP)



Complement: Daughter of X', sister to X

X' → X (WP)




NP
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N’
PP
from Phoenix
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PP
with red hair
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student
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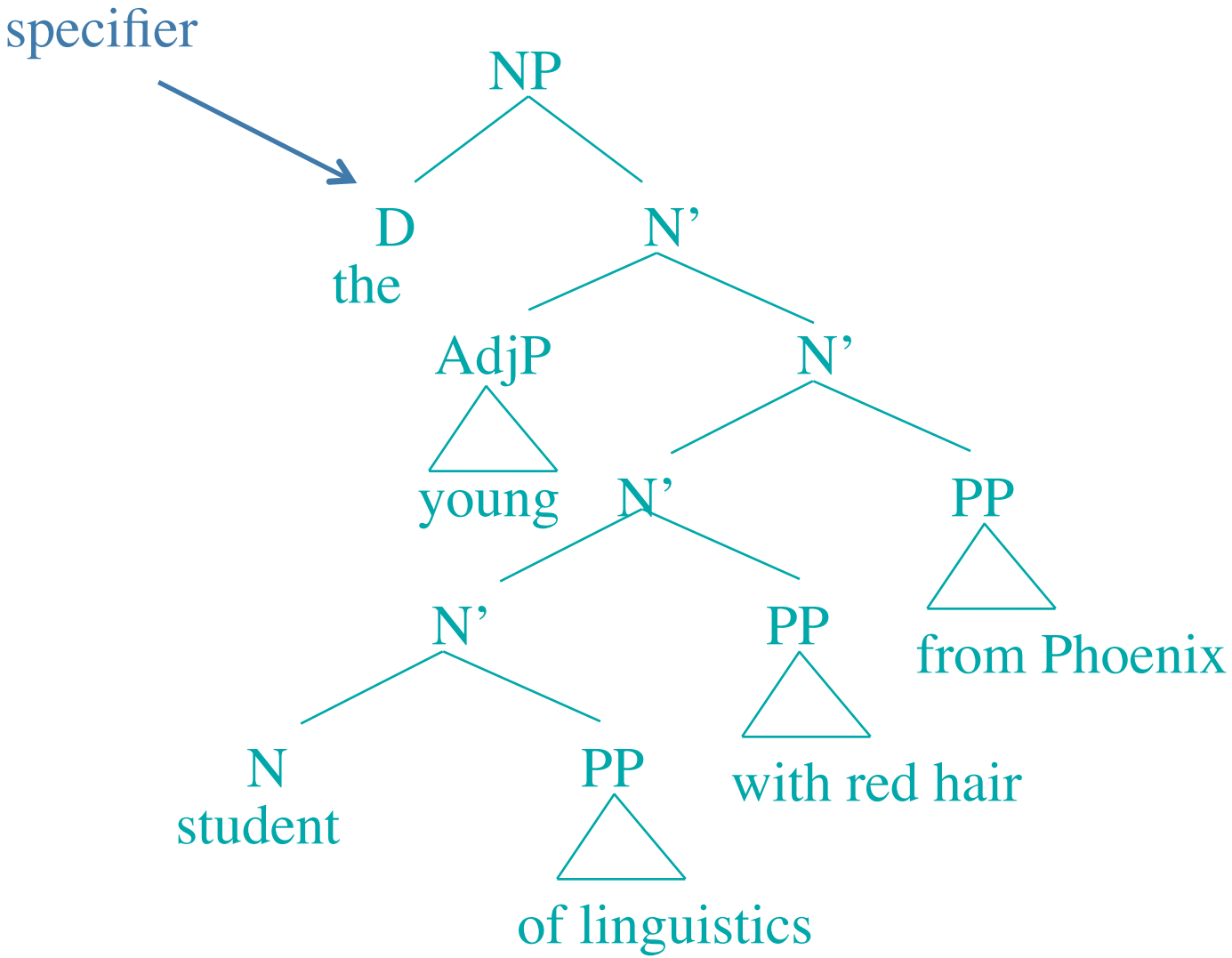
of linguistics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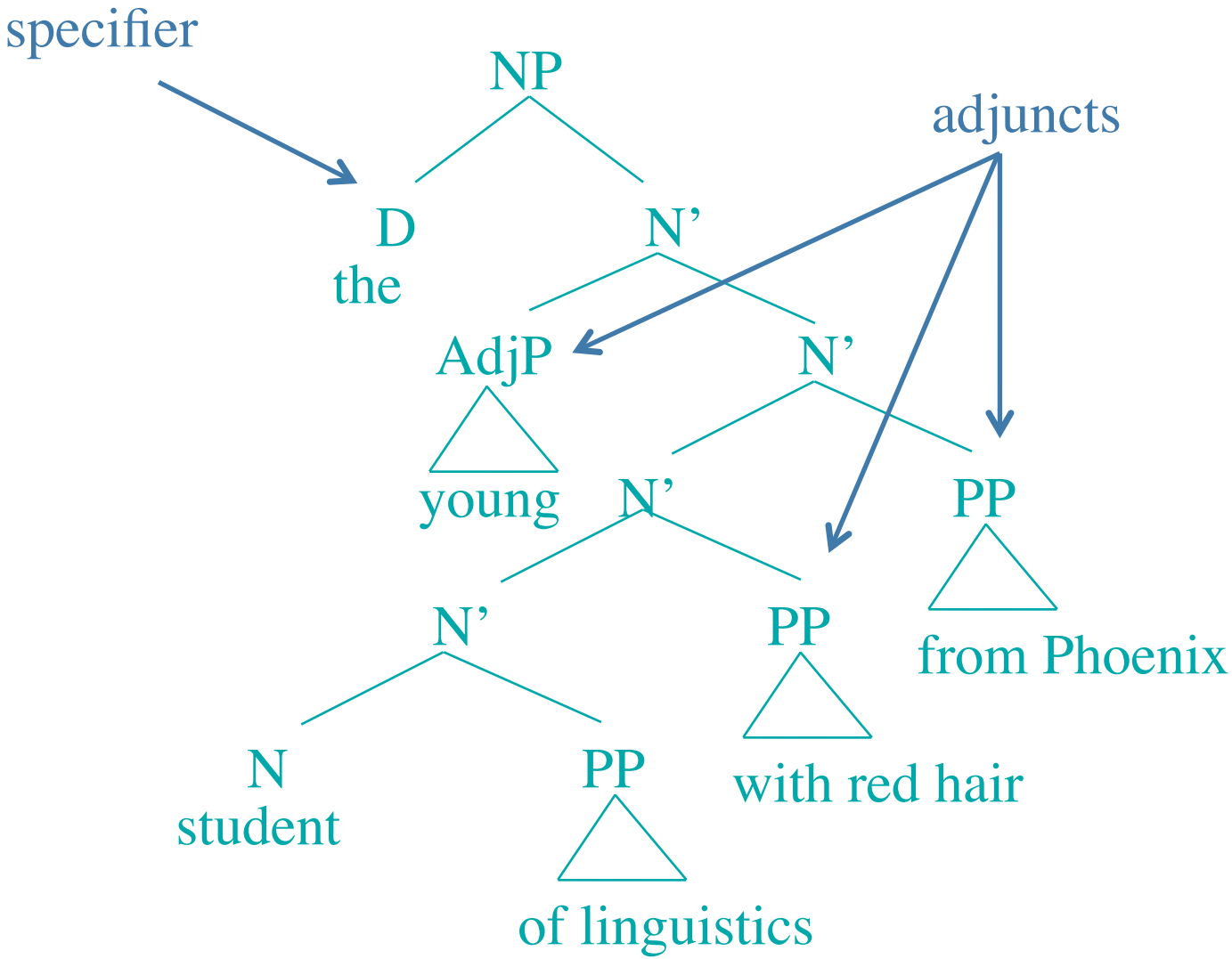
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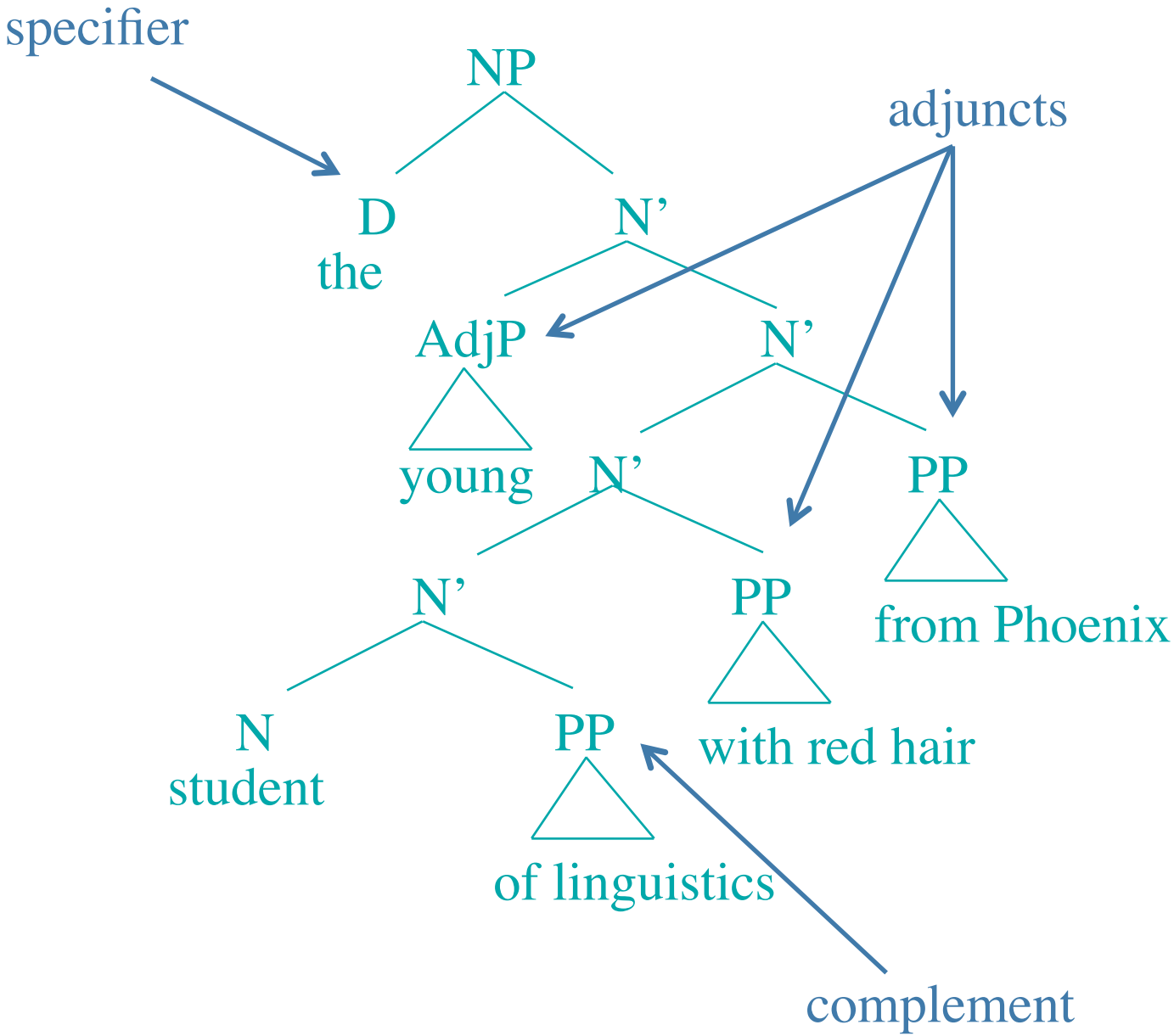
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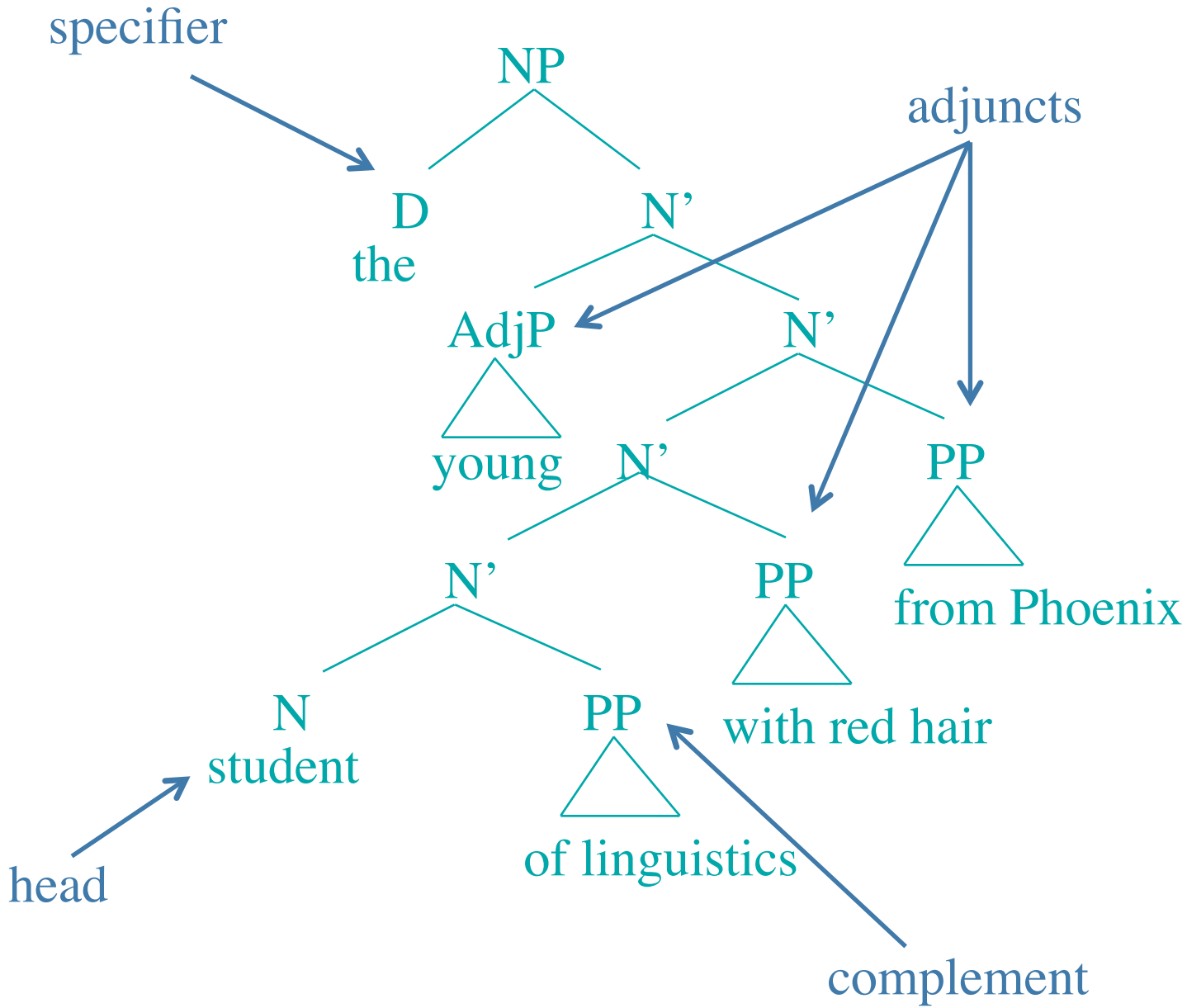
complement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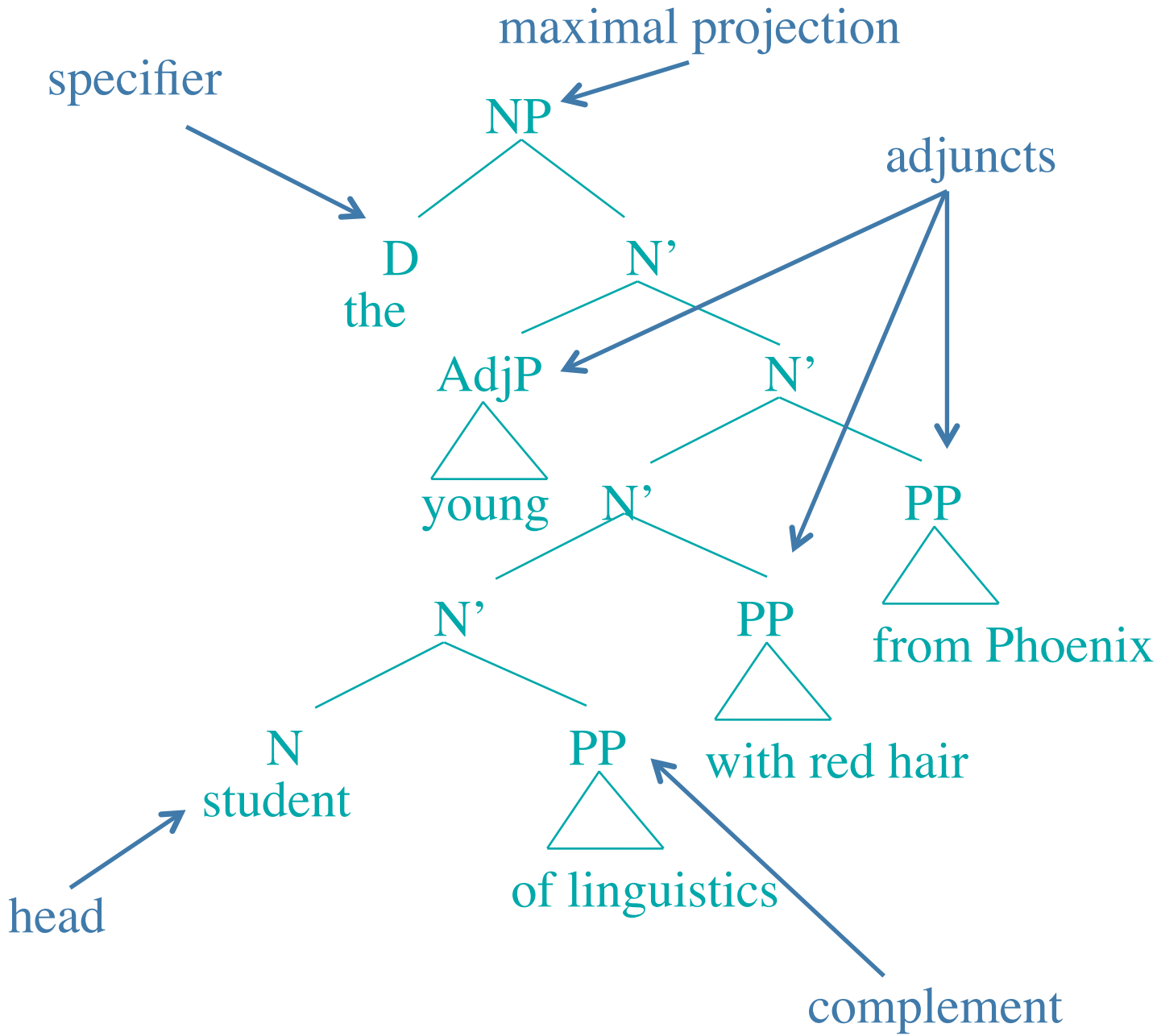
maximal projection
specifier
NP
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D
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young
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from Phoenix
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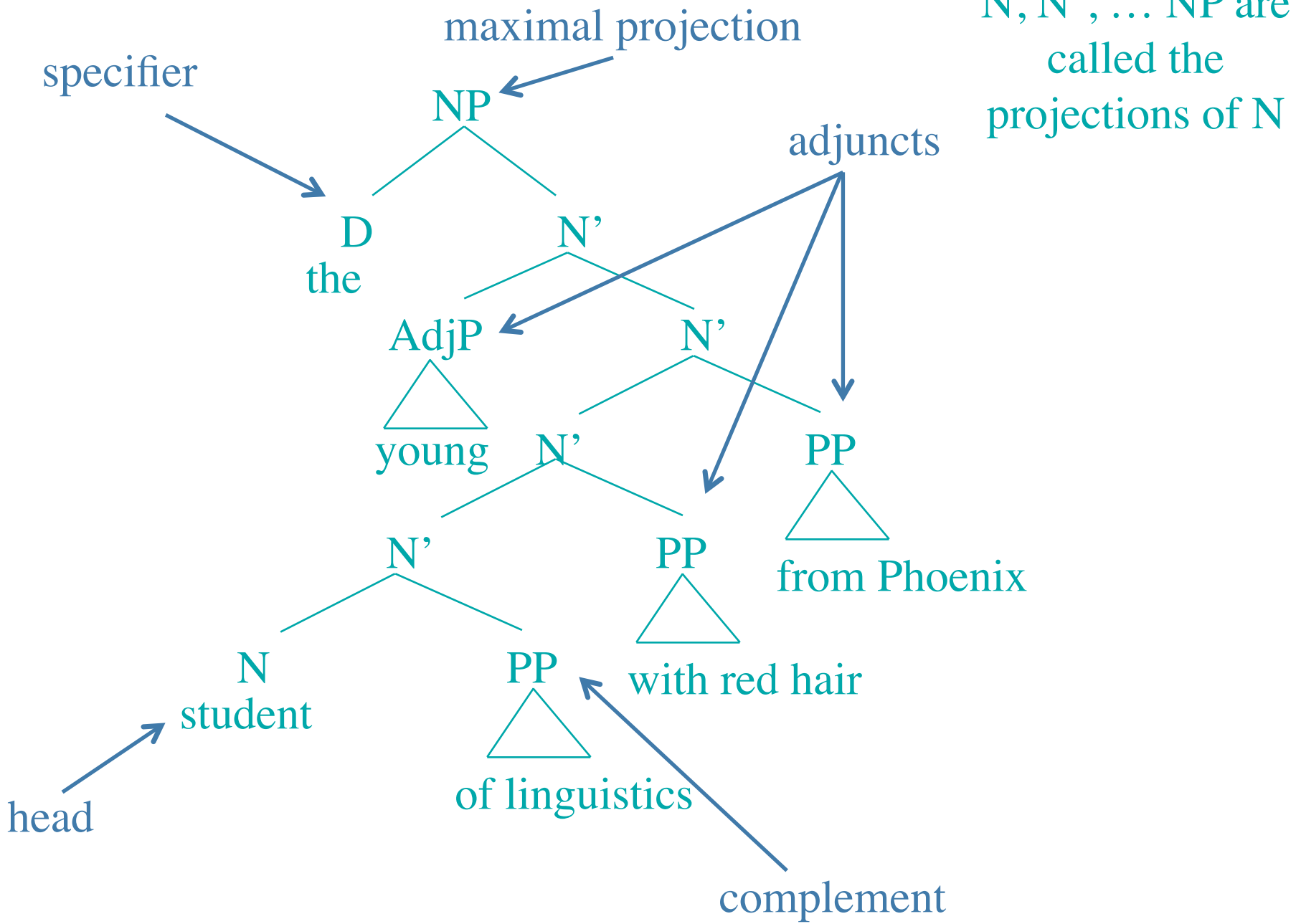
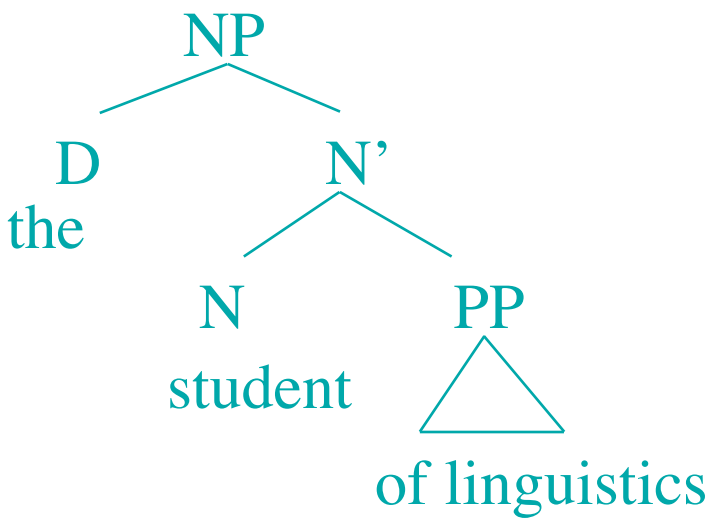
student
PP
with red hair
head
of linguistics
complement


N, N', … NP are called the projections of N
maximal projection
specifier
NP
adjuncts
D
the
N'
AdjP
N'
young
N'
PP
N'
PP
from Phoenix
N
student
PP
with red hair
head
of linguistics
complement

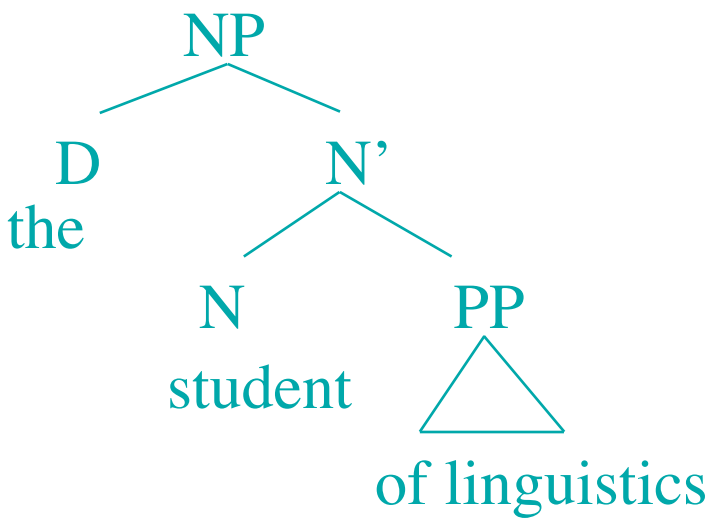
Revised Principle of Modification

- If an XP modifies some head Y, then it must be dominated by some projection of Y (i.e., it must be dominated by Y, Y', ..., Y', YP)

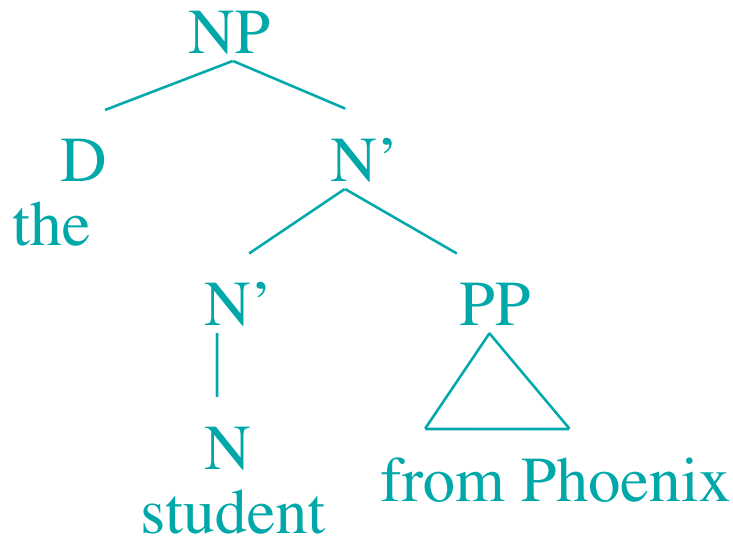
The student of linguistics



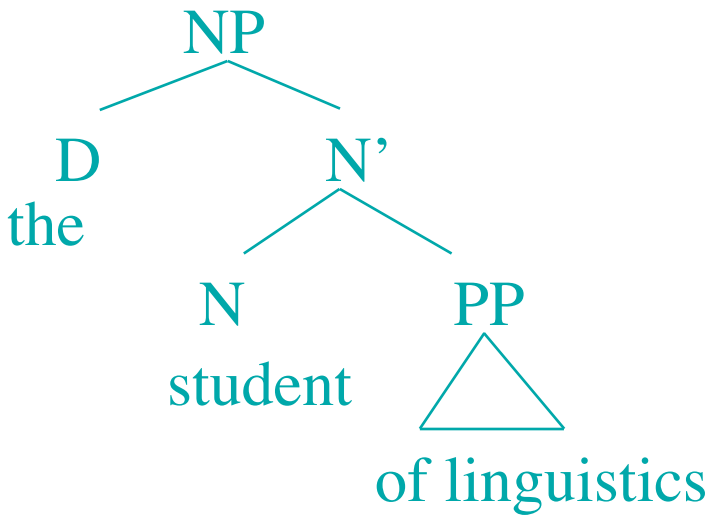
The student of linguistics



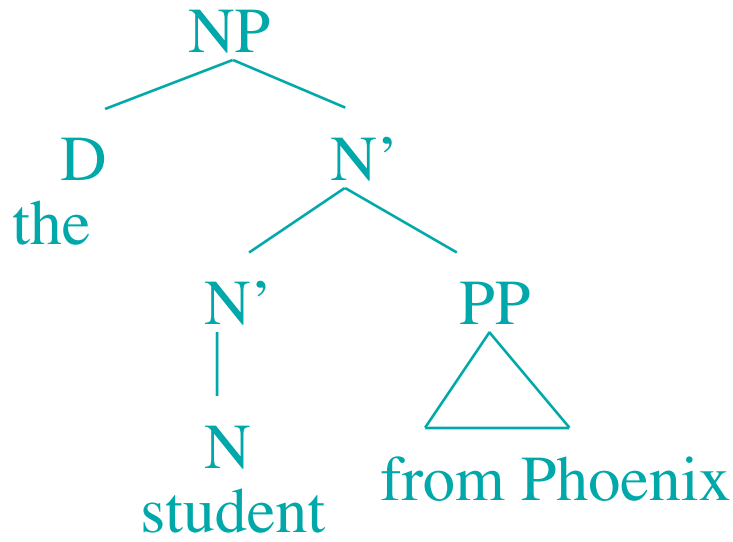
The student from Phoenix



The student of linguistics



The student from Phoenix



Quick way to distinguish complements and adjuncts in NPs (doesn't work for other categories). Complements of N are marked with the preposition 'of'. All other prepositions mark adjuncts. (This is not fool proof!)

Complements always closest to head

Complements always closest to head

The student [of linguistics] [from Phoenix]

Complements always closest to head

The student [of linguistics] [from Phoenix]

head complement adjunct

Complements always closest to head

The student [of linguistics] [from Phoenix]

head complement adjunct

*The student [from Phoenix] [of linguistics]

Complements always closest to head

The student [of linguistics] [from Phoenix]

head complement adjunct

*The student [from Phoenix] [of linguistics]

head adjunct complement

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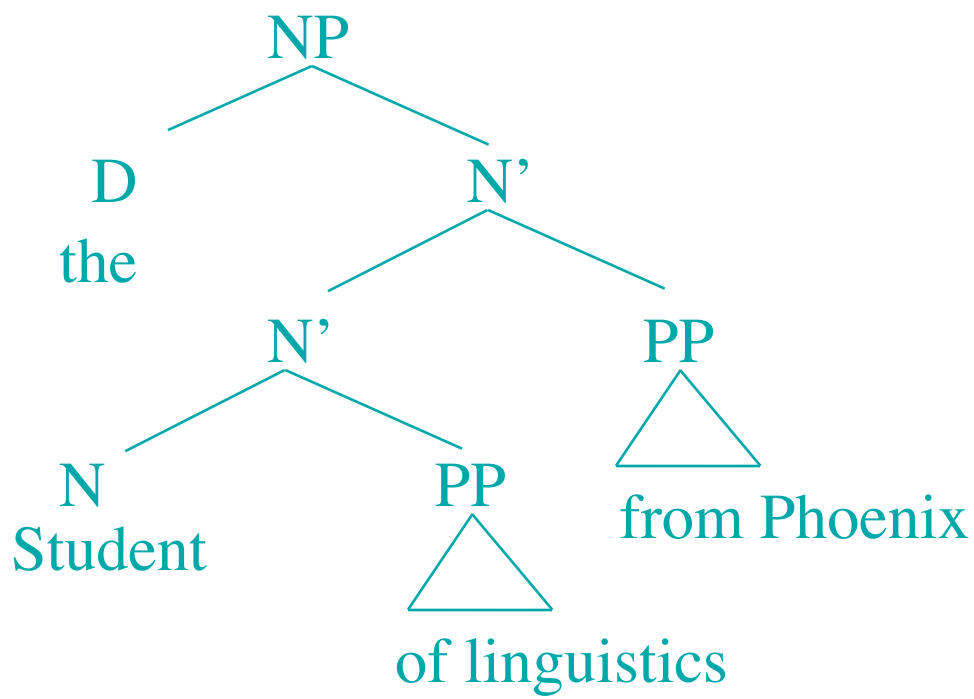


Complements always closest to head

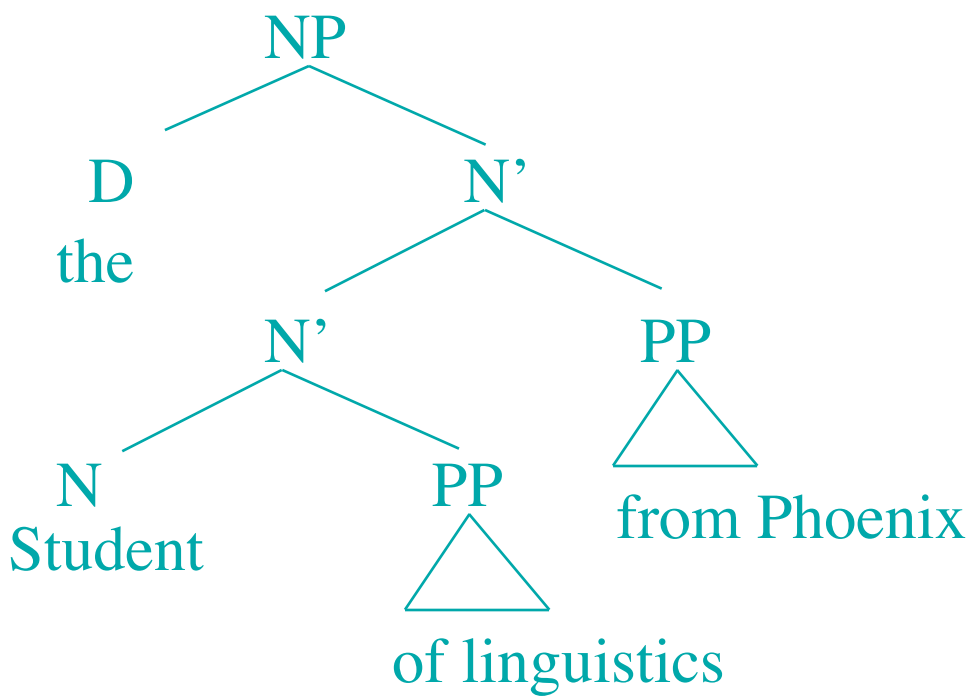
The student [of linguistics] [from Phoenix]

head complement adjunct

*The student [from Phoenix] [of linguistics]

head adjunct complement

since complements are sister to head



Only one complement, multiple adjuncts

- X' →(ZP) X' or X' → X' (ZP) Iterative
- X' → X (WP) not iterative

Only one complement, multiple adjuncts

- X' →(ZP) X' or X' → X' (ZP) Iterative
- X' → X (WP) not iterative

the student of linguistics with the red hair from Phoenix in the bath

Only one complement, multiple adjuncts

- X' →(ZP) X' or X' → X' (ZP) Iterative
- X' → X (WP) not iterative

the student of linguistics with the red hair from Phoenix in the bath

*the student of linguistics of chemistry from Phoenix

Adjuncts can be reordered

The student of linguistics from Phoenix with red hair on the bus.
The student of linguistics with red hair from Phoenix on the bus.
The student of linguistics with red hair on the bus from Phoenix.
The student of linguistics on the bus with red hair from Phoenix.
The student of linguistics on the bus from Phoenix with red hair.
The student of linguistics from Phoenix on the bus with red hair.
*The student from Phoenix of linguistics with red hair on the bus
*The student from Phoenix with red hair of linguistics on the bus
*The student from Phoenix with red hair on the bus of linguistics
(etc.)

Conjunction

Conjunction

- The conjunction rule: $X^n \rightarrow X^n$ Conj X^n

Conjunction

- The conjunction rule: $X^n \rightarrow X^n$ Conj X^n
  - The red and blue house *The red and cat

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- Complements can be conjoined with complements:

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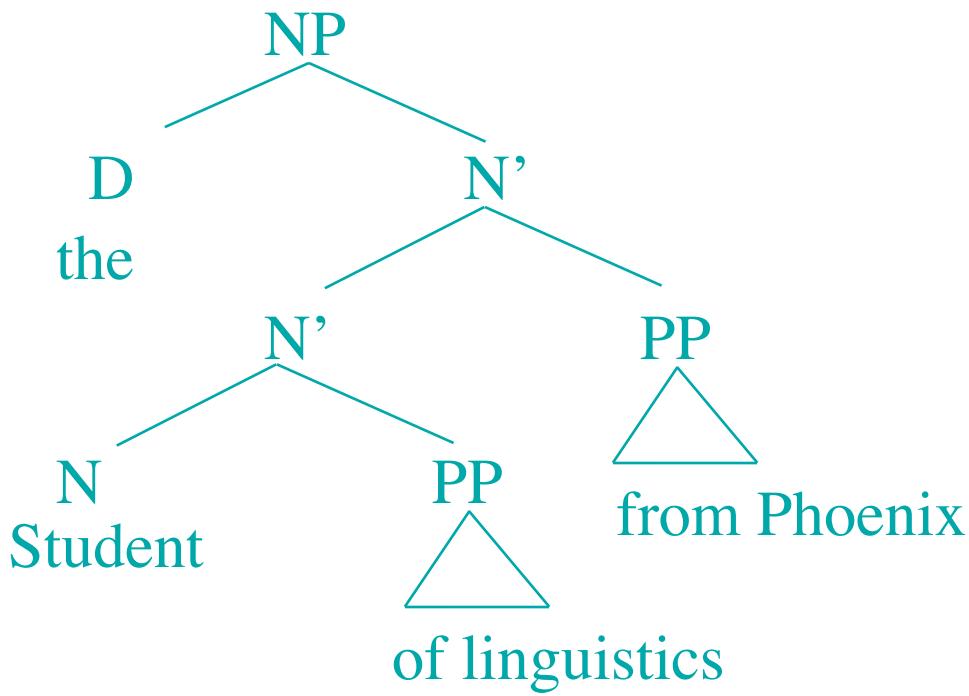
- Complements cannot be conjoined with adjuncts
  - *The student of linguistics and with red hair

One replacement

- One Replacement: replace N’ with one.



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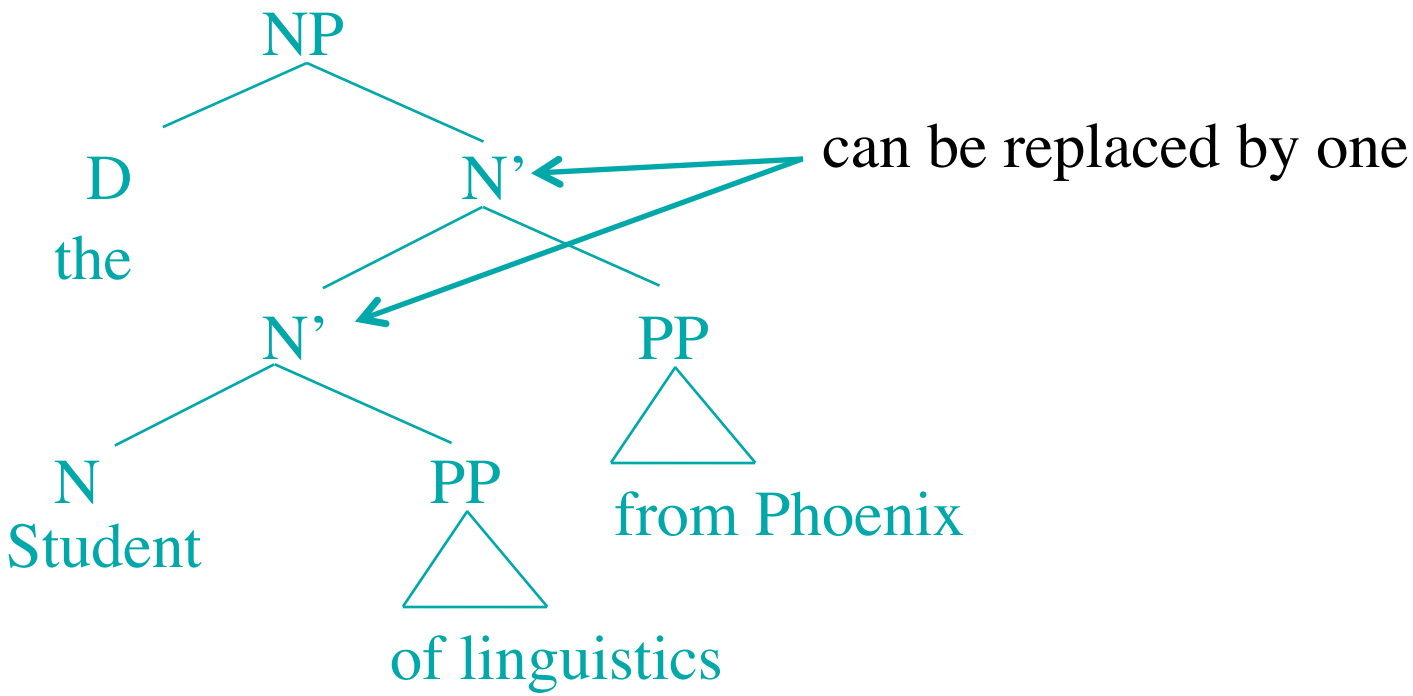

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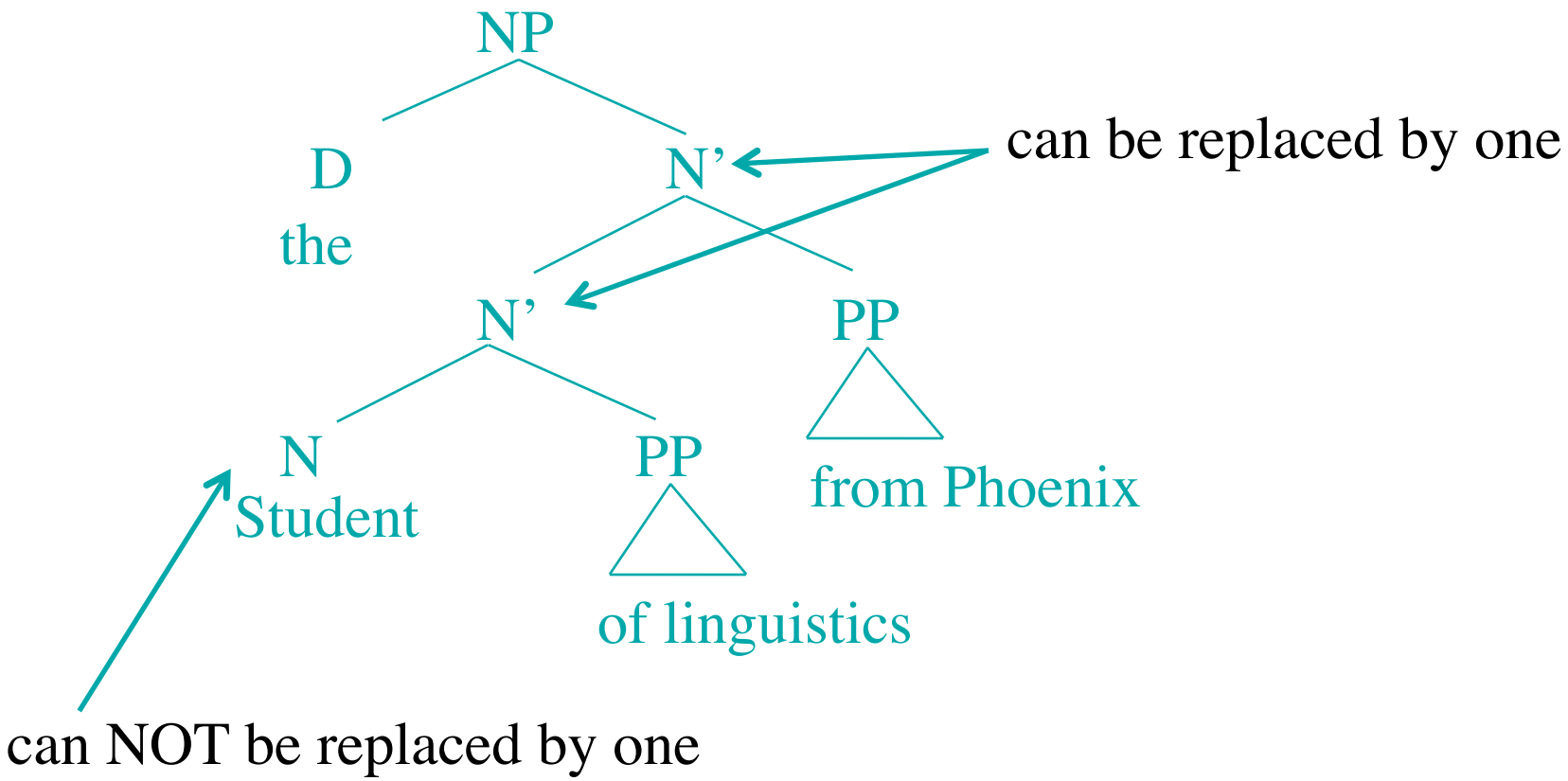

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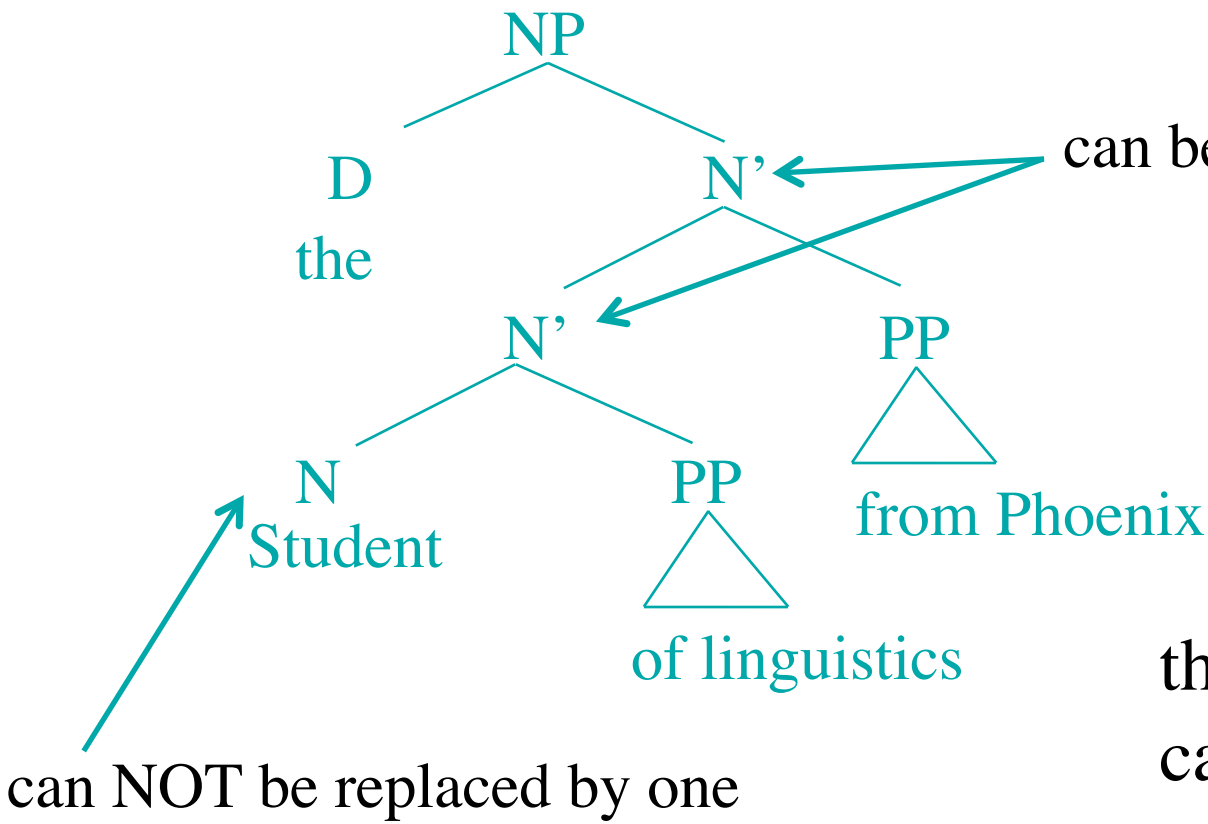

therefore an adjunct can follow 'one' but complements cannot!

One replacement

One replacement

- The student from Phoenix not the [$_{N'}$one] from Tucson

One replacement

- The student from Phoenix not the [$_{N'}$one] from Tucson
- *The student of linguistics not the one of chemistry

One replacement

- The student from Phoenix not the [$_{N'}$one] from Tucson
- *The student of linguistics not the one of chemistry

For those of you who find the last sentence grammatical, your rule targets both N and N' and this test won't work for you to distinguish adjuncts from complements

Telling complements from adjuncts

Complements	***Adjuncts***
only 1	multiple allowed
closest to head	may be separated from head
cannot be reordered	can be reordered
conjoin with complements	conjoin with adjuncts
*[one]+complement	✓[one]+adjunct

An easy mistake to make!

- When you have only one PP modifier or AdjP modifier, be very careful to see if it is a complement or adjunct. If it is an adjunct it must be a sister to the X' level!!!!!

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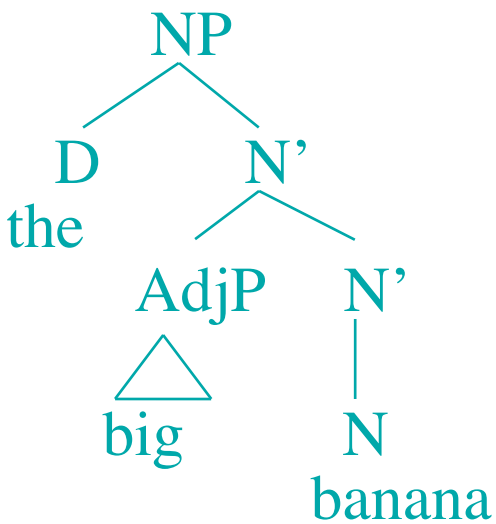

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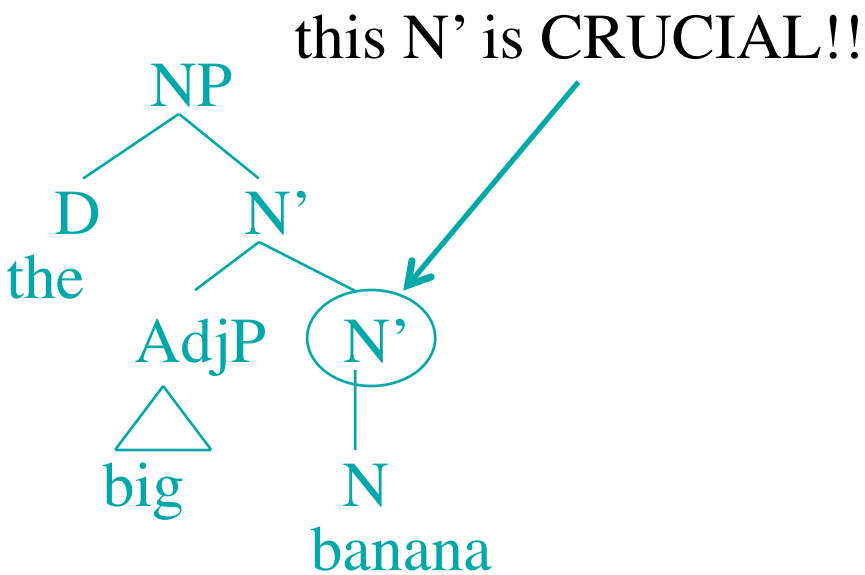

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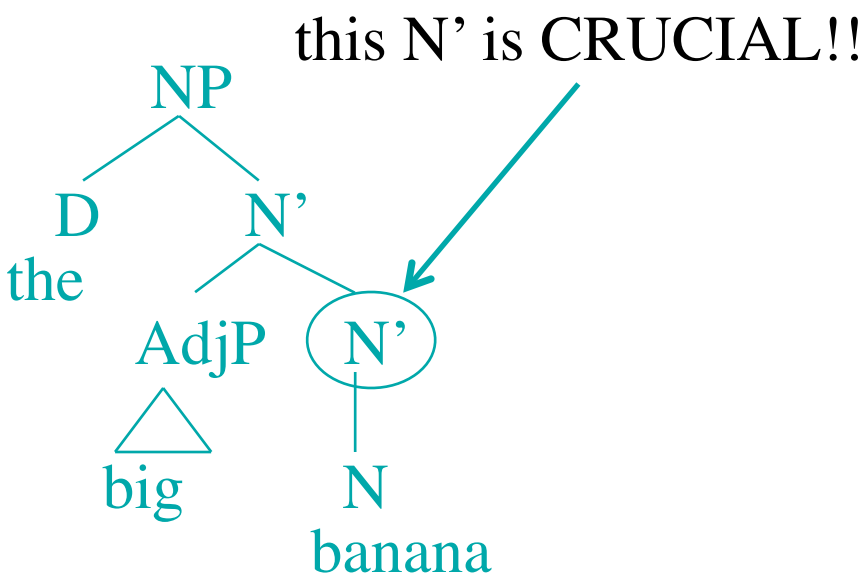

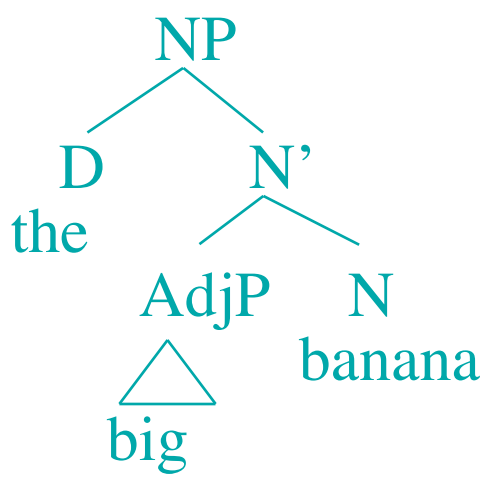

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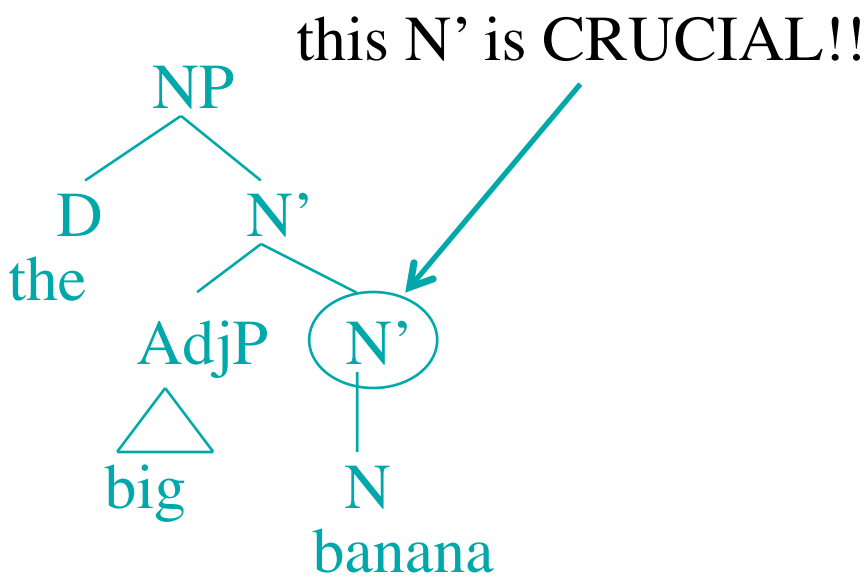

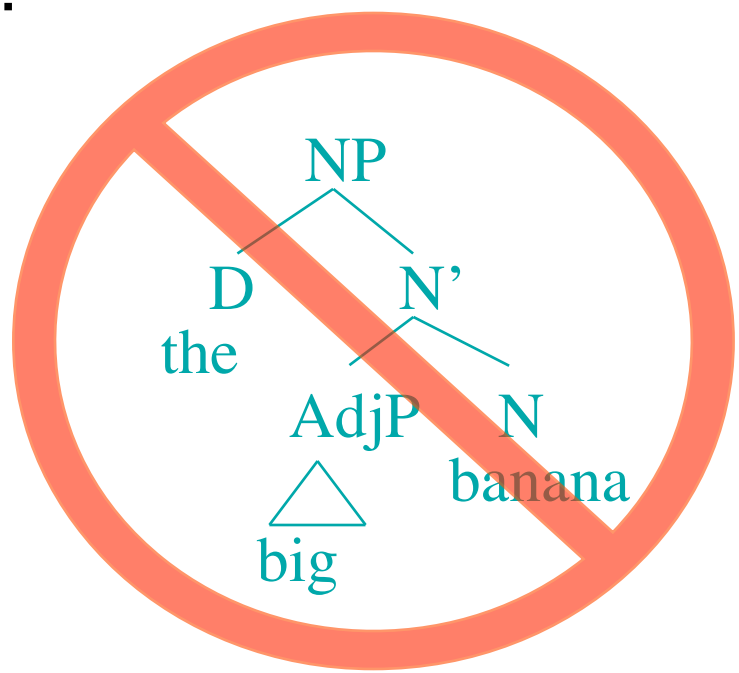

The complement/adjunct distinction in VPs

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I loved the policeman intensely with all my heart

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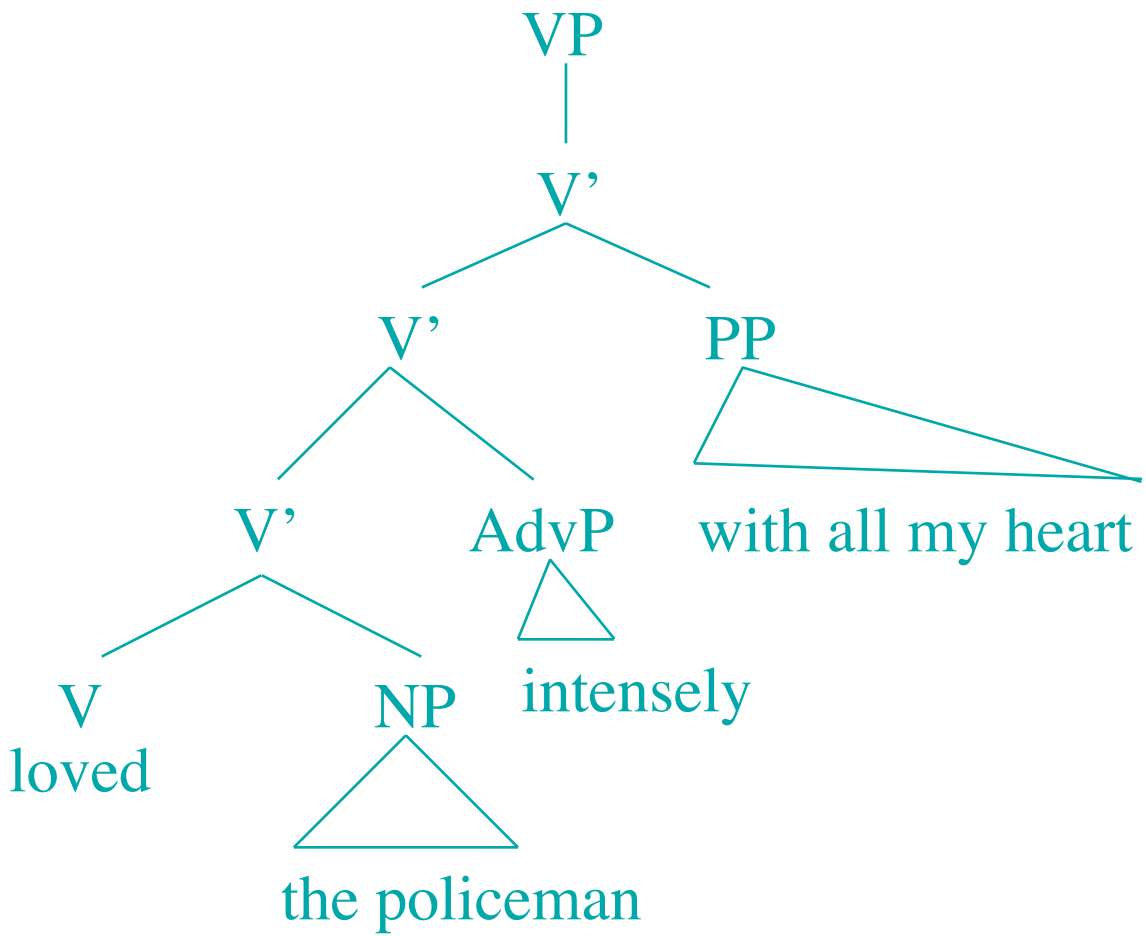

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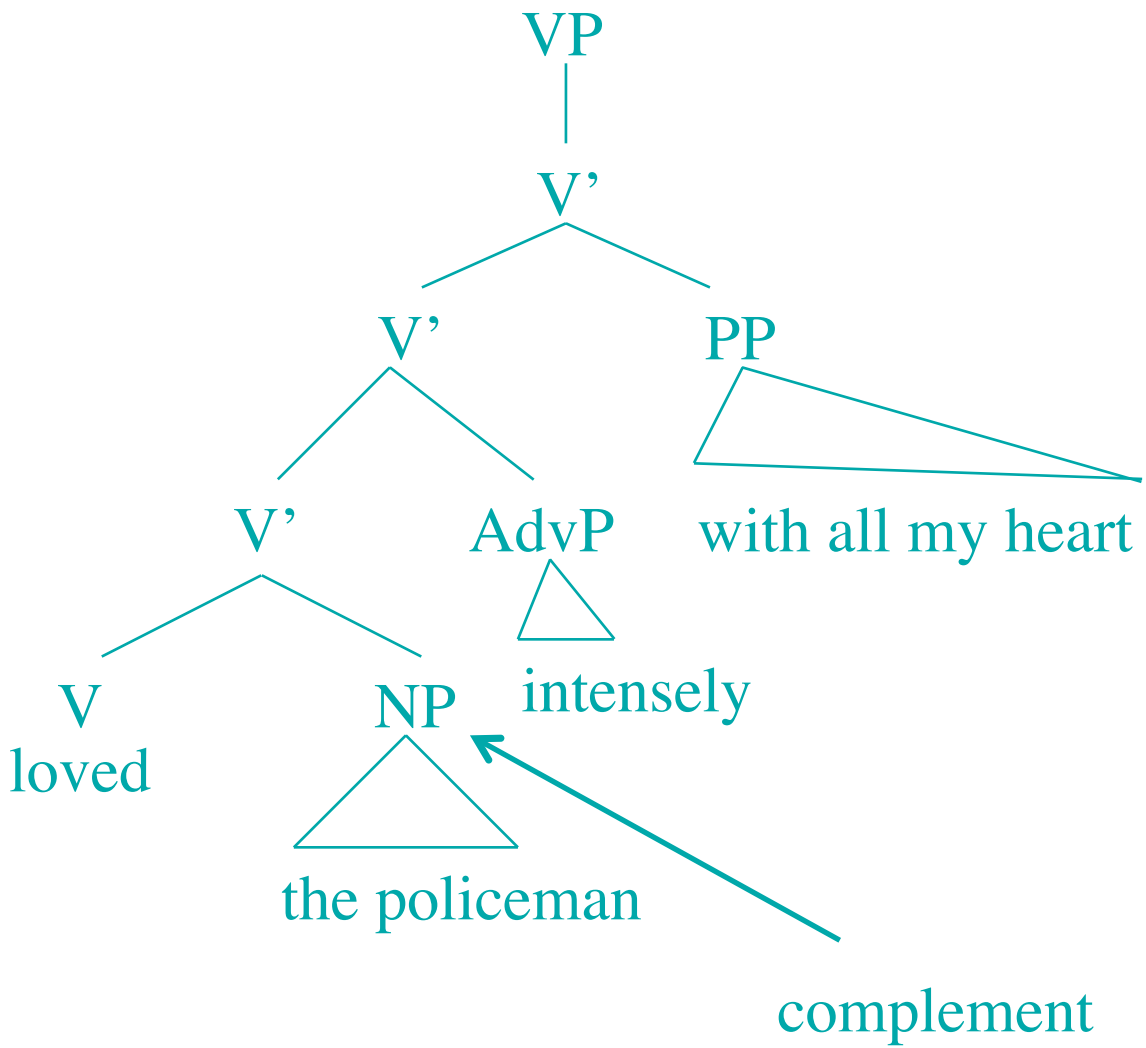

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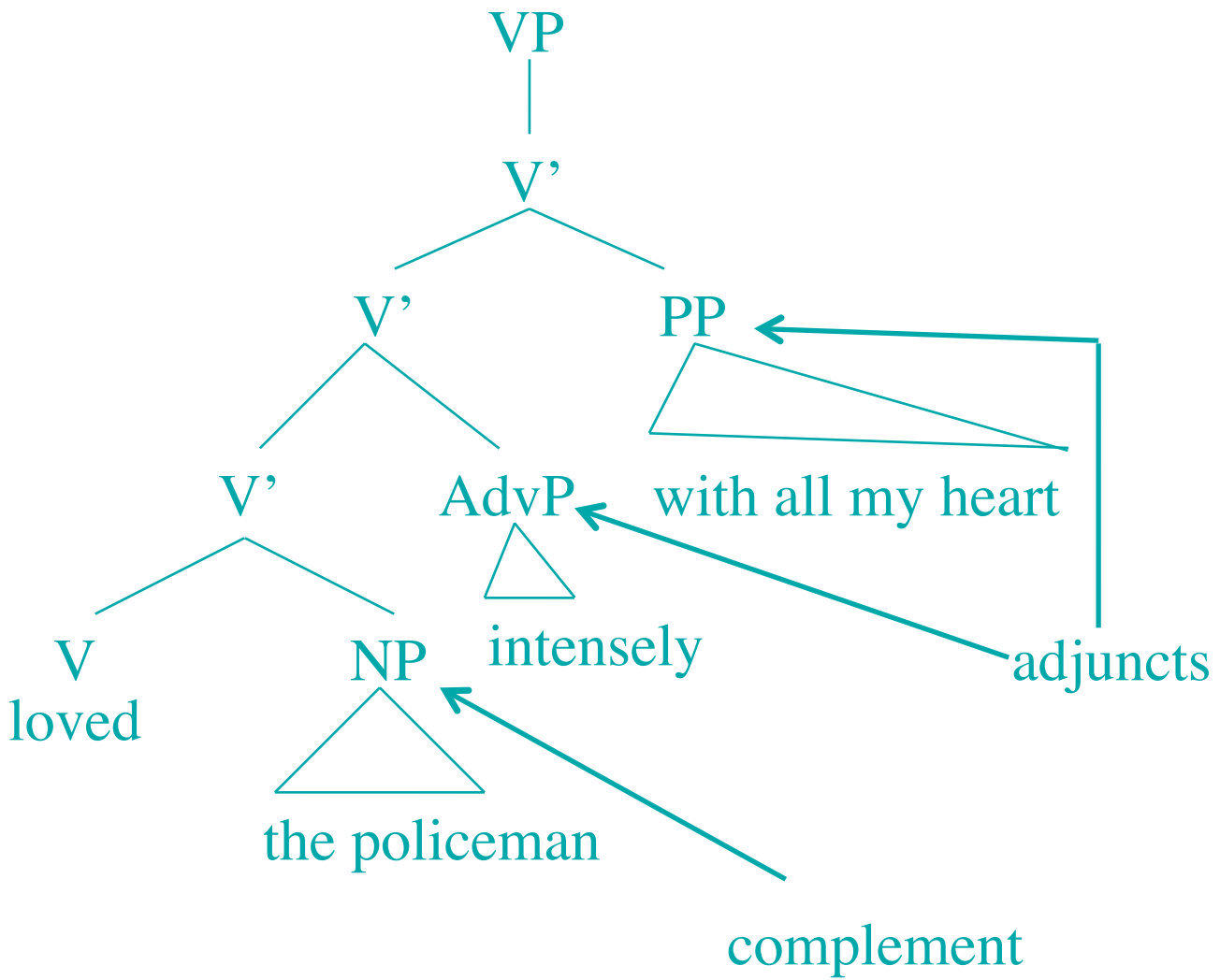

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- *Do so* replacement

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- We will assume the distinction exists here for parsimony reasons (that is, to make the theory pretty)

Specifiers

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Stay tuned
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- Instead, we'll argue the specifier is where subjects are generated. More on this later.
- For now, understand the definition (sister to X', daughter of XP), and put determiners there.

Stay tuned for exciting developments on Specifiers

Summary

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- Complement/Adjunct distinction hold of pre-head material too.
- The C/A distinction can capture ambiguity
- There is strong evidence for the C/A distinction in NPs and VPs
- The evidence for AdjPs/AdvPs and PPs is weaker
- We are leaving specifiers aside for the moment as something to be dealt with later.

Drawing X-bar Trees

How to draw trees in X-bar notation

Drawing Trees

Step 1: Identify the parts of speech for all the words in the sentence

Step 2: figure out what words "go together in phrases"

Step 3: apply the rules backwards (bottom up) to build the tree.

- ***Determine whether the modifier is a complement, adjunct, specifier*** -- REMEMBER, adjuncts are sisters to X', complements to X.
- ***Start with the modifiers closest to the head***

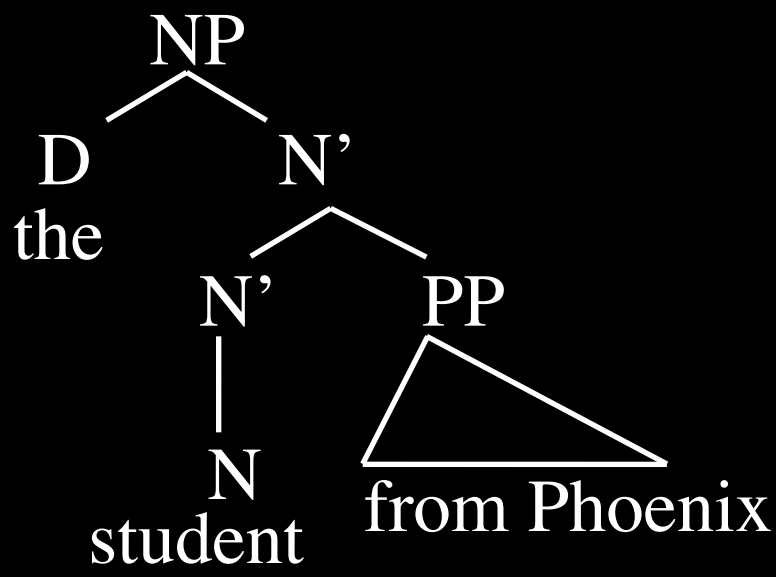
Step 4: now check your tree against your rules. Start at the top, and check that each set of lines can be generated by the rules.

None of the Rules are optional

minimal X' structure

Warning

Be very careful about Adjuncts!!!!
They must be daughter of X' and sister of X'



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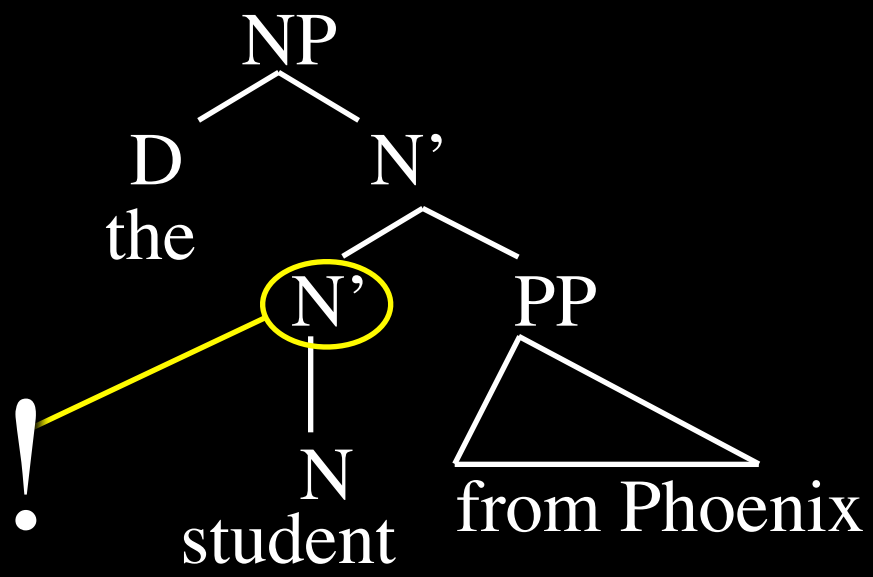

The man from Brazil found a book of poems in the puddle

D N P N V D N P N P D N

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NP
N’
D N P N V D N P N P D N
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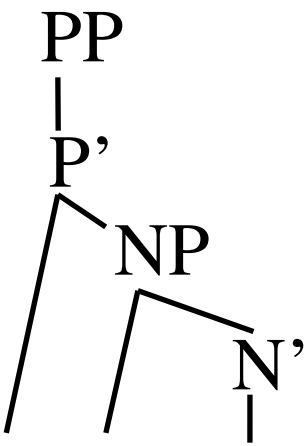

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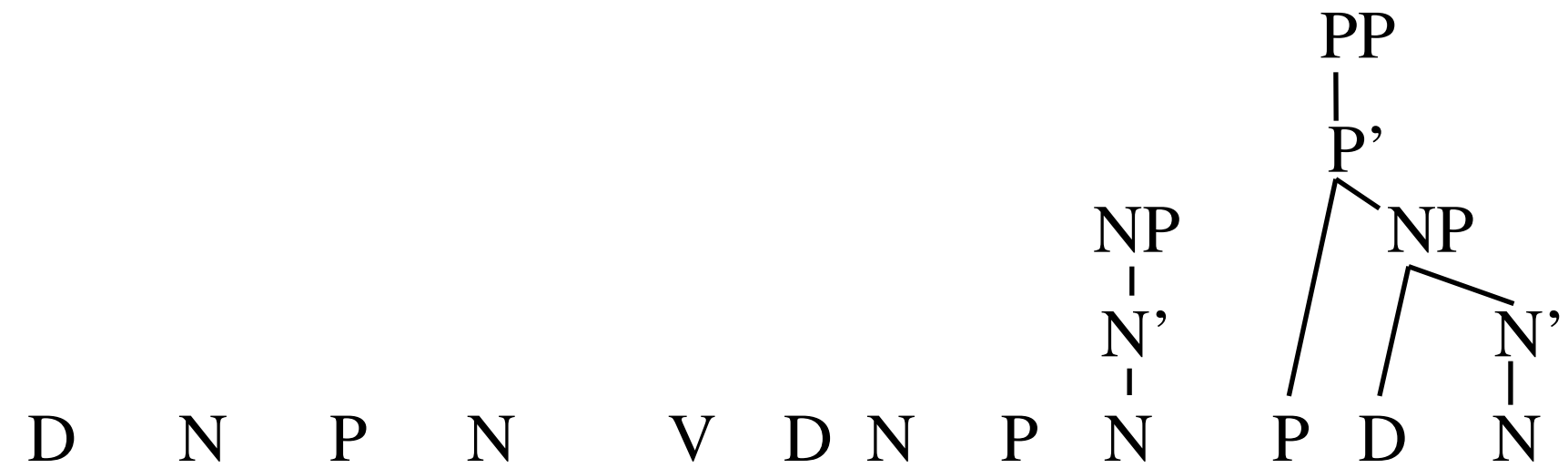

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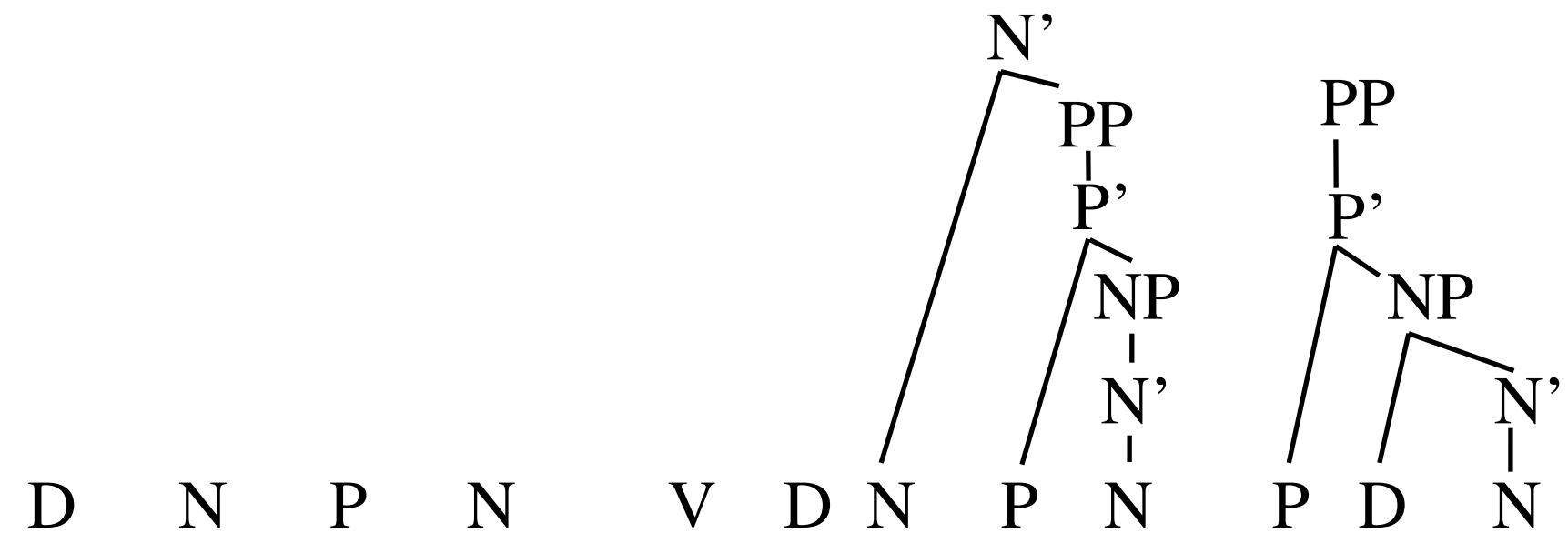

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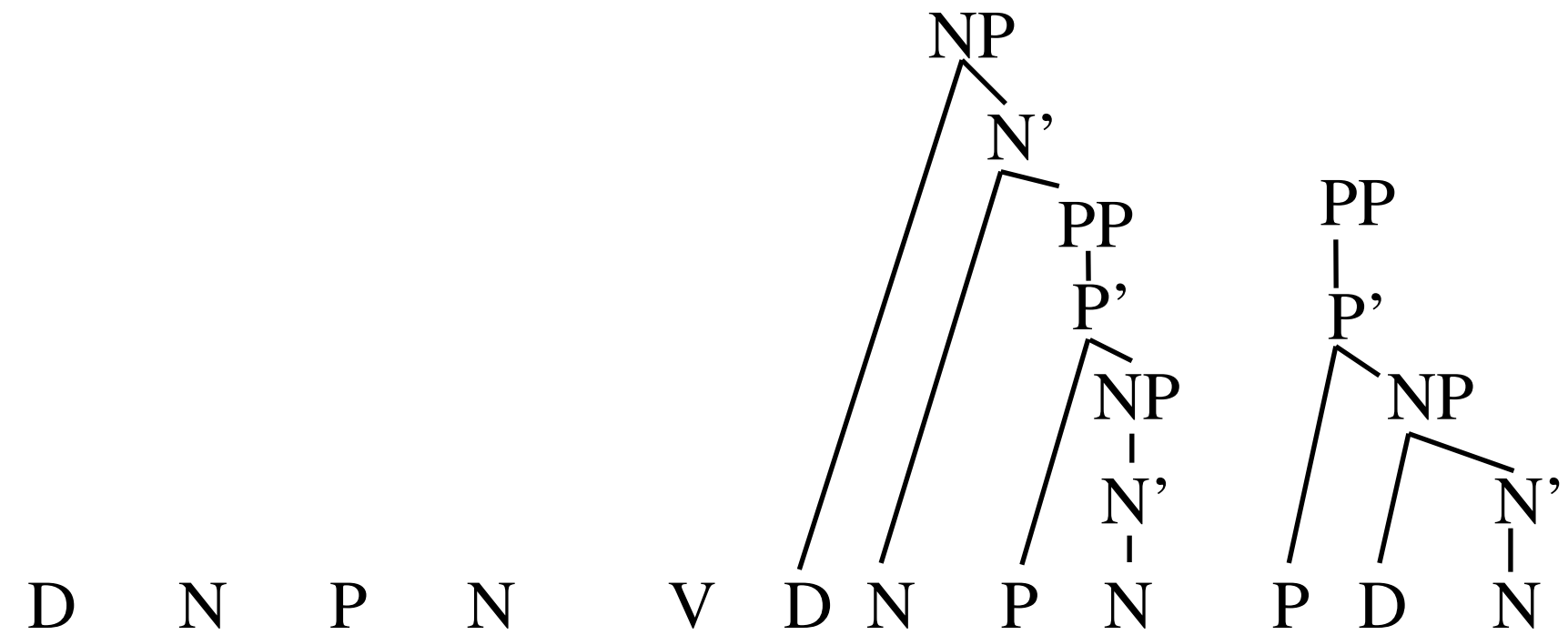

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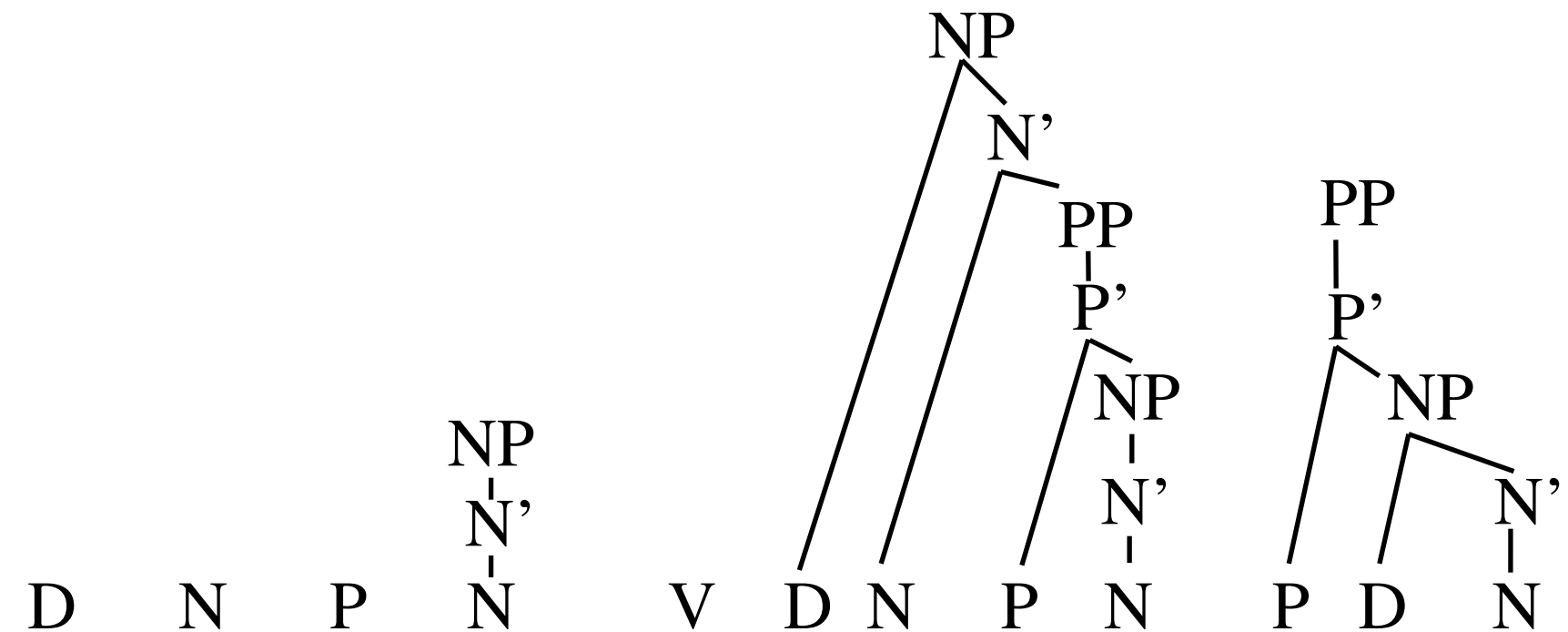

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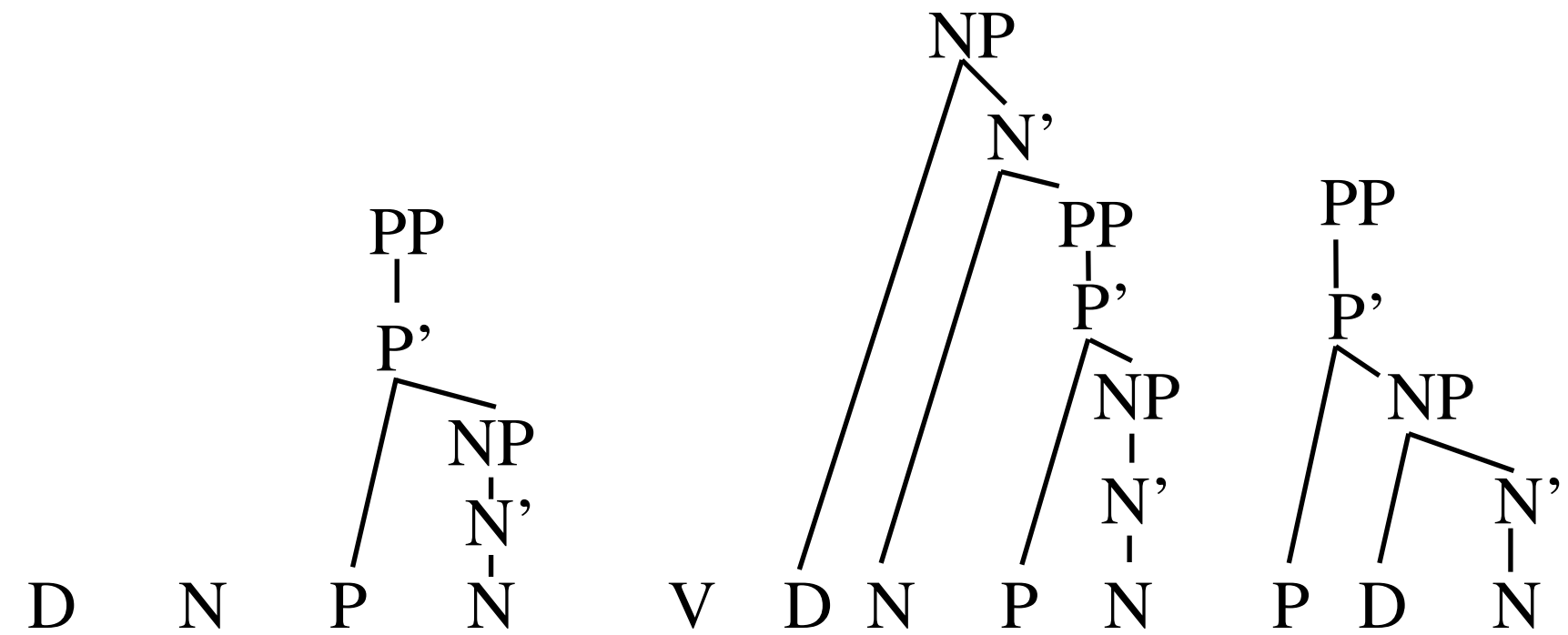

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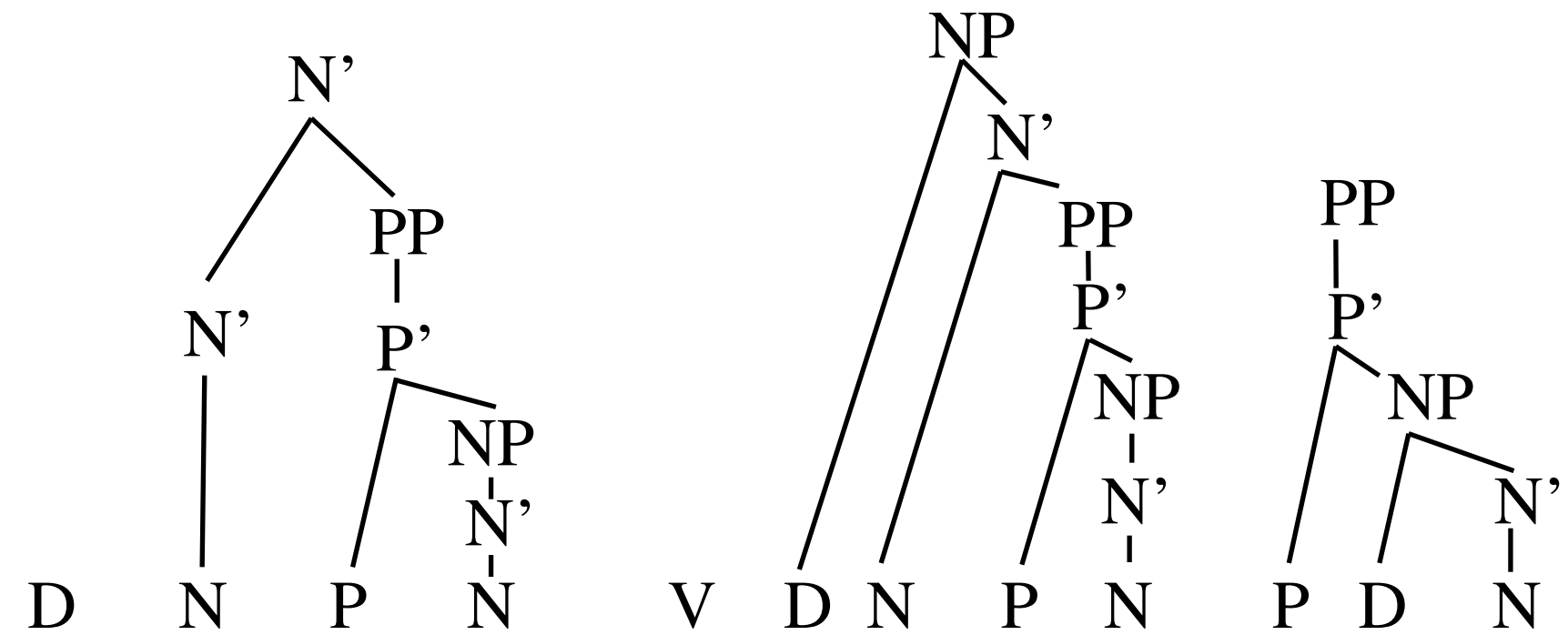

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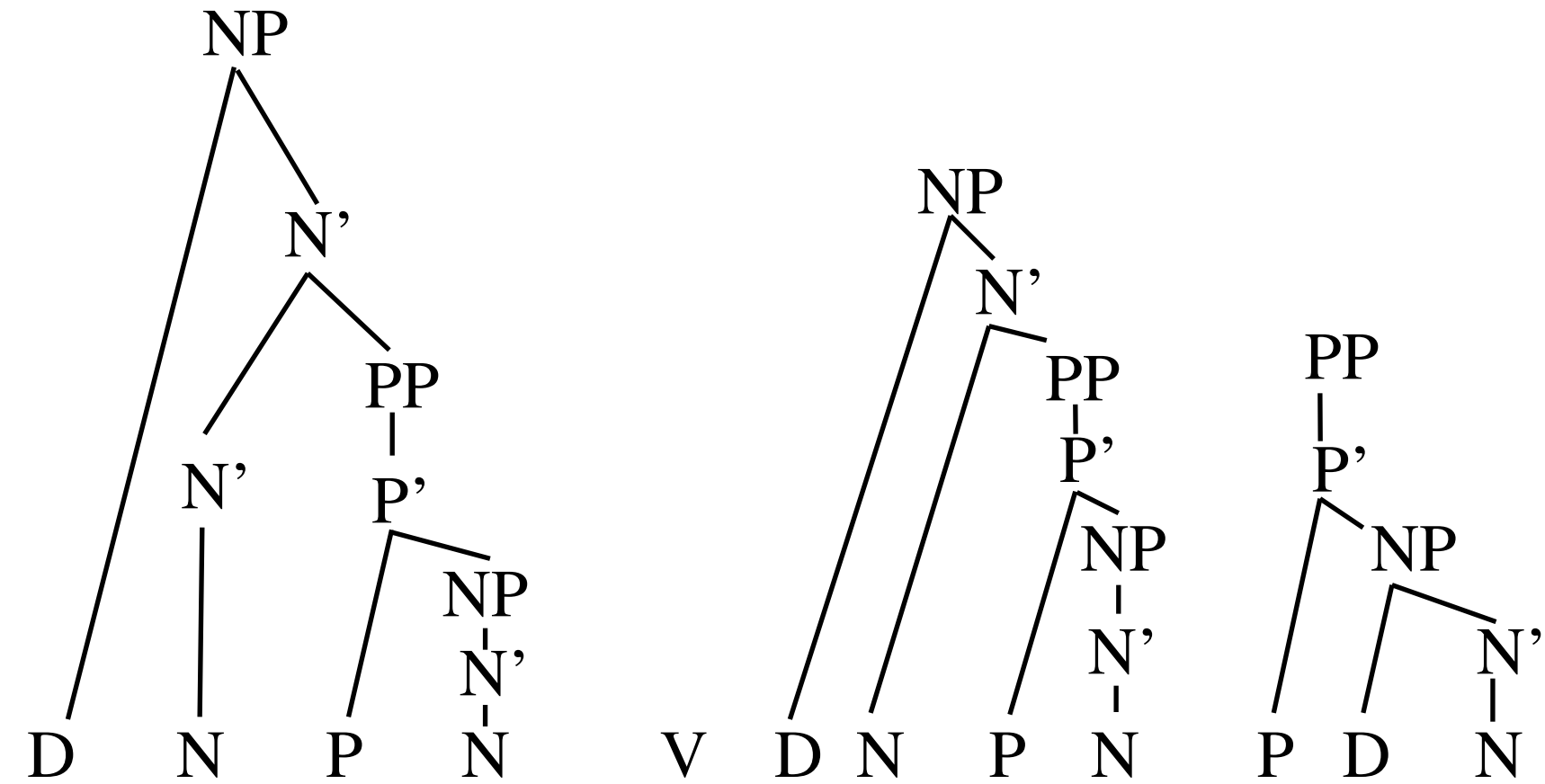

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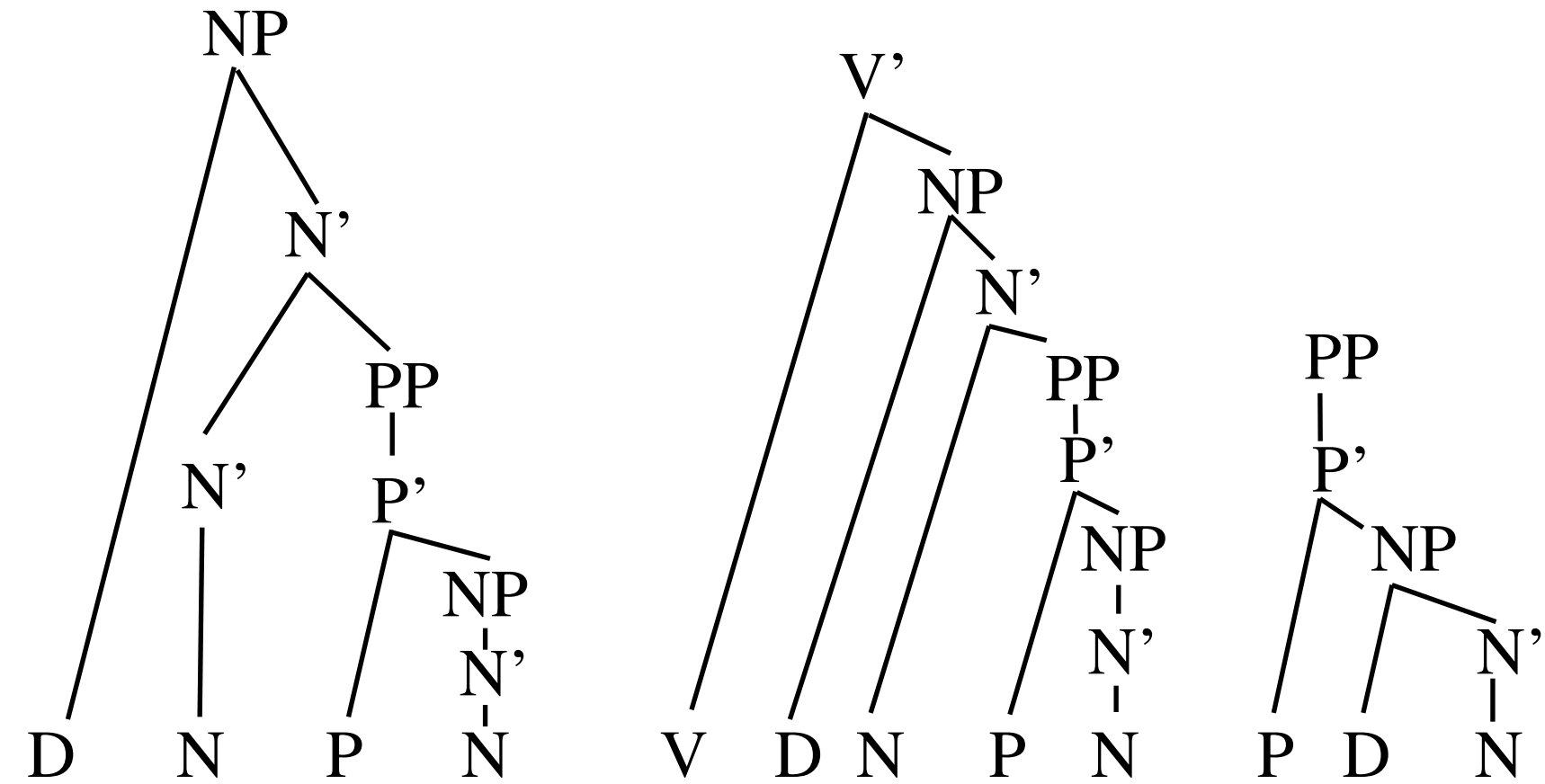

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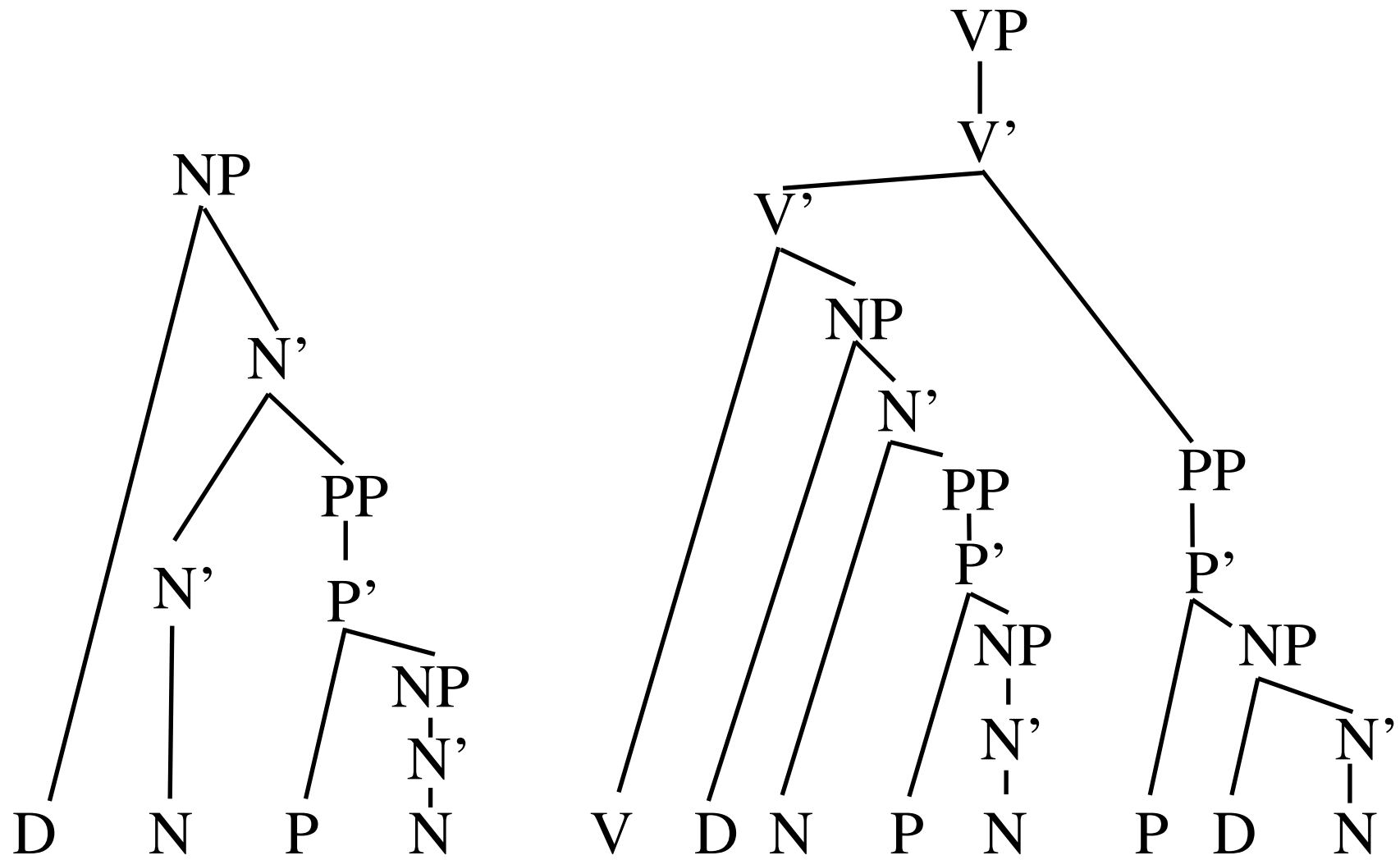

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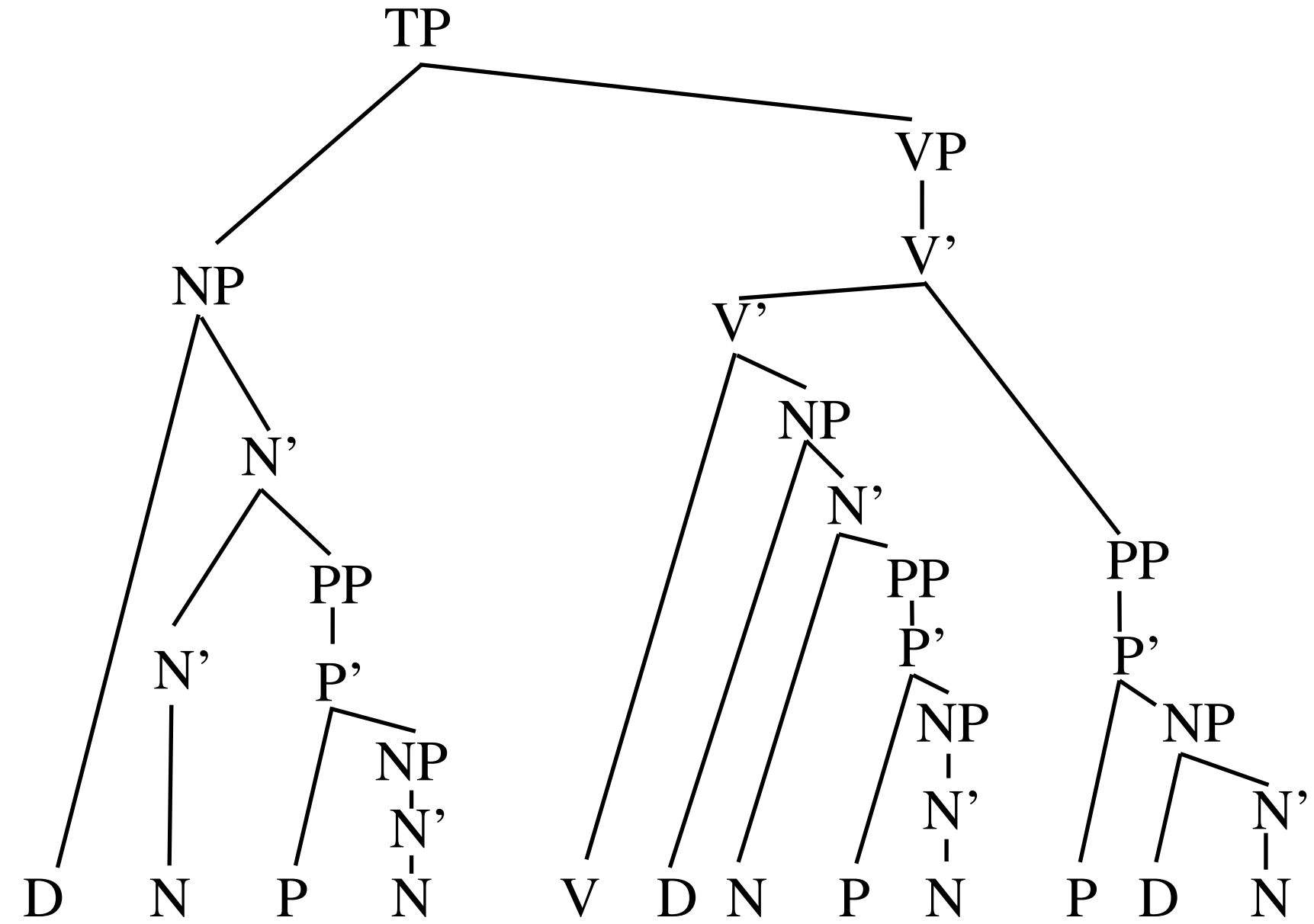
TP
VP
V’
NP
V’
N’
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PP
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Parameters of Word Order

How X-bar theory accounts for
(some of) the word orders of the World's Languages

The English X-bar rules

- The Specifier Rule: $XP \rightarrow (YP)\ X'$
- The Adjunct Rule: $X' \rightarrow X'\ (ZP)$ *or* $X' \rightarrow (ZP)\ X'$
- The Complement Rule: $X' \rightarrow X\ (WP)$

- In English, the specifier is on the left, the complement on the right, and the adjuncts can appear on either side

- PROPOSAL: the side that specifiers/ adjuncts/ complements appear on can vary depending upon the language.

Generalized X-bar Rules

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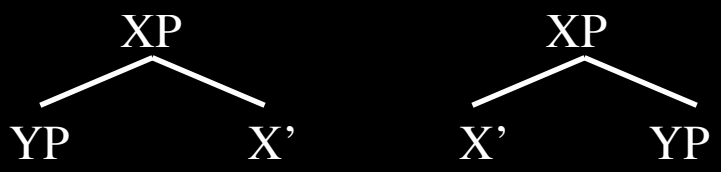

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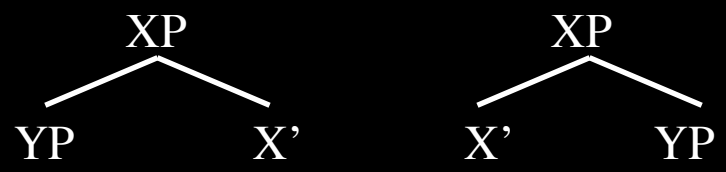

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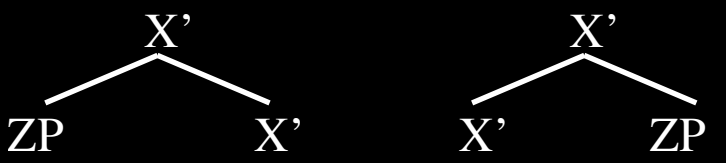

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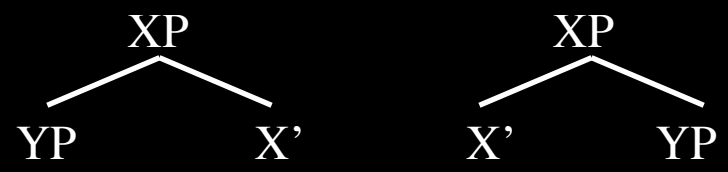

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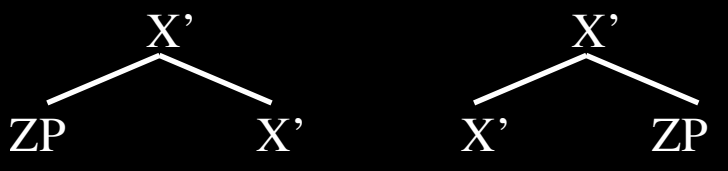

The Complement Rule: $X' \rightarrow X\ (WP)$ *or* $X' \rightarrow (WP)\ X$

*[TP[NP Policeman the] [VP Mary kissed]]

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!

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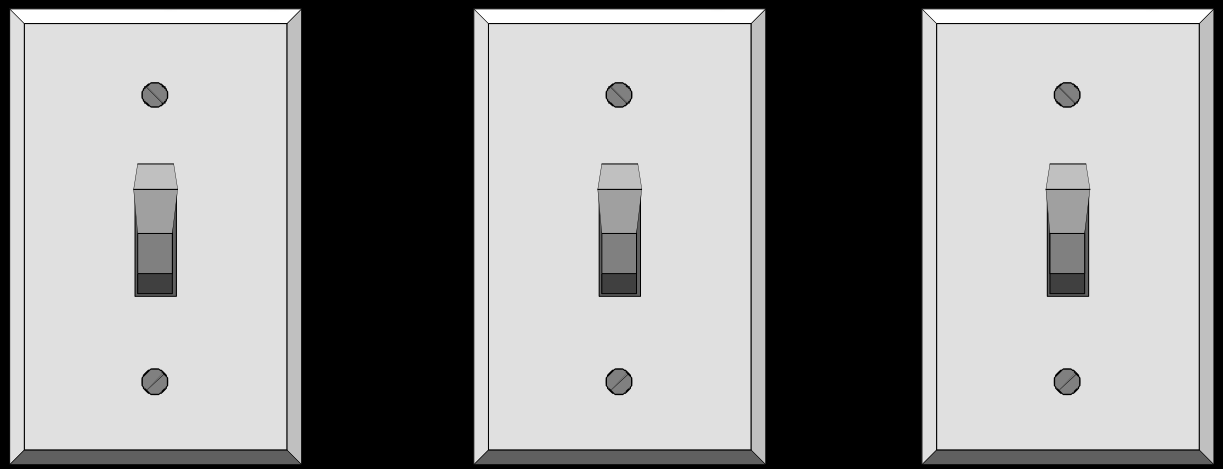
  - Each language only uses a subset of the options. These options are called parameters.
  - When a child learns a language it looks for certain cues in the input data to set its parameters

Parameters

$XP \rightarrow (YP)\ X'$ $X' \rightarrow X'\ (ZP)$ $X' \rightarrow X\ (WP)$



$XP \rightarrow X'\ (YP)$ $X' \rightarrow (ZP)\ X'$ $X' \rightarrow (WP)\ X$

English Parameter settings

- Specifiers precede heads:
  the basketball
  $XP \rightarrow (YP)\ X'$

- Adjuncts can be on either side:
  often kiss intensely.
  $X' \rightarrow X'\ (ZP)$ *or* $X' \rightarrow (ZP)\ X'$

- Complements are on the right (follow the head)
  bucket of chicken
  $X' \rightarrow X\ (WP)$

Turkish, an OV language

Hasan kitab-i oku-du
Hasan-subject book-object read-past
“Hasan read the book”

complement parameter set to: $X' \rightarrow (WP)\ X$

we will assume that the side that subjects appear on is the same as the side as specifiers, so the specifier rule of Turkish is set the same as English.

Summary Parameters

- By choosing the precise set of the three parameters we can derive the word order of most of the world's languages
- But not all! (e.g., VSO languages) more on this in later units.