



**MSP Lab**

**MINNESOTA SYNTAX AND  
PSYCHOLINGUISTICS LAB**



# Introduction

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# Syllabus

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- [www.dustinalfonso.net/teaching/2018gsentproc](http://www.dustinalfonso.net/teaching/2018gsentproc)
- **READ.**
  - Theoretical papers: "cover-to-cover"
  - Experiment papers: "inside-out"
- Come to class with questions, and prepared to describe the paper.
- Group Experiment
  - Materials, subjects, write-up
- Individual Proposal Write-Up
  - Proposal, presentation, write-up

# A Bad Hypothesis

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- **Grammar of English:**
  1. A long list of memorized utterances
  2. A motor plan for each utterance
  3. A signal-detection plan for each utterance
- **Psycholinguistics of English:**
  1. Perfectly produce each utterance
  2. Look-up percept in your look-up table

# A Bad Hypothesis

[[like(Dustin, Ernie)]]

[də.stɪn.laɪks.ər.ni]

[[eat(Dale, pie)]]

[deɪ.leɪt.ðə.p<sup>h</sup>aɪ]

[[¬∃x[grey(x) & cat(x)]]]

[ðeɪ.rɪz.no.greɪ.k<sup>h</sup>æt]

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**Chomsky & Miller (1968); Fodor,  
Garrett, Bever (1974)**

# A Bad Hypothesis

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- Grammatical knowledge is **productive**

*This isn't Catherine's knife.*

*The news announcers think that it isn't easy to surf.*

*I was begging Willie to dance two months ago.*

*Haven't the computer programmers already missed jogging?*

# A Bad Hypothesis

- Grammatical knowledge is **digital** / **compositional**

*Dale ate the cherry pie*

[deɪl.eɪt.ðə.tʃeɪ.ri.paɪ]

[[eat(dale,cherry pie)]]

*Dale ate the **huckleberry** pie*

[deɪl.eɪt.ðə.hək.l.be.ri.p<sup>h</sup>aɪ]

[[eat(dale,**huckleberry** pie)]]

***Harry** ate the cherry pie*

[he.ri.eɪt.ðə.tʃeɪ.ri.ri.p<sup>h</sup>aɪ]

[[eat(**harry**,cherry pie)]]

# A Bad Hypothesis

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- The same phonological percept can be assigned to different semantics (= **syntactic ambiguity**)

*Dale likes hot coffee and pies*

*Audrey sent Dale the letter from the Great Northern*

*Harry told the cop that everyone trusted the report*

# A Better Hypothesis

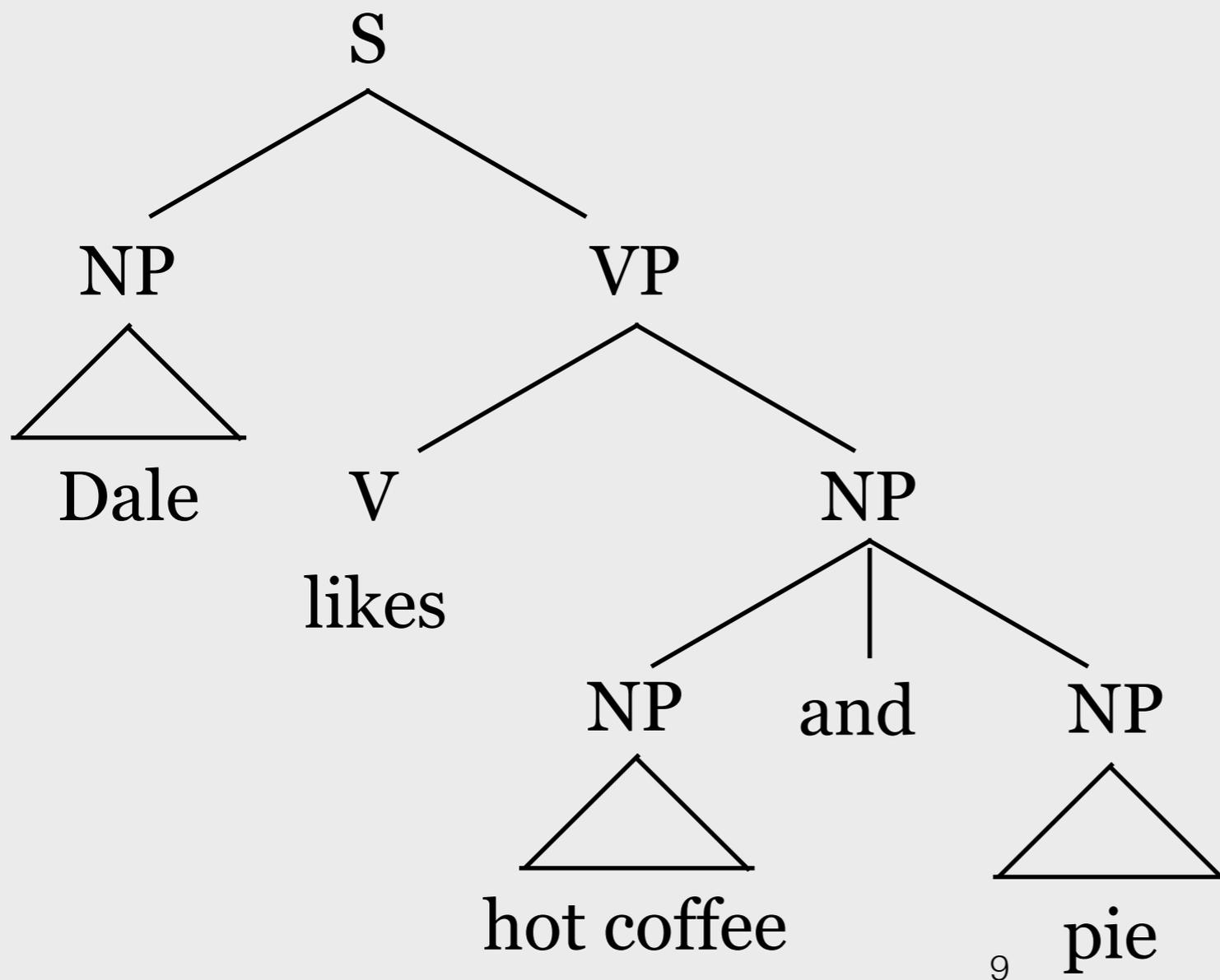
- Syntactic knowledge (= **grammar**) allows systematic, indefinitely many mappings between sound & meaning
- Implies a set of procedures (= **parser**) for determining whether some utterance is a token of some sentence
- Knowing what a cherry pie is is deeply rooted to processes used for identifying something is a cherry pie



**Chomsky & Miller (1968); Fodor,  
Garrett, Bever (1974)**

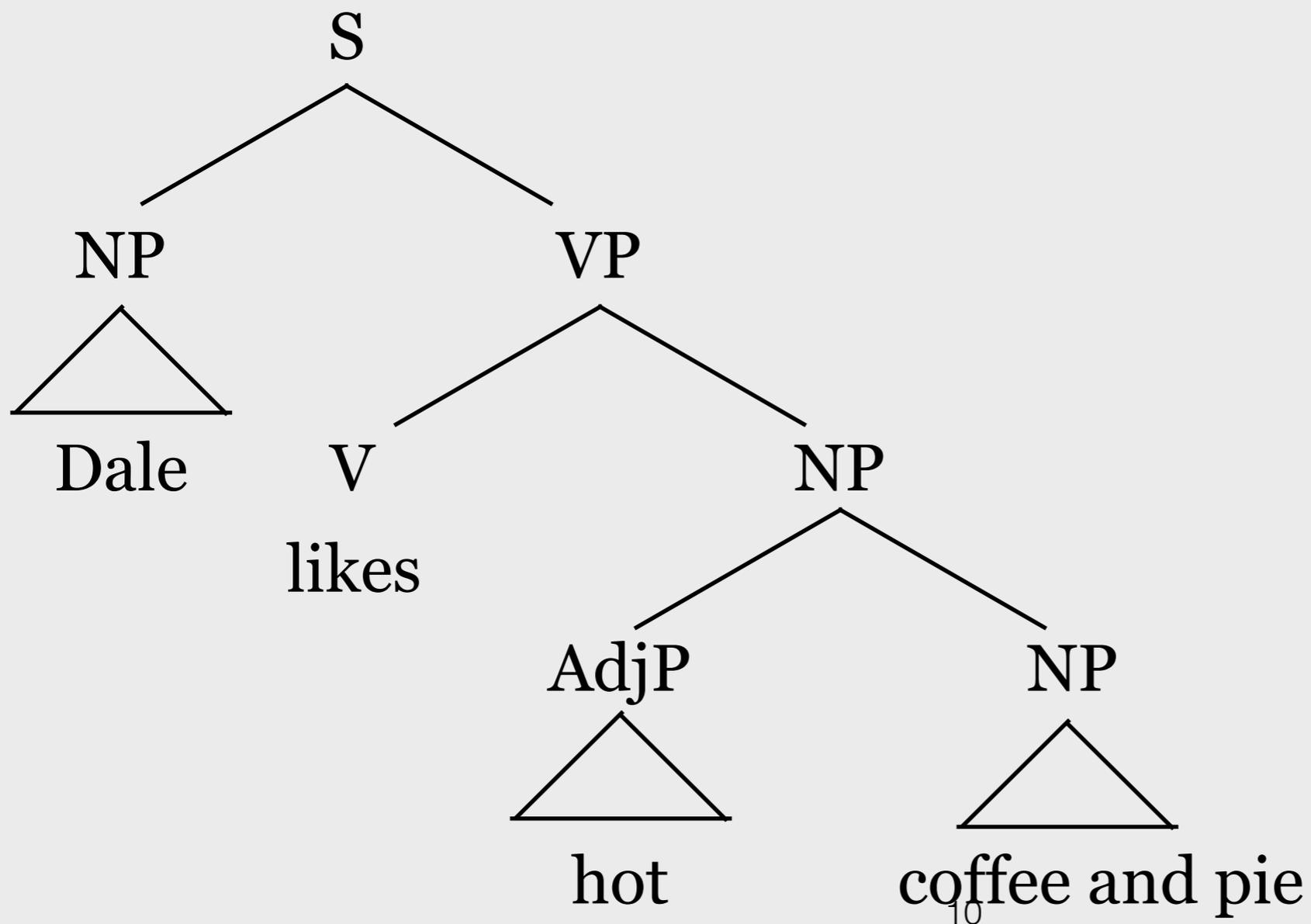
# A Better Hypothesis

- Syntacticians have shown that sentences are built in a hierarchical, recursive structure



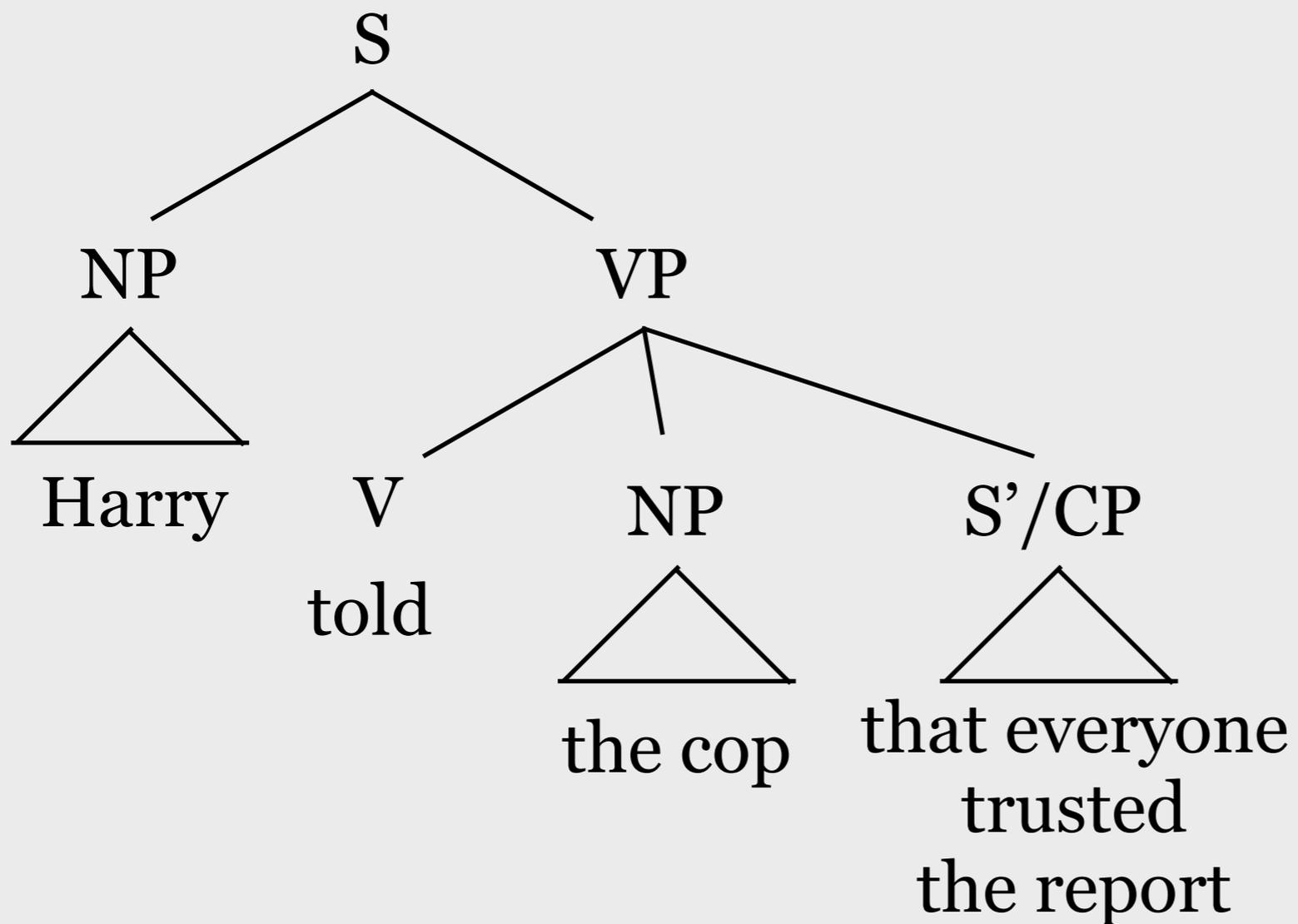
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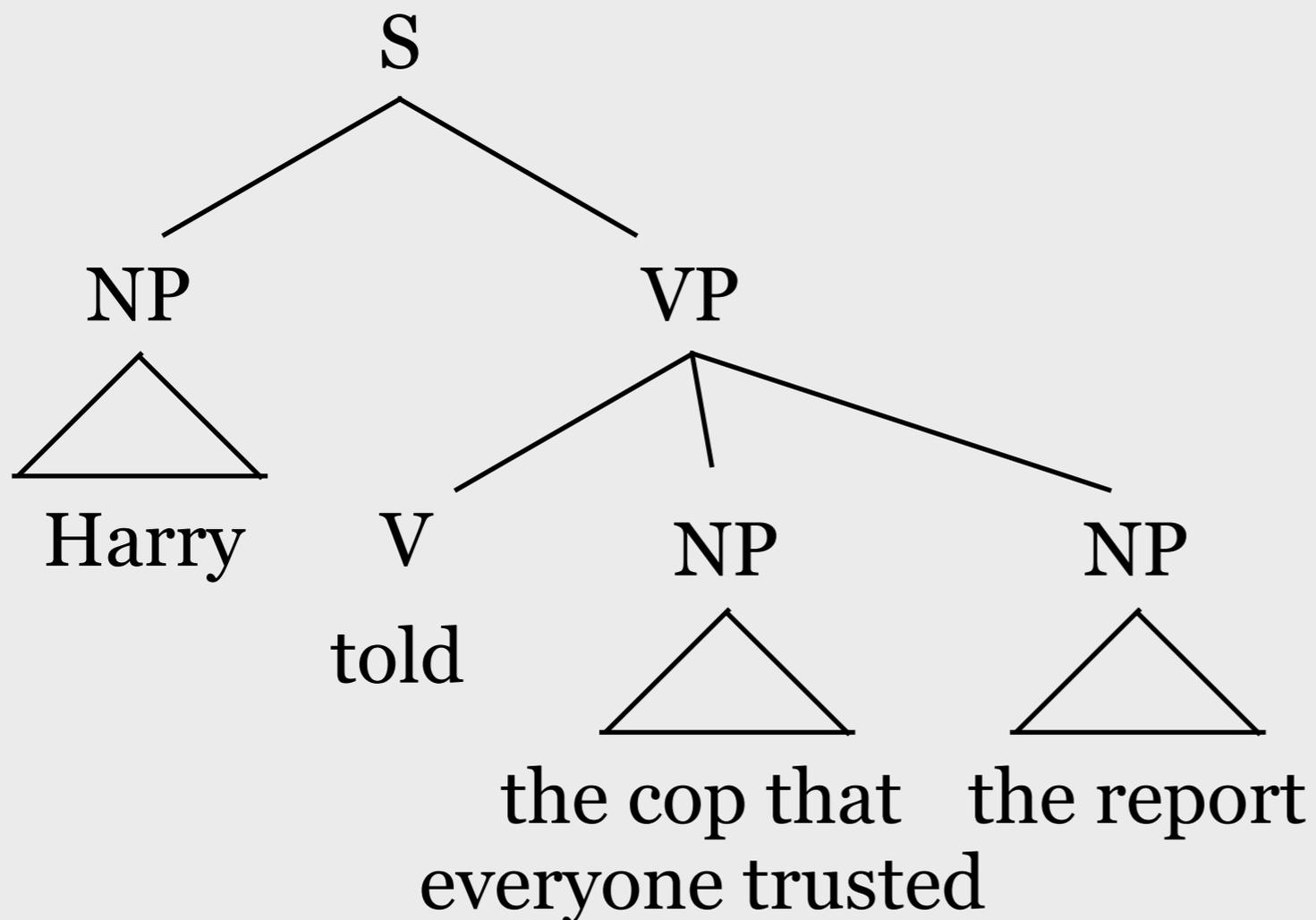
# A Better Hypothesis

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# A Better Hypothesis

- Syntacticians have shown that sentences are built in a hierarchical, recursive structure



# A Better Hypothesis

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- Syntacticians have typically examined **off-line** (“slow”) judgments of sentences to develop theories of grammatical representations
- But, **on-line** (“fast”), not all possible representations may be immediately available, or comprehenders may consider interpretations that are unavailable

# A Better Hypothesis

- Traditionally, linguists have divided up the project into two “modules”
- **Competence** (grammar): The system that defines the mental representations that link sounds and meanings, as detected in off-line data  
(= syntax trees/semantic formulae)
- **Performance** (parser): Other systems (memory, attention, prediction) that build some kind of proprietary representations, that are then related to the grammar, as detected in on-line data  
(Townsend & Bever 2001; Ferreira 2002)

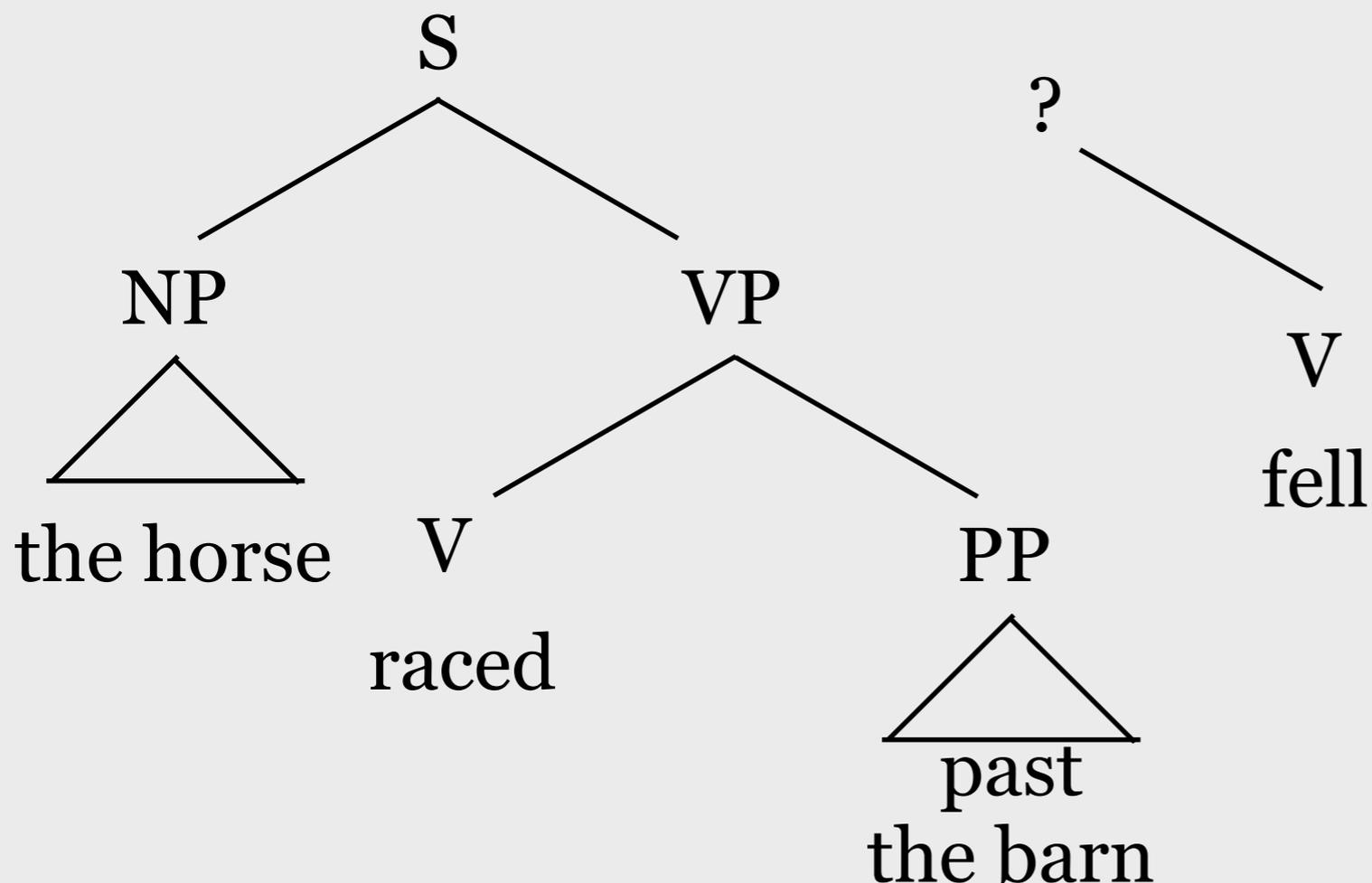
# The Best Hypothesis?

- What would a **one-system** theory look like?
- **A Proposal:**  
Parser = grammar + independent cognitive systems
- Parser's representations are the same as the grammar's representations
- *Prima facie*, comprehenders are good at using fine-detailed grammatical constraints to limit what a sentence might mean
- All “mismatches” between off-line and on-line data follow from limitations on memory/attention/prediction systems and how they interact with grammatical representations

# The Best Hypothesis?

- **Garden Path Effects** (Bever 1970)

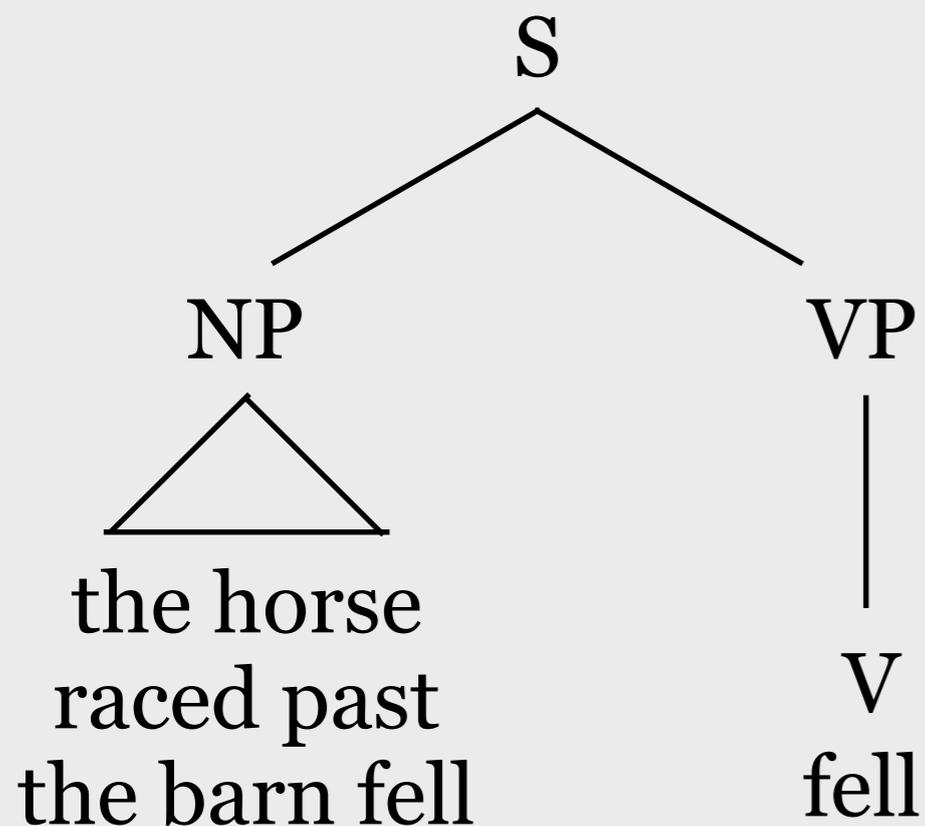
*The horse raced past the barn fell*



# The Best Hypothesis?

- **Garden Path Effects** (Bever 1970)

*The horse raced past the barn fell*



(cf. *The horse ridden past the barn fell;*  
*The horse that was raced past*  
*the barn fell*)

# The Best Hypothesis?

- Why do we falter in comprehending this sentence?
- **Two-systems hypothesis:** The parser has a heuristic for assigning the first N to the subject position, and the first V to the main verb position (Bever 1970)
- **One-system hypothesis:** The grammar specifies that a main verb is needed, so the first verb is assigned to the main verb position to satisfy this grammatical constraint

# The Best Hypothesis?

- Foreshadowing a bit, we can use the Garden Path Model (a One-System model) to describe why this error occurs
- Build the structure [S [NP *The horse* ]]
- **Integrate** the verb *raced* as the main verb, because this satisfies some relevant principles:  
[S [NP *The horse* ] [VP *raced*]]
- Integrate *past the barn*  
[S [NP *The horse* ] [VP *raced past the barn*]]
- There is no grammatical way to integrate *fell* into the structure; **reanalyze** the sentence  
[S [NP *The horse* [RC *raced past the barn*]] [VP *fell*]]

# The Best Hypothesis?

- Two-system hypotheses predict significant mismatches:

*More people have been to Russia than I have*

- **Two-system hypothesis:**
  - The initial percept of acceptability is because it is a well-formed representation *for the parser*
  - But the resulting incoherent judgment is because it is not well-formed *for the grammar* (Townsend & Bever 2001)

# The Best Hypothesis?

- Two-system hypotheses predict significant mismatches:

*The key to the cabinets are on the table*

- **Two-system hypothesis:**
  - The initial percept of acceptability is because it is a well-formed representation *for the parser*
  - But the resulting ungrammatical judgment is because it is not well-formed *for the grammar* (Townsend & Bever 2001)

# The Best Hypothesis?

- The one-system hypothesis needs to diagnose *why* these mismatches obtain

*More people have been to Russia than I have*

- (Wellwood et al 2014) *More* with nouns is ambiguous between comparing *events* and *entities*:

*More cars crossed the George Washington Bridge  
in 2007 than any other year*

*More Americans ate at McDonald's last year than any  
other year*

# The Best Hypothesis?

- Thus, *More people have been to Russia than I have* is a kind of **garden path sentence**, because comprehenders first represent *more* as quantifying over events, but then is provided with a comparison set over entities
- This does not require any kind of “parsing representations” or “parsing procedures” that are unlicensed by the grammar
- Instead, it suffices to observe that the *beginning* of the sentence is misleading or ambiguous, and that detecting and recovering from the initial parse is difficult



# The Best Hypothesis?

- *Types of misalignments between online and offline responses*
  1. Computations that are not yet complete (internal stages of computation)
  2. Computations that fail to complete (processing over-load)
  3. Computations that complete, but inaccurately, due to noisy architecture (properties of memory access mechanisms)
  4. Computations that complete successfully, but that are later challenged by subsequent input (garden paths and revision failures)

# The Best Hypothesis?

- **Questions to keep in mind for this class:**
  - What is the relation between the representations that we build in sentence comprehension and the algorithms we use to build them?
  - To what extent we can we attribute “misalignments” between on-line and off-line data to (independently motivated) properties of memory, attention, prediction, etc.?
  - What might “moment-by-moment” theories of syntax look like?