COGS300

Language as a Symbol System

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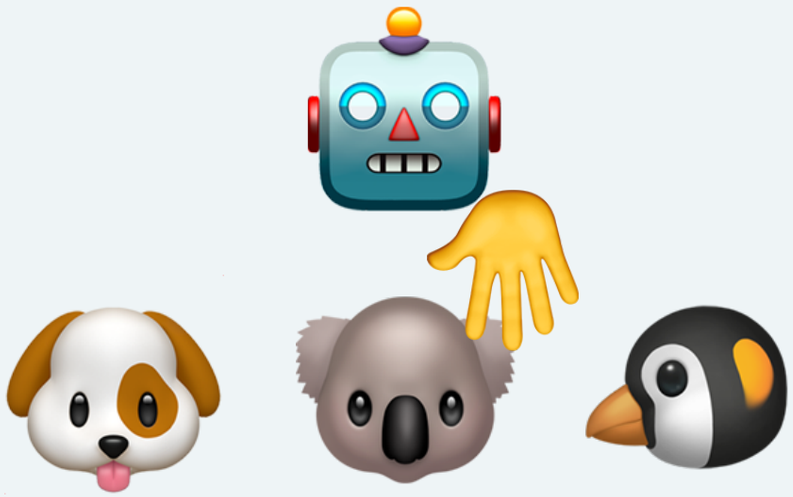
Symbols

pet, (,), D, K, P, …

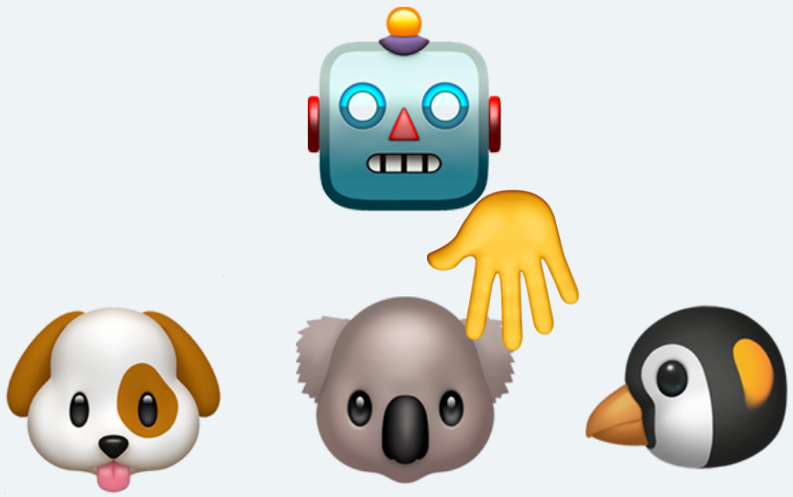


Symbols

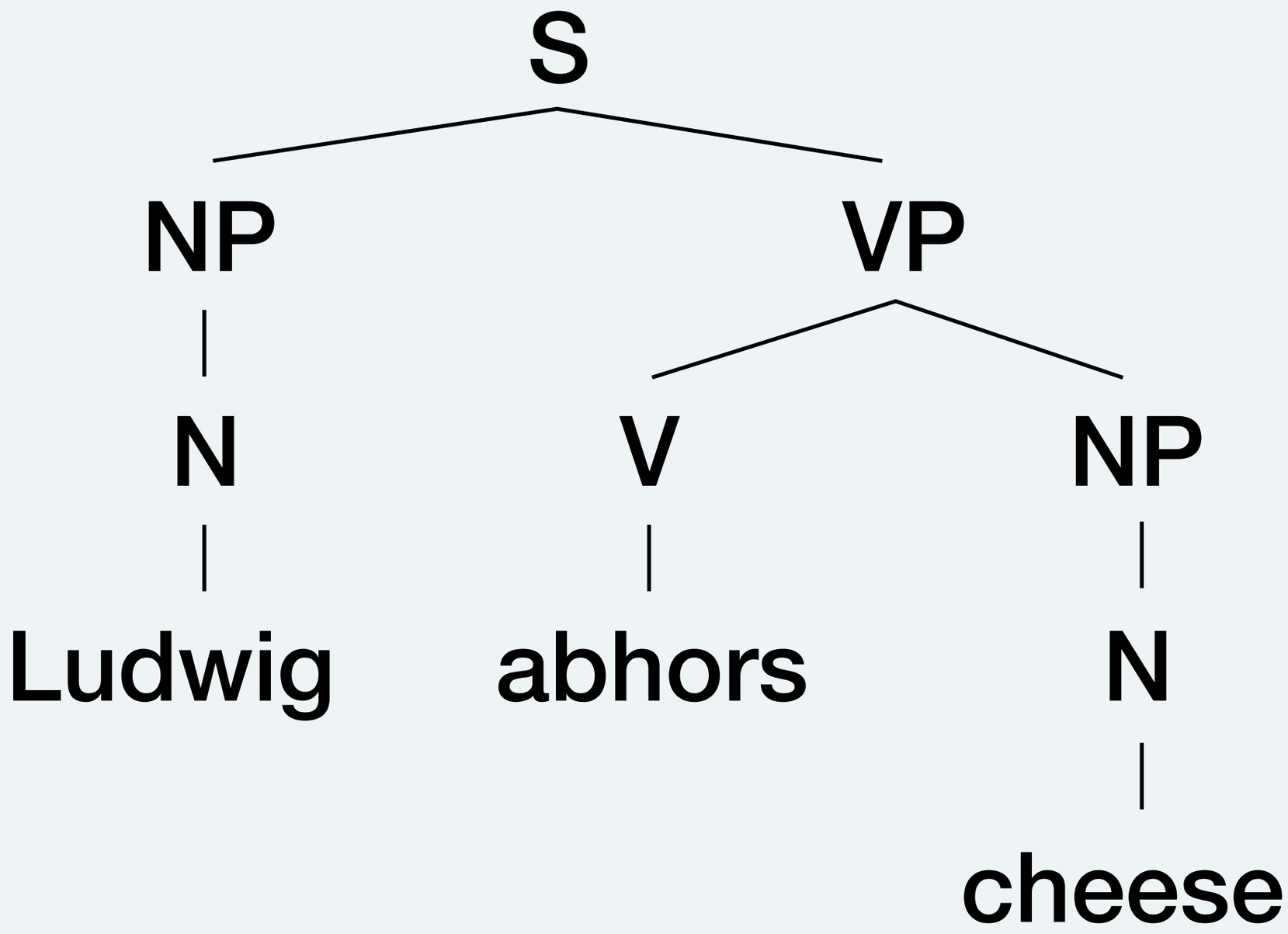
{NP, VP, N, *vase*, *a*, TRACE, …}

Expressions

pet(D), pet(K), pet(D, K)

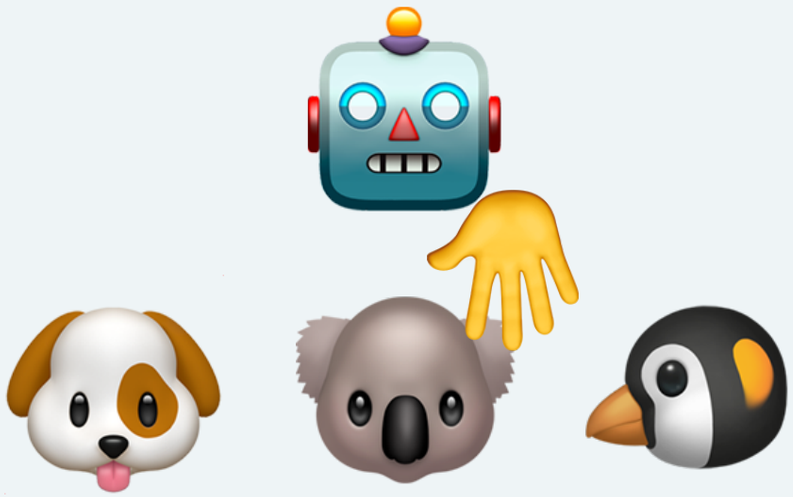


Expressions



Processes

pet(D, K) → pet(D); pet(K)



Processes

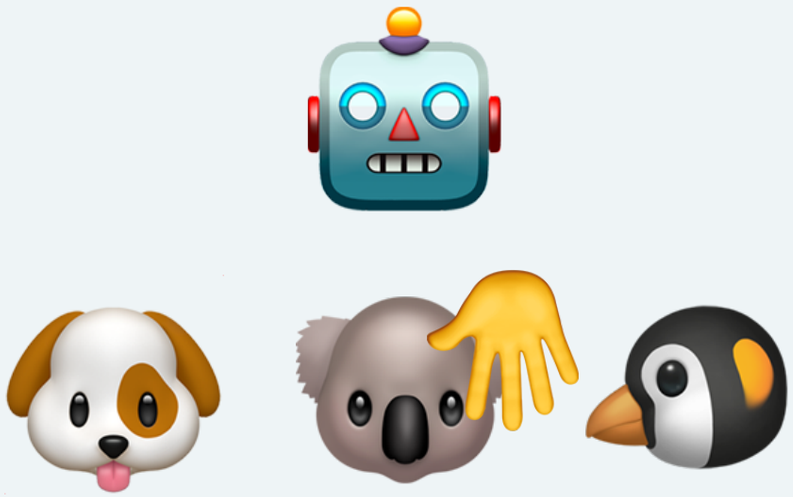
$$S \rightarrow NP\ \ VP$$

$$VP \rightarrow V\ \ NP$$

Designation

pet(K)

↓



Designation

Ludwig

↓

Interpretation

pet(D)

↓

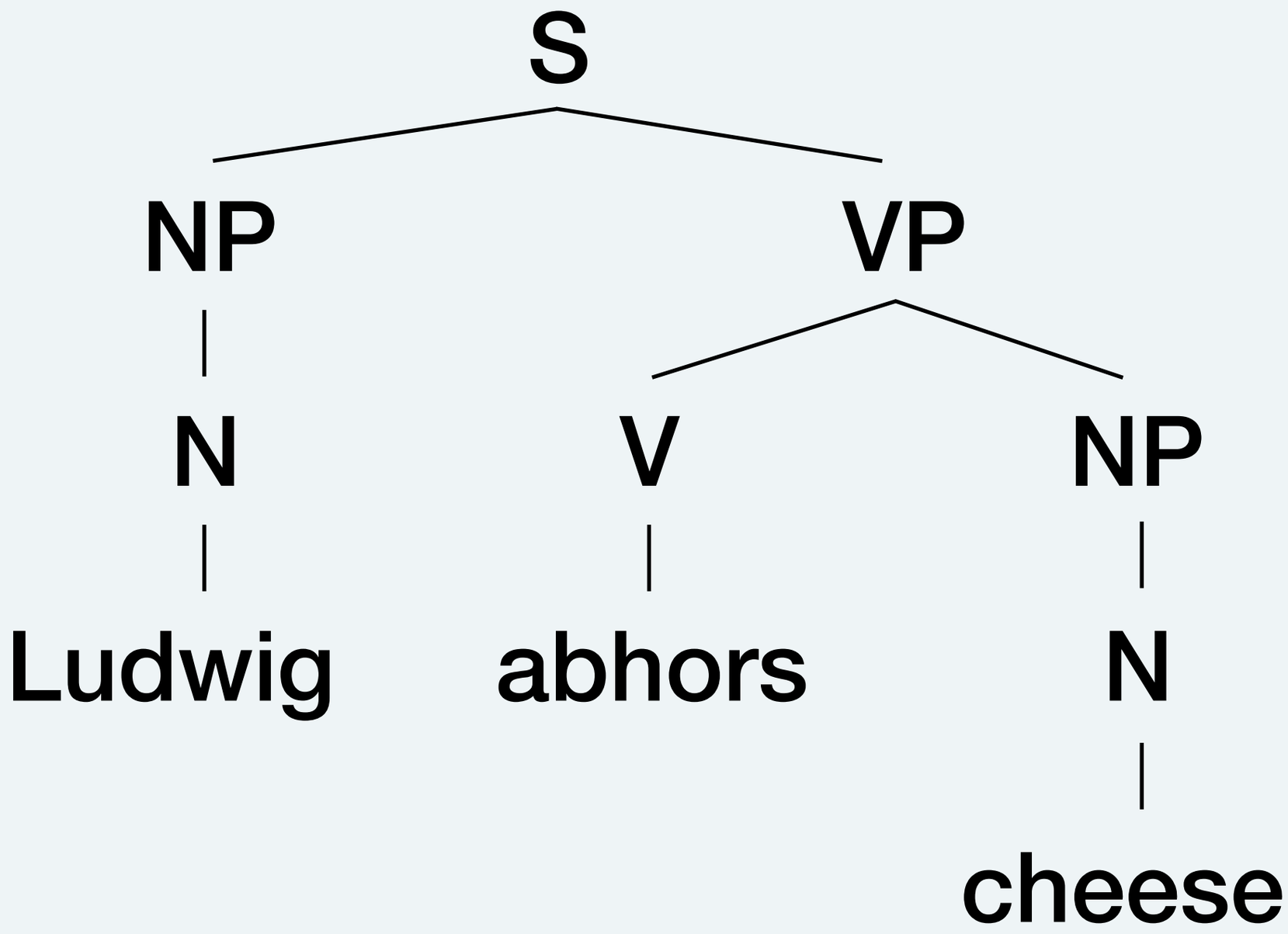
d_physical = locate(D)

head = find_head(d_physical)

move_hand(head)

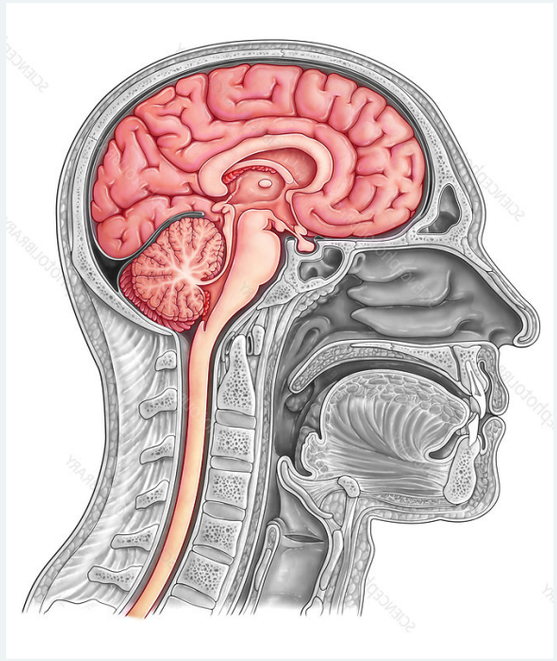
...

Interpretation

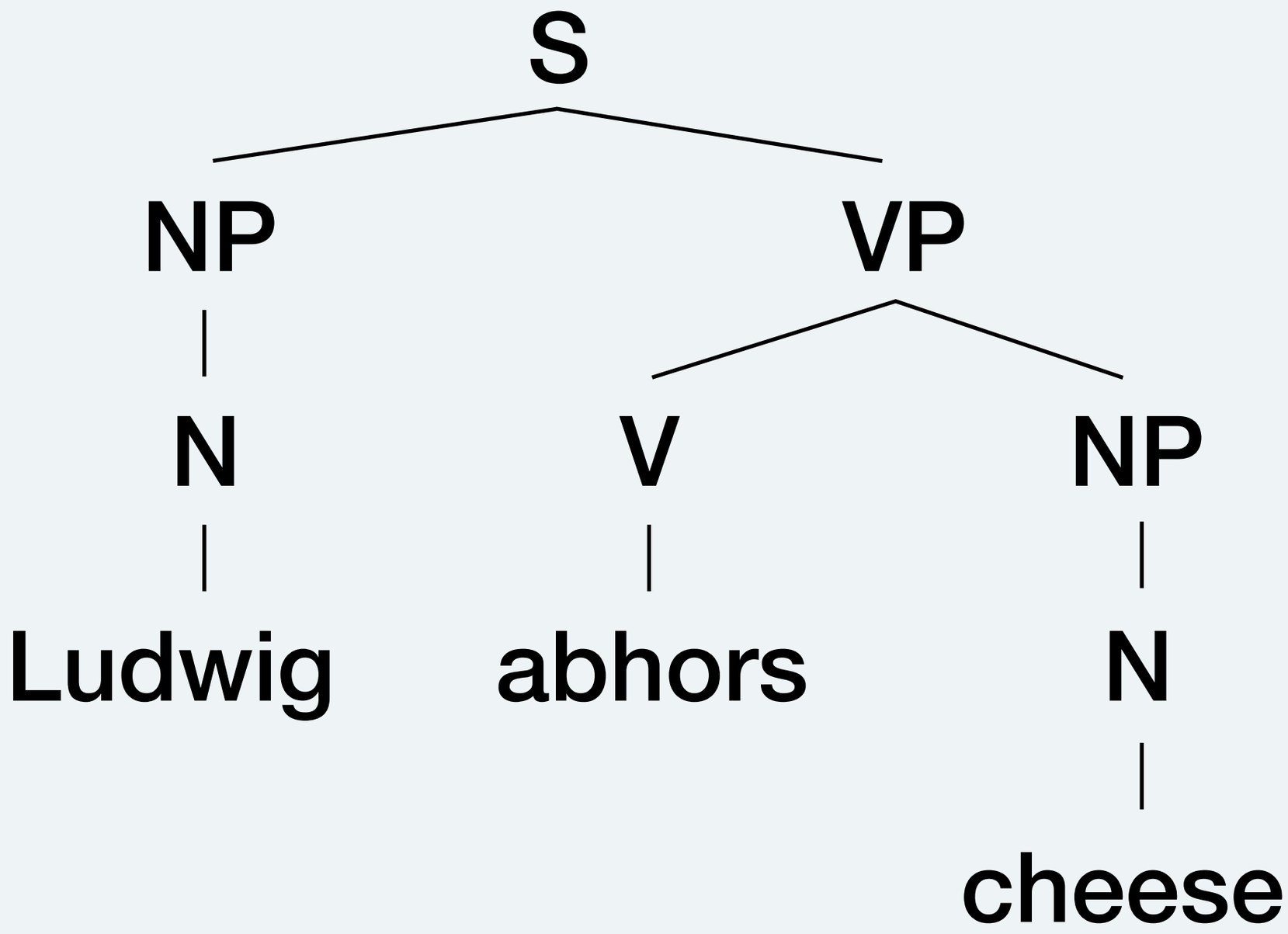


Interpretation (1)

“PF”: phonetic form

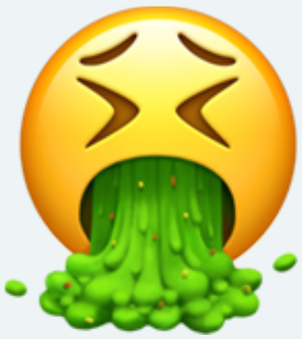


Interpretation (2)



Interpretation (2)

“LF”: logical form



(

,

)

OK, let’s backtrack a little.

Why all this complexity?

Constituency – doing syntax

The experienced researchers replicated those results.

Constituency – doing syntax

?

The experienced researchers replicated those results.

Constituency – doing syntax

Pro-form substitution

they

~~The experienced researchers~~ replicated those results.

“can you replace it with *it*, *that*, *they*, *them*, *there*, *then*, *did so*, etc.?”

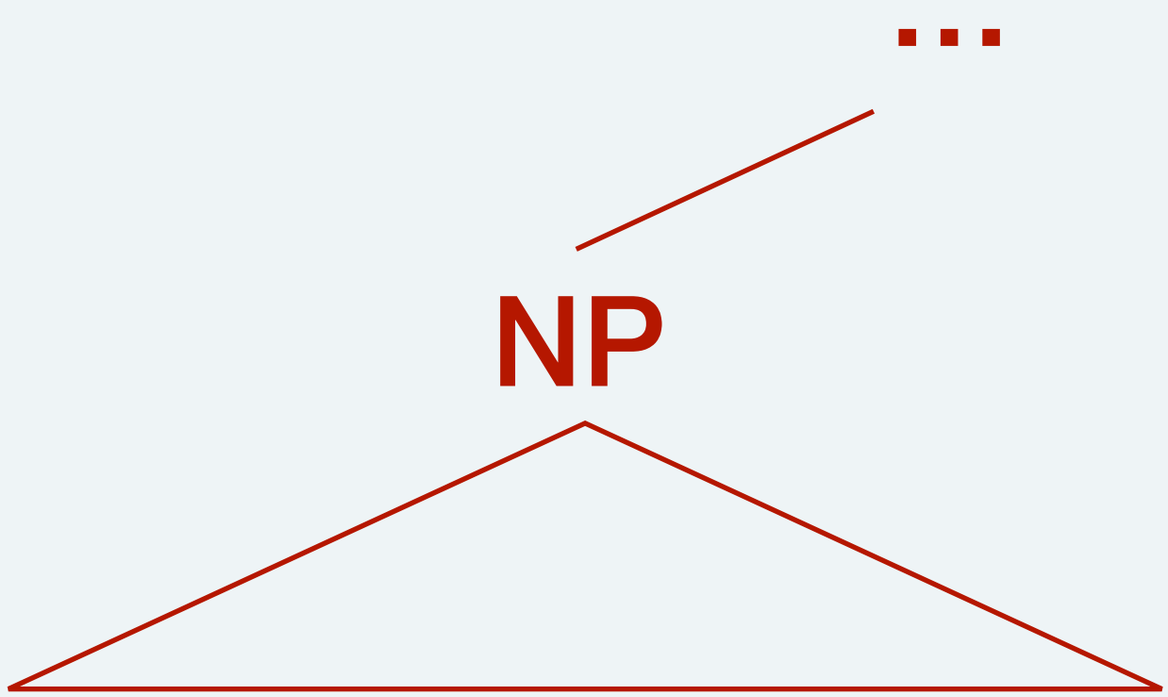
Constituency – doing syntax

Clefting

The experienced researchers are who replicated those results.

"can you move it to the front of the sentence using X is/are *who/where/how*…?"

Constituency – doing syntax



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Constituency – doing syntax

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Constituency – doing syntax

Pro-form substitution

did so

The experienced researchers ~~replicated those~~ results.

“can you replace it with *it*, *that*, *they*, *them*, *there*, *then*, *did so*, etc.?”

Constituency – doing syntax

Coordination

replicated the results

The experienced researchers and

shaved the sea urchins.

“can you coordinate it with sth else using *and* / *or*?”

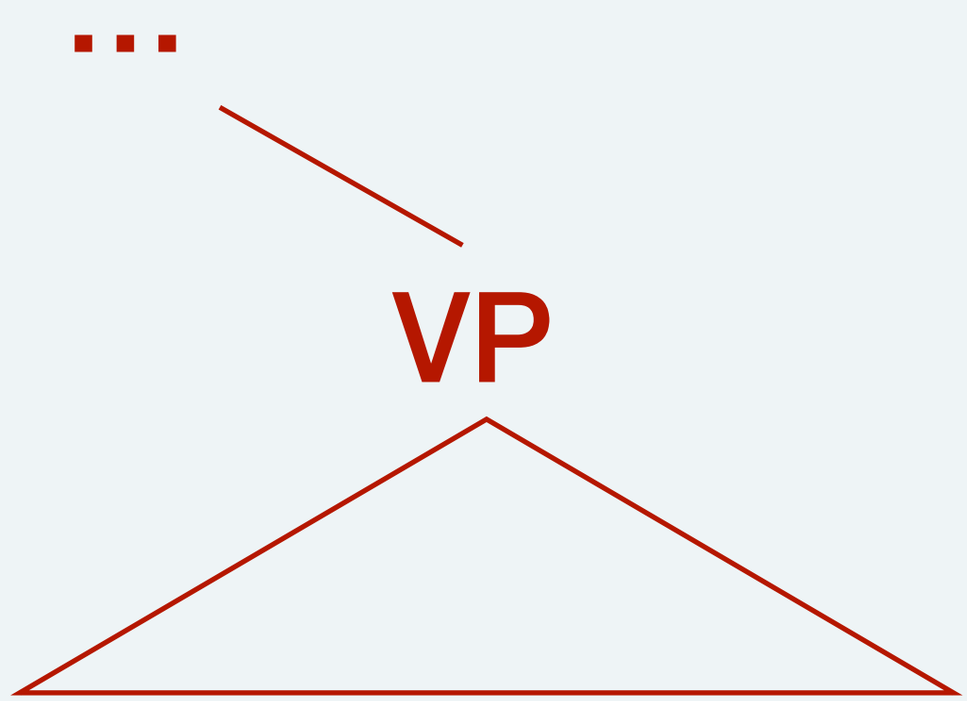
Constituency – doing syntax

Clefting

Replicate those results
is what
the experienced researchers did.

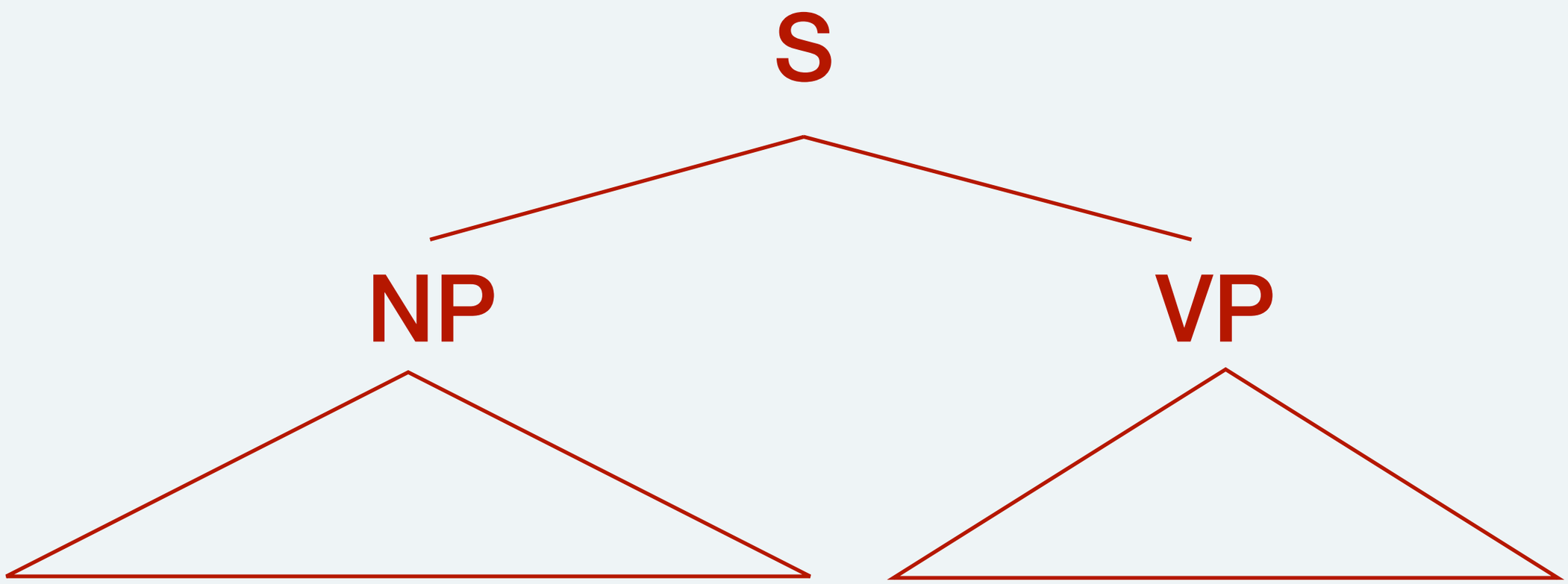
"can you move it to the front of the sentence using X *is who/where/how*…?"

Constituency – doing syntax



The experienced researchers replicated those results.

Constituency – doing syntax



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Constituency – doing syntax

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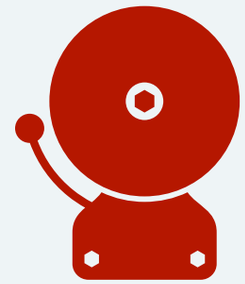
Constituency – doing syntax



Pro-form substitution

did so

The experienced researchers replicated those results.

“can you replace it with *it*, *that*, *they*, *them*, *there*, *then*, *did so*, etc.?”

Constituency – doing syntax

?

Coordination

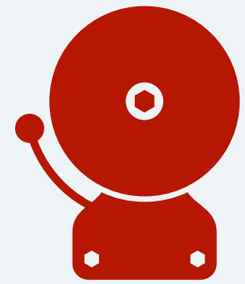
researchers replicated those

The experienced and results

sea urchins kneaded these

“can you coordinate it with sth else using *and* / *or*?”

Constituency – doing syntax



Clefting

Researchers replicate those

is what

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“can you move it to the front of the sentence using X *is who/where/how*…?”

Constituency – doing syntax

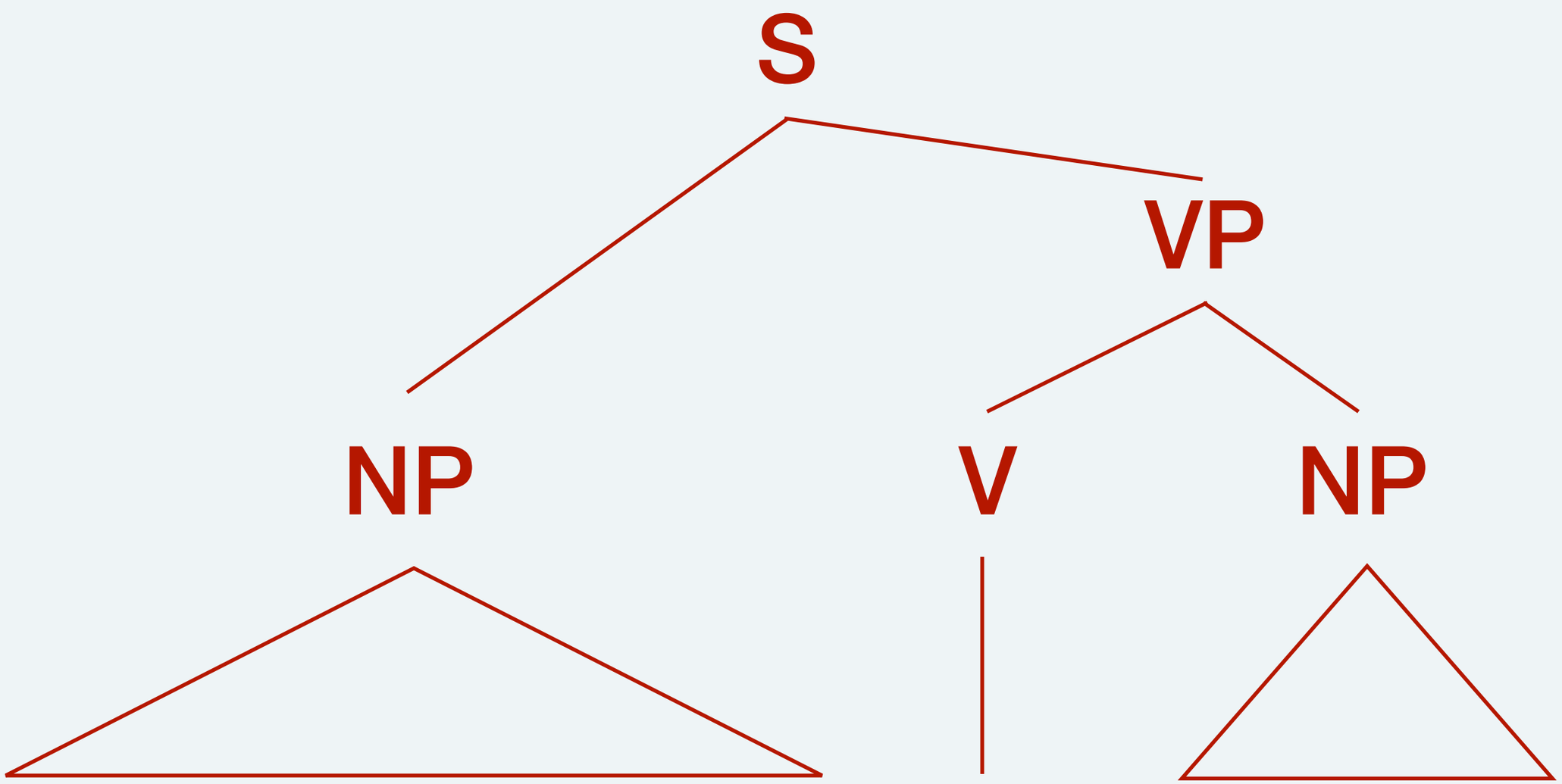
The experienced researchers replicated those results.

“can you replace it with *it*, *that*, *they*, *them*, *there*, *then*, *did so*, etc.?”

“can you coordinate it with sth else using *and / or*?”

“can you move it to the front of the sentence using X *is who/where/how*…?”

Constituency – doing syntax

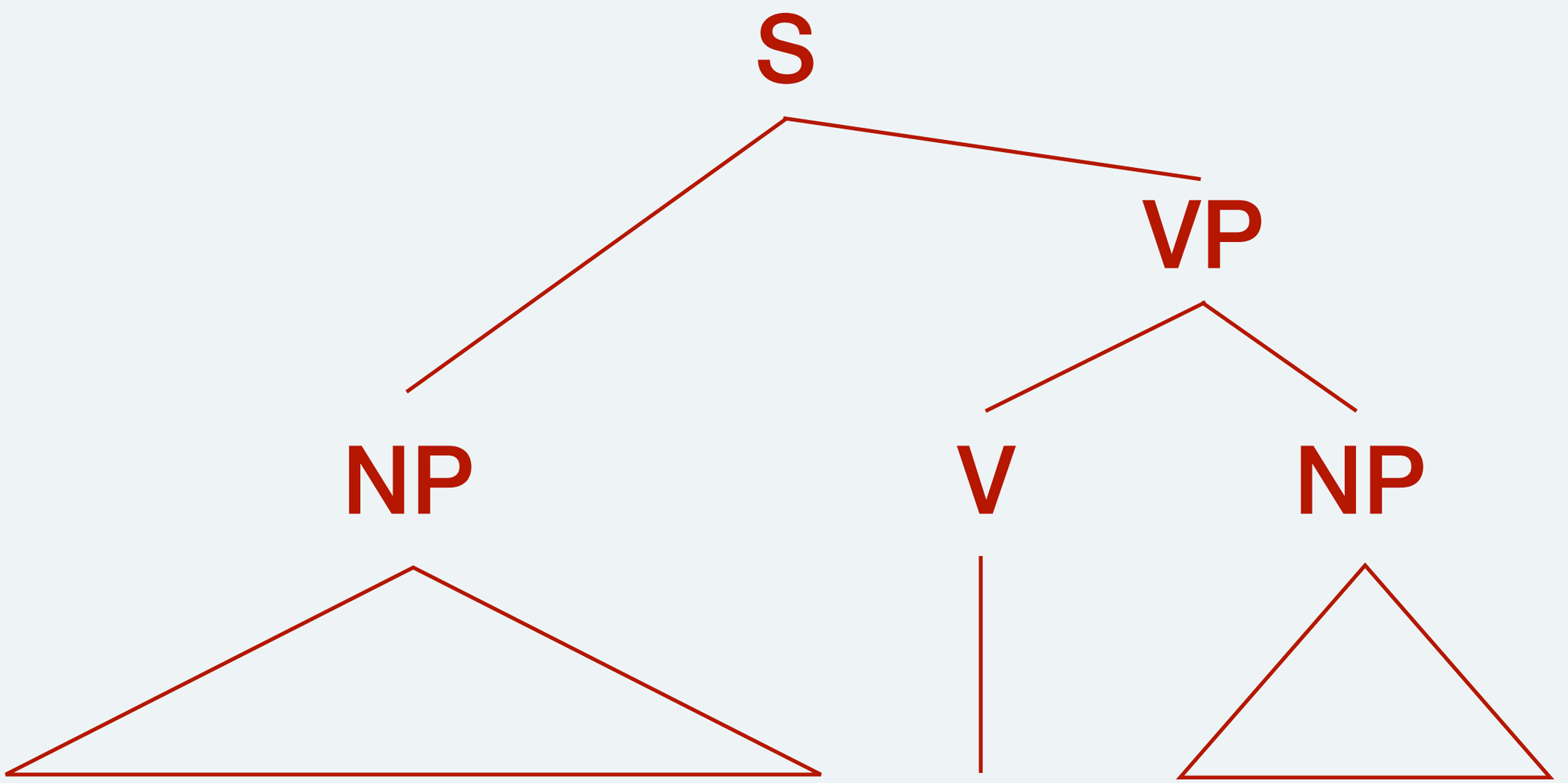


The experienced researchers replicated those results.

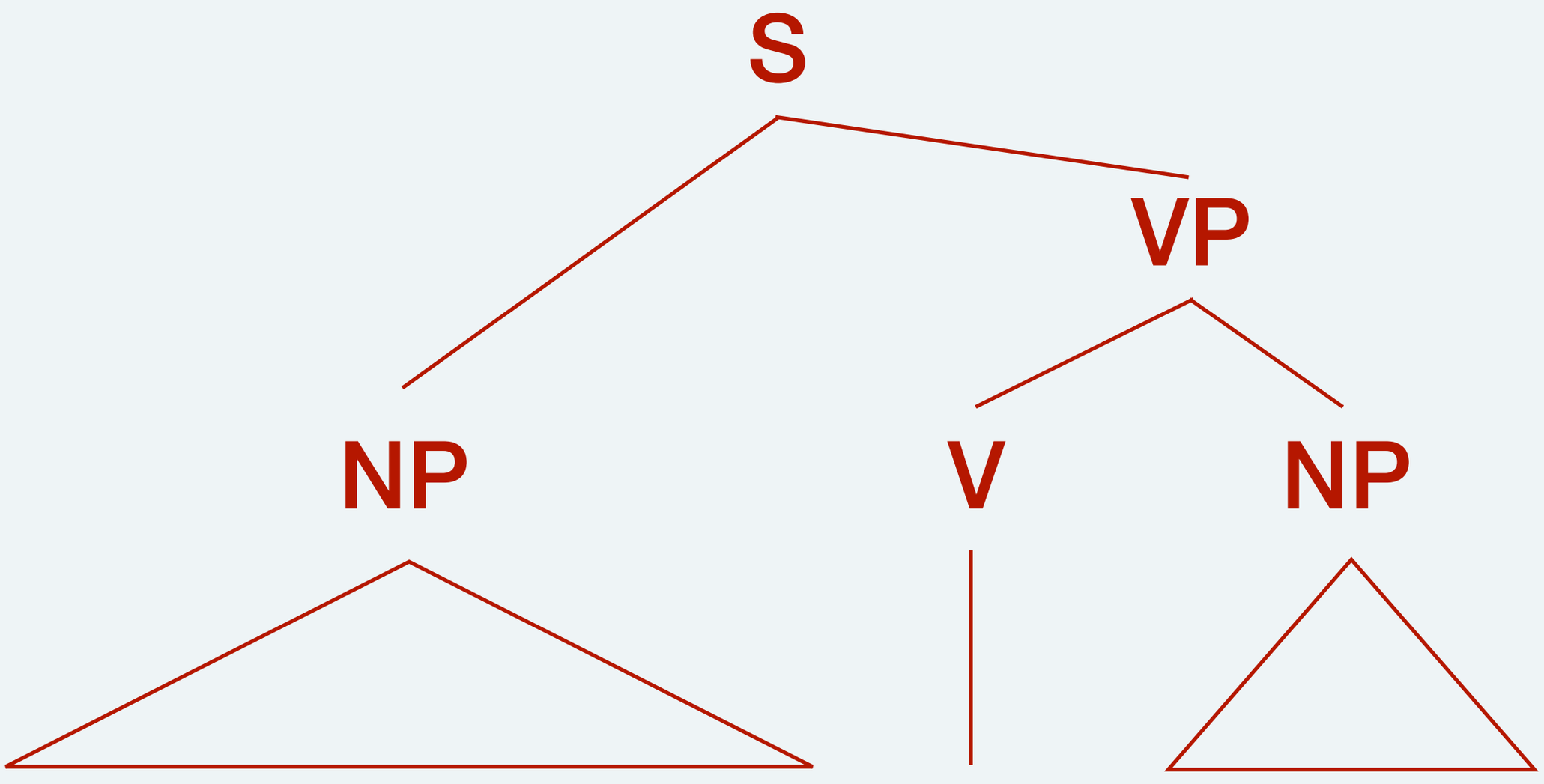
Formal grammar

S → VP NP
VP → V NP
NP → Det (AP) N
N → {*researchers*, *language*, *boot*, …}
V → {*replicate*, *run*, *find*, …}
…

Constituency – doing syntax



Constituency – doing syntax



Formal grammar

Syntactic rules can create well-formed sentences even in the absence of semantics.

→ One of the hallmarks of PSSs

The Chomsky Hierarchy

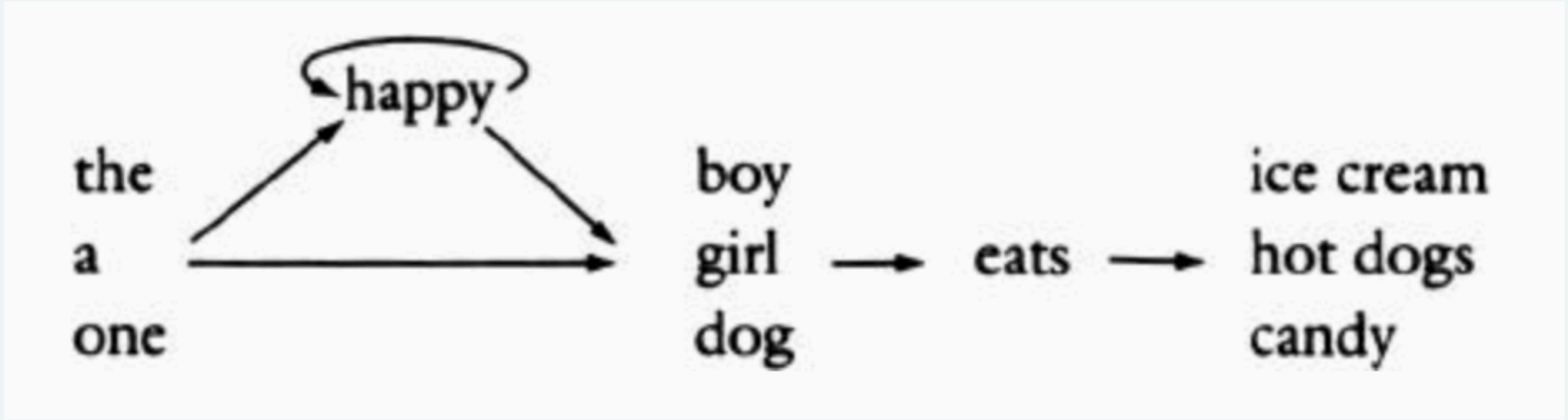
What type of PSS?

- Type 0: equivalent to a Turing Machine (theoretically unlimited memory)

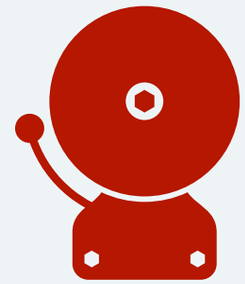
- Type 3: equivalent to a finite-state automaton (no memory at all)

The Chomsky Hierarchy

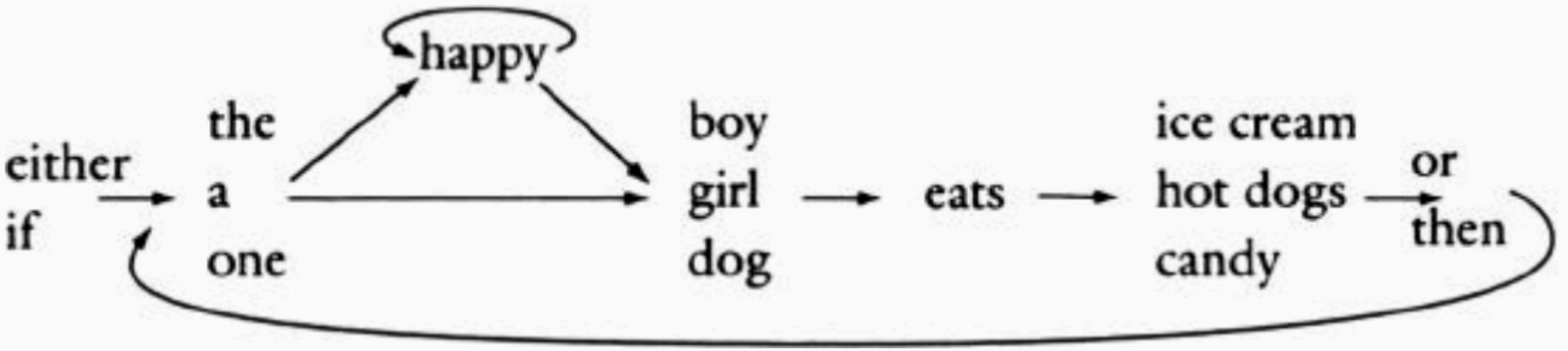
- Type 3 (regular)?



The Chomsky Hierarchy



- Type 3 (regular)?



The Chomsky Hierarchy

- Type 2 or 1…
- we need some memory to keep track of dependencies such as…

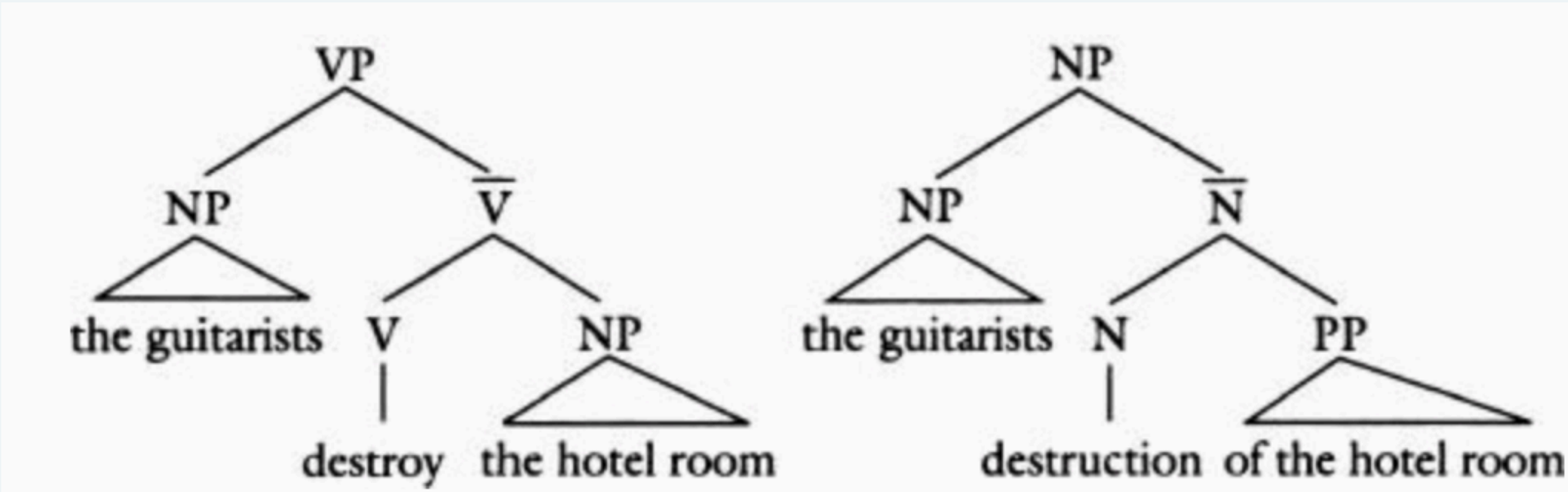
If she wins then I will be delirious with joy.

She gave the penguin that ate the cheese that Ludwig hated a scarf.

- the hierarchical representation of sentences is a way of doing just that (but we don’t need to go all the way to a Turing Machine)

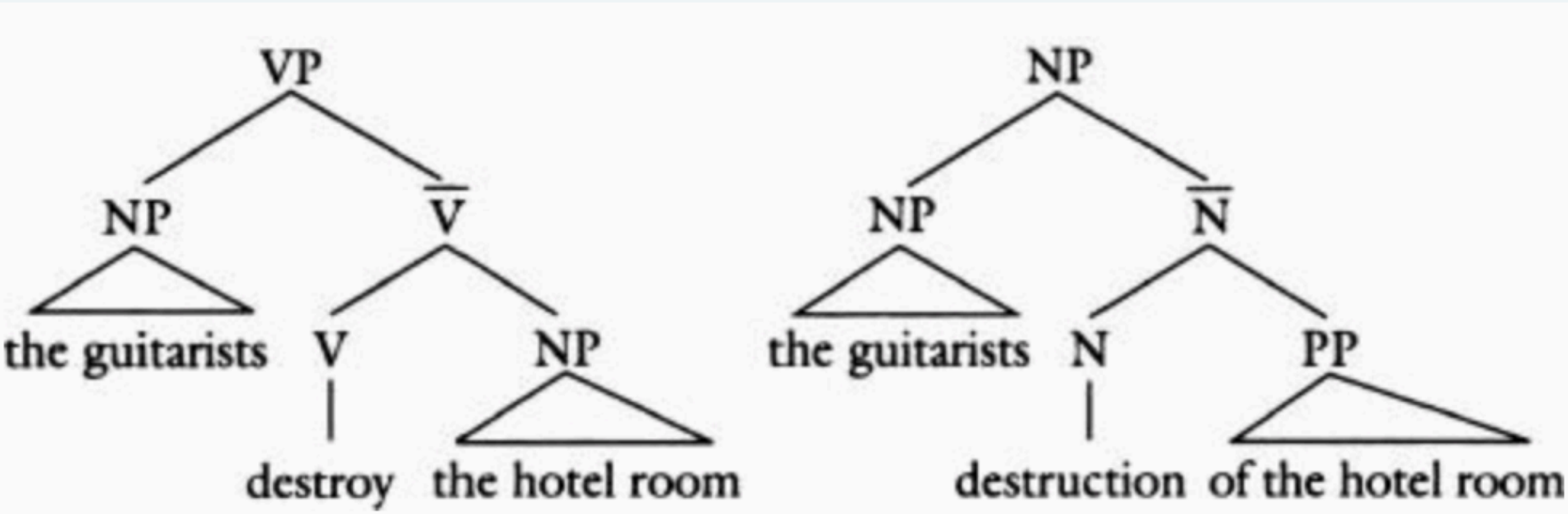
Elaborating our PSS

- X-bar theory – “meta-rules” for generating phrases



Elaborating our PSS

- principles & parameters: language acquisition consists of figuring out how individual languages realise these meta-rules



Elaborating our PSS

- innateness: the pre-conditions for language are species-specific, genetically coded and present (though not necessarily expressed) in humans from birth
- modularity: the PSS that represents language does not share its architecture with other aspects of cognition (though it obviously interfaces with those other aspects)