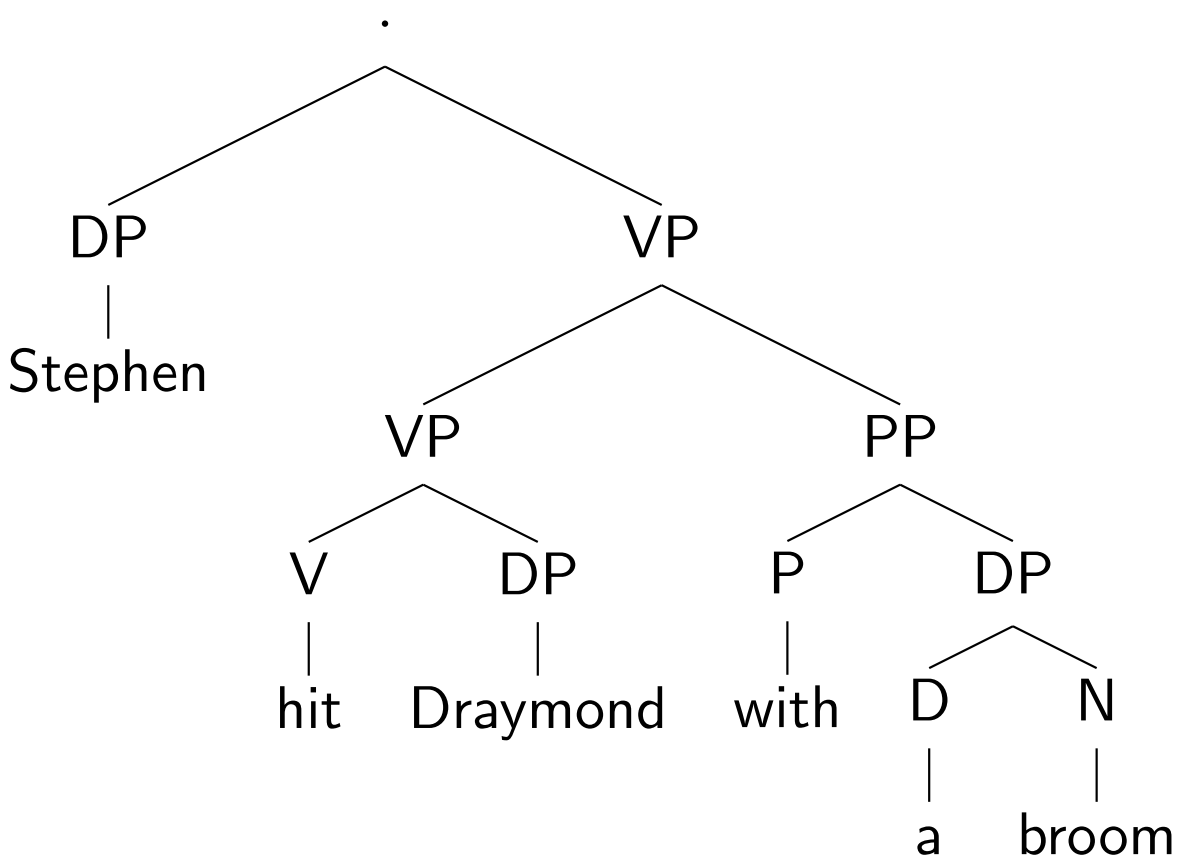
Syntax 2.2: Hierarchical constituency and context free grammars

May 6, 2020

Recall from Monday and last video

$$\Big[\ \text{Stephen}_{DP}\ \Big[\ \big[\text{hit}_{V}\ \text{Draymond}_{DP}\big]_{VP}\ \big[\text{with}_{P}\ [\text{a}_{D}\ \text{broom}_{N}]_{DP}\ \big]_{PP}\ \Big]_{VP}\ \Big].$$



Hey, wait a minute...

If you test the group of words {*hit*, *Draymond*, *with*}, you get a grammatical result.

In question: *hit Draymond with* VERB PHRASE?

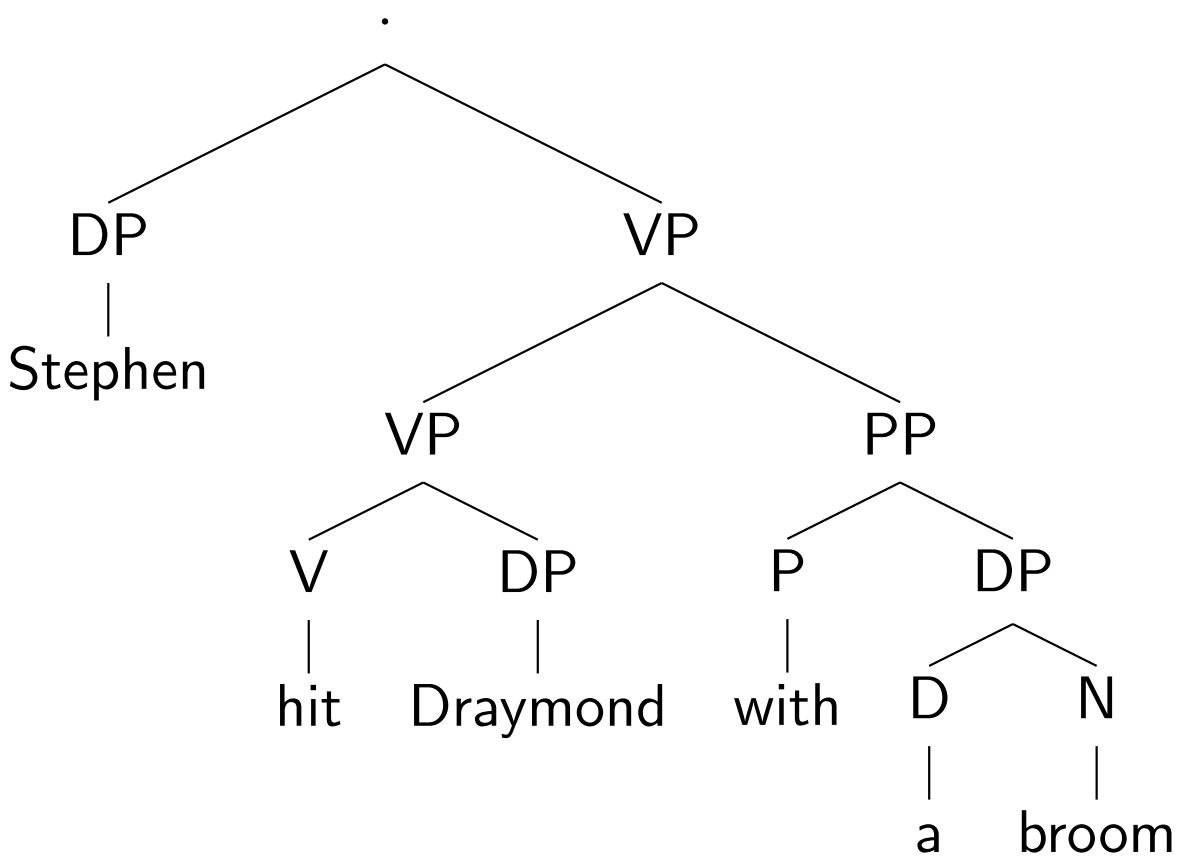
Stephen { Replacement VP: walks, bought, gave, . . .
Replacement DP: it*
Replacement PP: there* } a broom.

This is a false positive. The relationship of *a broom* and the verb are different: in the original sentence, *a broom* is part of a **modifier** to the VP; in the second, it is the **complement** of the V.

Seeing the difference

Original:

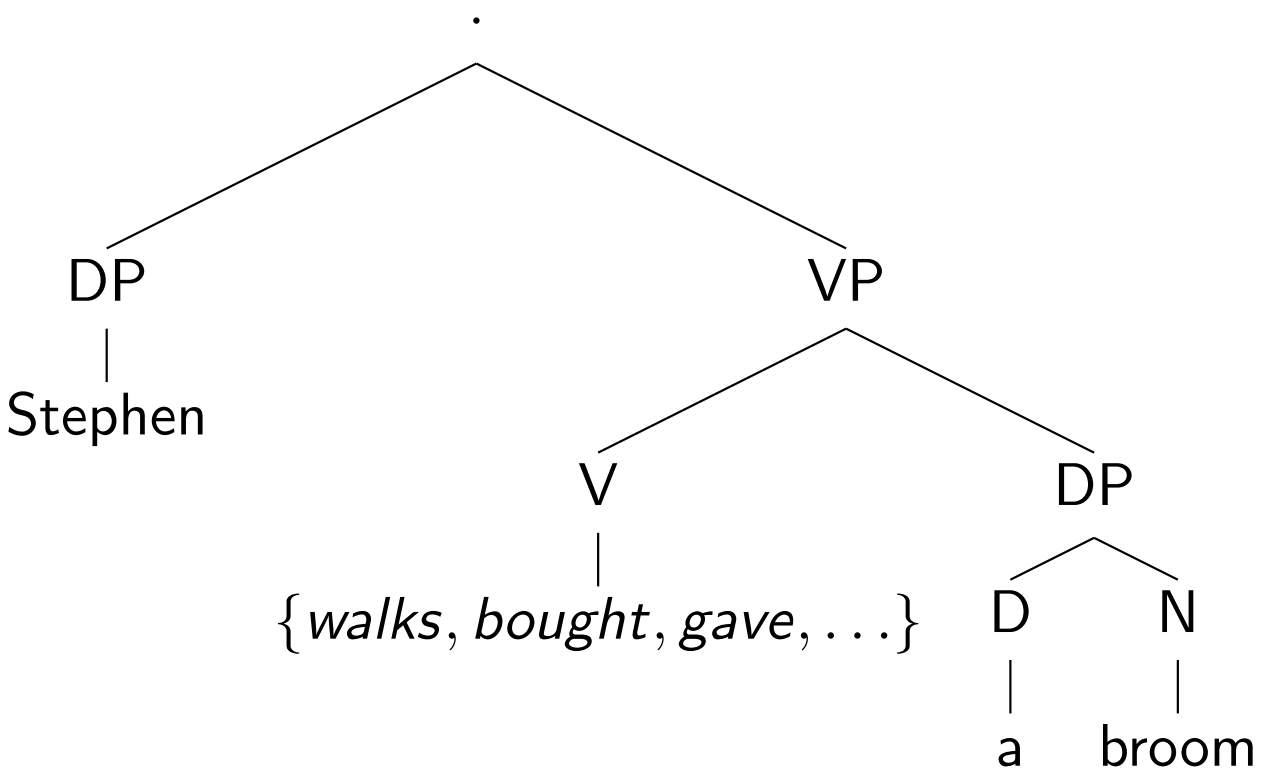
[Stephen [[hit Draymond] [with [a broom]]]].



Seeing the difference

Sentence with substitution:

[Stephen [V [a broom]]].



Why this happens

There are different flavors of verb:

. intransitive (no complement / no argument / 'has no direct object')
sleep, *fall*, *walk* . . .

. transitive (one complement / one argument / 'has direct object').
devour, *hold*, *walk* . . .

. ditransitive (. . .) *give*, *send*, . . .

Many verbs can go between adjacent classes....

So, must make a more careful substitution — try *sleep*

In question: *hit Draymond with* NOT A VERB PHRASE

Stephen **slept* a broom.

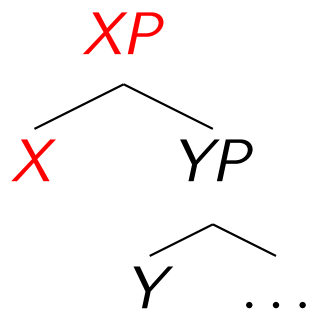
This suggests the group $\{hit, Draymond, with\}$ does not form a constituent.

Hierarchical trees — wikiHow

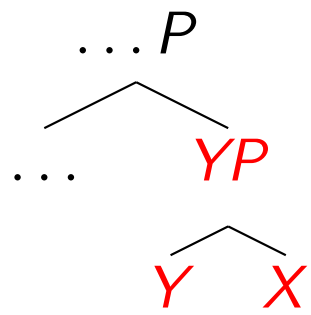
Every bracketing can be represented by a hierarchical tree with labeled nodes and terminals. Layers of brackets $\rightsquigarrow$ levels of hierarchy

You can construct it from top to bottom or from bottom to top. Start point indicated with red.

Top to bottom: $[\ X\ [Y\ [\ldots]\ ]_{YP}\ ]_{XP}$ $\rightsquigarrow$

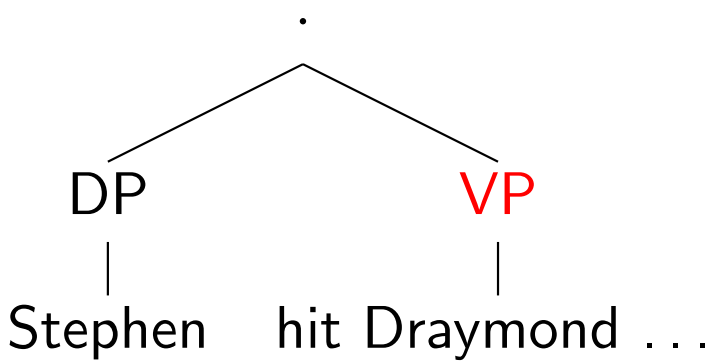


Bottom to top: $[\ \ldots\ [Y\ X]_{YP}\ ]_{\ldots P}$ $\rightsquigarrow$

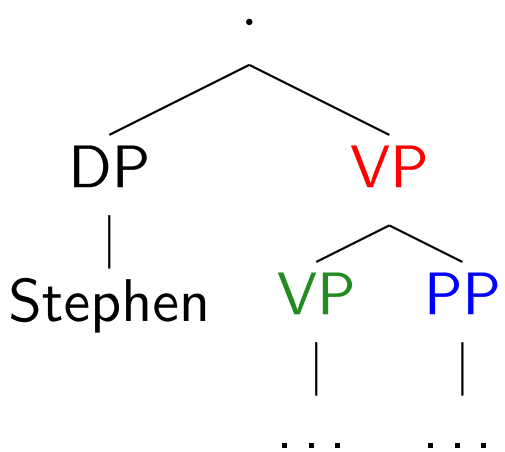


Top to bottom:

Step 1: $\Big[$ Stephen$_{DP}$ $\Big[$ [hit Draymond] [with [a broom]] $\Big]_{VP}$ $\Big]$



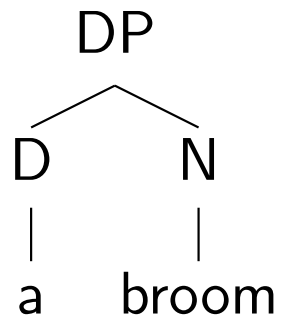
Step 2: Stephen $\Big[$ $\big[$hit Draymond$\big]_{VP}$ $\big[$with [a broom] $\big]_{PP}$ $\Big]_{VP}$



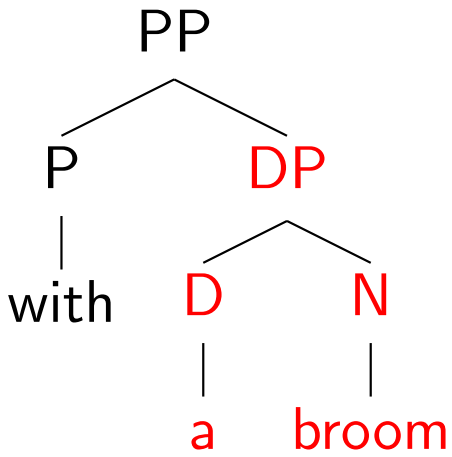
Step 3: etc.

Bottom to top:

Step 1: [Stephen [[hit Draymond] [with $\left[\text{a}_D \text{ broom}_N \right]_{DP}$]]]

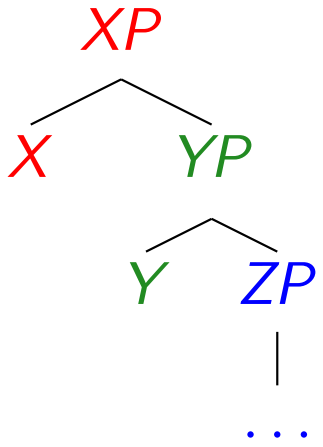


Step 2: [Stephen [[hit Draymond] $\left[\text{with}_P \left[\text{a}_D \text{ broom}_N \right]_{DP} \right]_{PP}$]]



Step 3: etc.

Context free grammars

For any bracketing $[\ X\ [Y\ [\ldots]_{ZP}\ ]_{YP}\ ]_{XP}$ and structure 

, we can summarize it with the 'rules'

$XP \rightarrow X\ \ YP$ and $YP \rightarrow Y\ \ ZP$ and $ZP \rightarrow \ldots$

Note: they are called 'context-free' because you can apply them with no context — compare to phonological rules where we introduce $/$ in notation for context.

$X \rightarrow Y \ / \ Z$

Our list of rules *so far*

The sentence we've been considering gives us the following rules, where for the top node ·, we now call it S (which stands for sentence):

(i) $S \rightarrow DP\ VP$ — GENERATE SENTENCE

(ii) $VP \rightarrow VP\ PP$ — VERBAL MODIFIER

(iii) $VP \rightarrow V\ DP$ — TRANSITIVE VERB

(iv) $PP \rightarrow P\ DP$ — PREPOSITIONAL PHRASE

(v) $DP \rightarrow D\ N$ — DETERMINER PHRASE W/UNMODIFIED NOUN

There are many more rules. This just gives you an idea of how we come up with them.

End of this video's material.