Syntax

BCS 152
October 24 2018

Midterm

- Please don't talk about it with friends yet! (some students haven't taken it yet)

- Grades will become available after next week

Homework 3

- Due **Wednesday, October 31st at 11:59pm**

- Conduct 2 experiments on word recognition on your friends!

- Read instructions carefully & submit all of the required documents

We can combine a finite number of words into an infinite number of sentences!

2 ways of creating infinite sentences: recursion and repetition

Recursion

The rat hid.

The rat that the cat chased hid.

The rat that the cat that the dog barked at chased hid.

The rat that the cat that the dog that the person scolded barked at chased hid.

and so on…

Repetition

The very furry little green llama is cute.

The very very furry little green llama is cute.

The very very very very very [.......] very very very furry little green llama is cute.

Word Recognition vs. Sentence Processing

- Finite number of words, but infinite sentences

- Most of the sentences we hear we've never heard before

- Need to develop a simple rules system so we can understand these new sentences as they come

Big-Picture Topics in Syntax

- What are the rules underlying how sentences can be formed? (today)

- How do we build up these structures while processing sentences? (next Monday & Wednesday)

- How do we decide which structures to use when speaking? (next Wednesday)

Competence vs. Performance

The rat that the cat that the dog that the person scolded barked at chased hid.

Easy to produce from rules, but *really* hard to understand!

Why do we need structure?

"The man bit the dog"

vs.

"The dog bit the man"

Ambiguous sentences

"Grandmother of Eight Makes Hole in One"

"Miners Refuse to Work After Death"
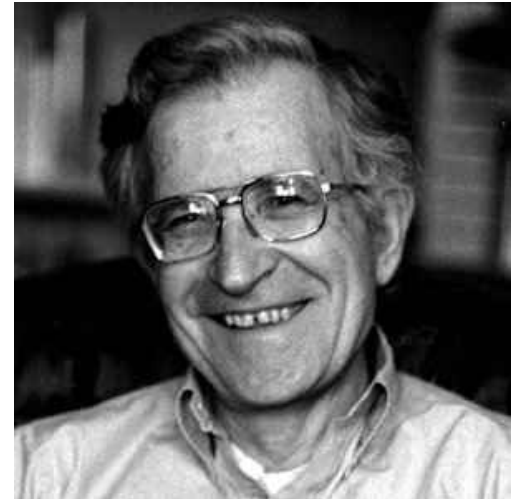
"Drunk Gets Nine Months in Violin Case"

"12 On Their Way to Cruise Among Dead in Plane Crash"

etc. etc.

We need a way to describe why the two interpretations are different

Generative Grammar

A system of rules that can **generate** all the grammatical sentences of a language

Noam Chomsky

Why generative?

→ we can't write down an exhaustive list of all of the different possible sentence structures – there are an infinite number!

'Colorless green ideas sleep furiously.'
- famous sentence from Chomsky demonstrates that we can know that a sentence is grammatical even if its meaning is strange/hard to understand

How do we know what is and isn't grammatical?

- Ask native speakers of the language if a sentence sounds acceptable

The girl read the book.

*Girl the read book.

*The girl put the book.

* = unacceptable

How can we create a simple system of rules that predicts all sentences?

Divide up sentences into **phrases** that combine into **clauses** (sentences)

Building blocks of phrases are **parts of speech** that play different characteristic roles in phrases

Disclaimer: if you've already taken a syntax class before, we won't be following all of the formalisms you learned. They are too complicated for one lecture!

Parts of Speech and Basic Phrase Structure Rules

Parts of Speech (for English)

- Noun
- Verb
- …
- What else?

Parts of Speech (for English)

- Noun (N)
  - lecture, classroom, psycholinguistics
- Verb (V)
  - learn, read, study
- Adjective (Adj)
  - funny, green, round
- Adverb (Adv)
  - quickly, lightly
- Determiner (Det)
  - articles ('the', 'a') and quantifiers ('some', 'most')
- Preposition (P)
  - in, on, under, with
- Conjunction (Conj)
  - and, but
- Pronoun (Pro)
  - he, she, they, it

Open Class (Content Words)

- Noun (N)
  - lecture, classroom, psycholinguistics
- Verb (V)
  - learn, read, study
- Adjective (Adj)
  - funny, green, round
- Adverb (Adv)
  - quickly, lightly

Closed Class (Function Words)

- Determiner (Det)
  - articles ('the', 'a') and quantifiers ('some', 'most')
- Preposition (P)
  - in, on, under, with
- Conjunction (Conj)
  - and, but
- Pronoun (Pro)
  - he, she, they, it

Building Blocks of a Sentence: Phrases

- Noun Phrase (NP)
- Verb Phrase (VP)
- Sentence (S) → NP VP
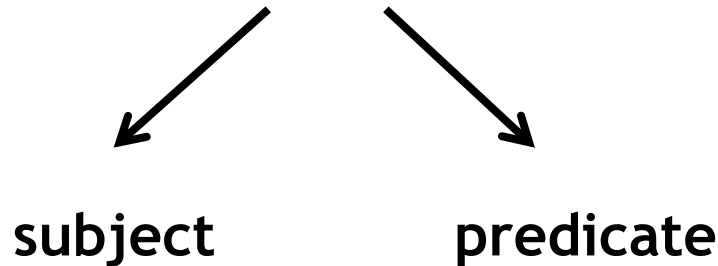
subject   **predicate**

- Every sentence has a subject and a predicate

- Phrases are defined by a set of rules governing what elements can be inside them (and in what order)

Example Phrase Structure Rules

NP → Det N (Noun Phrase → Determiner Noun)

Det → the, a(n), some, many, all, …

N → lecture, book, professor, …

'the book'

'a professor'

'many lectures'

…

We can visualize the structure of a phrase using *syntactic trees*

'the book'

```
            NP
           /  \
         Det    N
          |     |
         the   book
```

'many lectures'
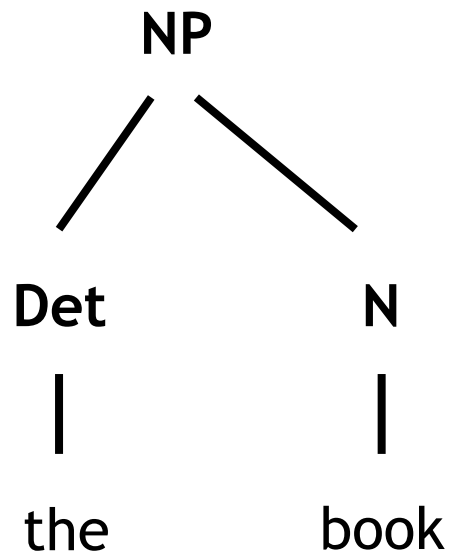
```
             NP
            /  \
          Det    N
           |     |
         many  lectures
```
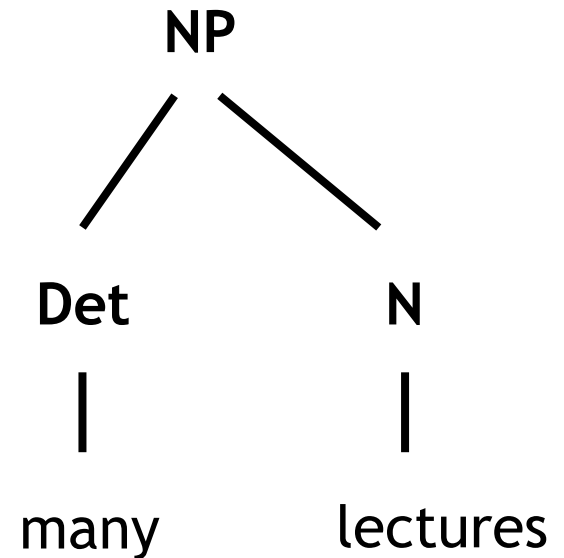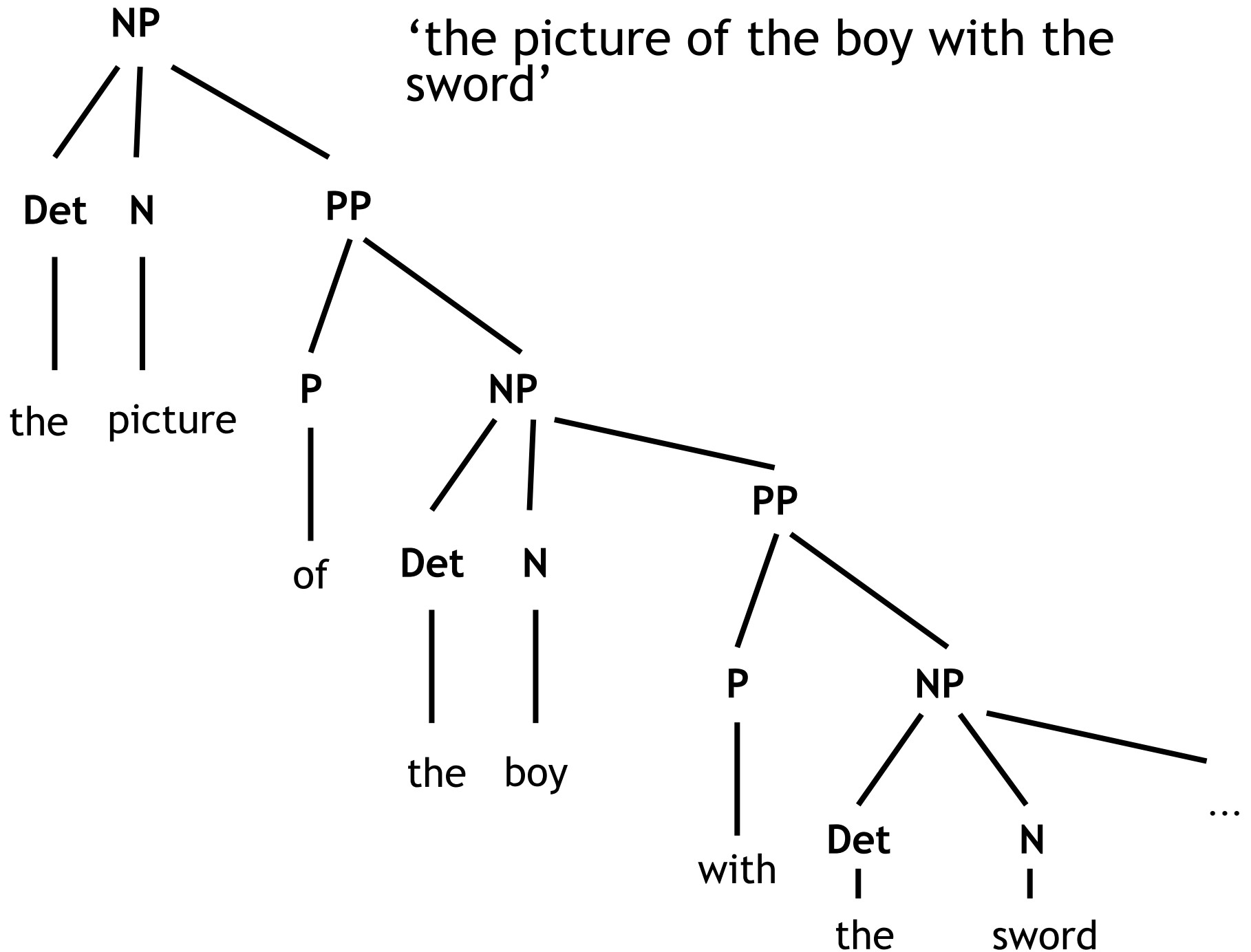
Recursion

NP → Det N PP (Prepositional Phrase)

PP → P NP

'the picture of the boy with the sword under the table in the room next to the kitchen […]'

'the picture of the boy'

'the picture of the boy with the sword'
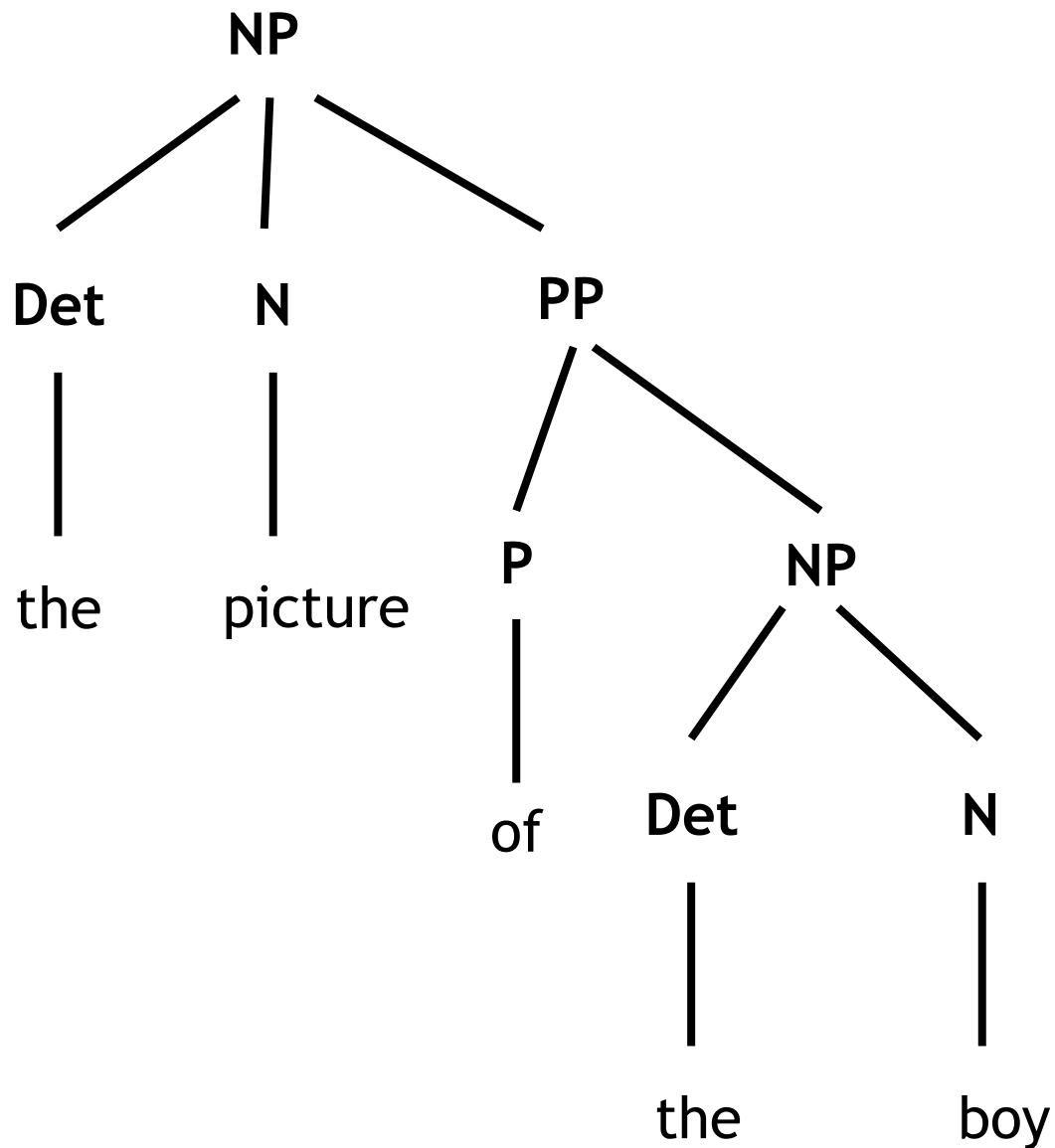
NP
- Det → the
- N → picture
- PP
  - P → of
  - NP
    - Det → the
    - N → boy
    - PP
      - P → with
      - NP
        - Det → the
        - N → sword
        - ...

Noun Phrases

What is the most simple rule we can come up with for noun phrases?

NP → (Det) (Adj*) N (PP)

() = optional

* = add as many as you want

Are we missing anything?

NP → (Det) (Adj*) N (PP)

NP → (Det) (Adv*) Adj* N (PP)

'the amazingly smart student'

*'the amazingly student'

Can you draw the syntactic tree for these NPs?

'the extremely bright student'
'the girl with the big fluffy dog'

Remember:
NP → (Det) (Adj*) N (PP)
NP → (Det) (Adv*) Adj* N (PP)
PP → P NP

Verb Phrases

VP → V NP

'taught the lecture'
'kicked the bucket'
...

What are we missing?

Transitivity

- Different verbs take different numbers of *objects*
- Intransitive: verb takes no object
  - lie, sleep
- Transitive: verb takes one object
  - hug, kick
- Ditransitive: verb takes two objects
  - give, put

Transitivity

- Some verbs don't *require* a specific number of objects, but can optionally take them

Chris ran.

Chris ran a marathon.

Linda donated the chair.

Linda donated the chair to the charity.

- Not all verbs take NP objects

	NP	PP
I gave	the book	to my friend.

VP → V NP PP

- Some verbs take full clauses as an object:

I think Bob is a nice person.

VP → V S

Possible verb phrase structures

VP → V   Intransitive

VP → V NP   Transitive

VP → V NP NP   Ditransitive double object (DO)

VP → V NP PP   Ditransitive prepositional object (PO)

VP → V S   Complement Clause

Ditransitive DO vs. PO

I gave my friend the book.

Double Object (DO)

VP → V NP NP

I gave the book to my friend.

Prepositional Object (PO)

VP → V NP PP

Verb Phrases

- Like noun phrases, verb phrases can also have modifying words/phrases

VP → (Adv*) V NP (Adv*) (PP) (Adv*)

I quietly read the book.

I read the book quietly.

I read the book under a tree.

I read the book under a tree quietly.

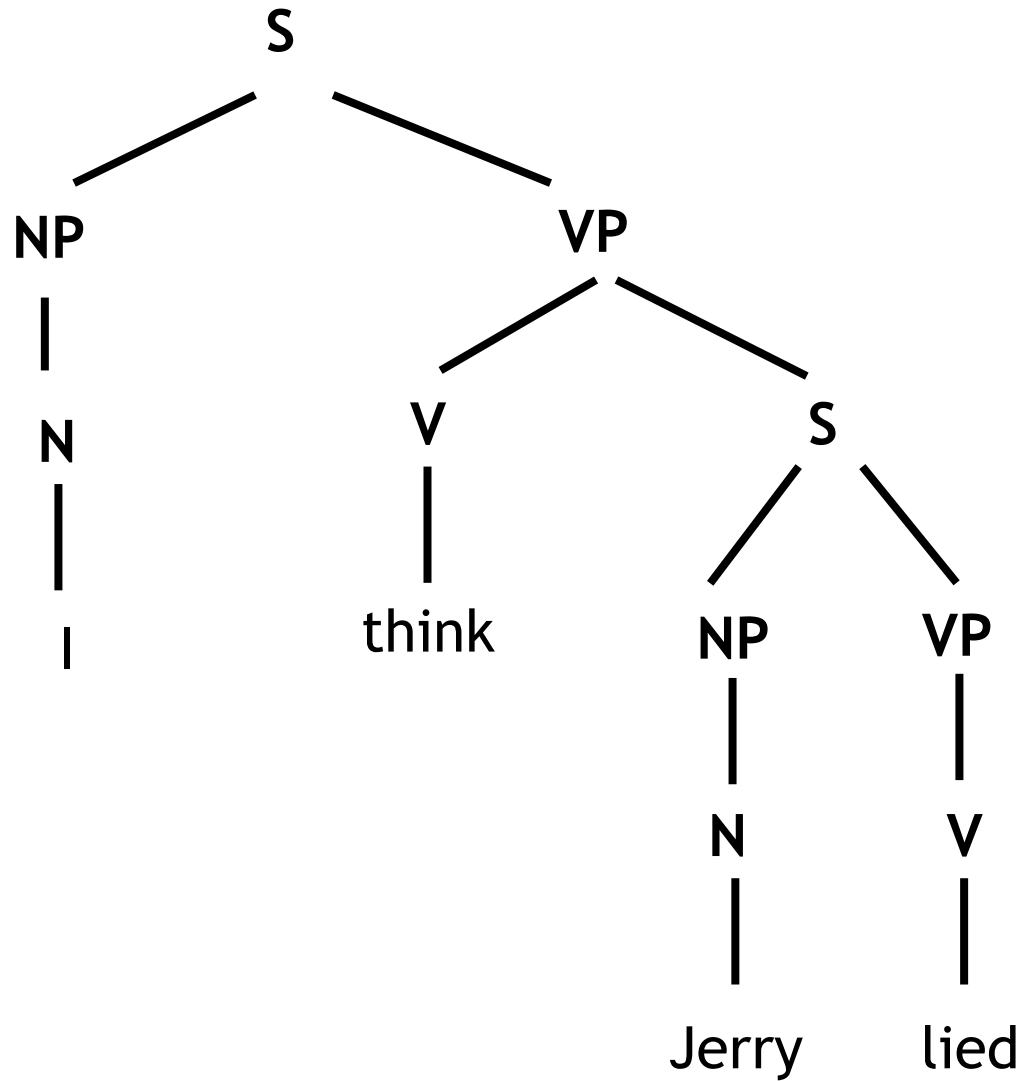I read the book quietly under a tree.

I quickly read the book quietly.

Creating full sentences

S → NP VP

'The girl read the book.'
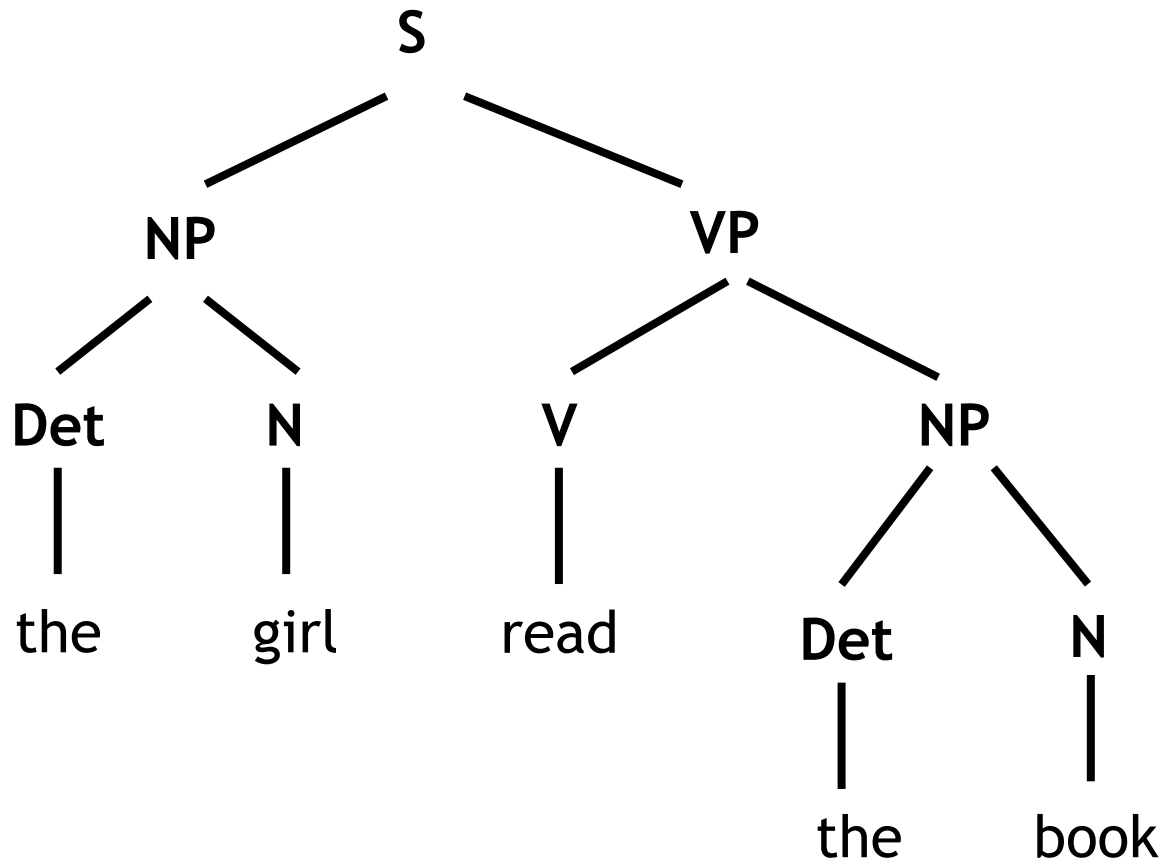
'I think Jerry lied.'

Can you draw the syntax tree for this sentence?

'Colleen likes the painting of the boy with a dog.'

Thematic Roles

Our grammar still generates ungrammatical sentences!

- 'She put the book' is possible in our grammar because we don't know how to decide between the different VP phrase rules

- We need information about what kinds of arguments different verbs can take

Thematic Relations

A class of terms that define the conceptual part each noun phrase plays in a sentence

'I gave the book to my friend last night.'

agent   **theme**   **recipient**   **time**

Thematic Relations

Agent	The instigator of an action (corresponding to the subject, usually animate)
Theme	The thing that has a particular location or change of location
Recipient	The person receiving the theme
Location	Where the theme is
Source	Where the theme is coming from
Goal	Where the theme is moving to
Time	Time of the event
Instrument	The thing used in causing the event

Argument Structure

The thematic relations a verb is *required* to have

'give' → <agent, theme, recipient>
*I gave my friend.

'kick' → <agent, patient>
*John kicked.

What is the argument structure of these verbs?

laugh

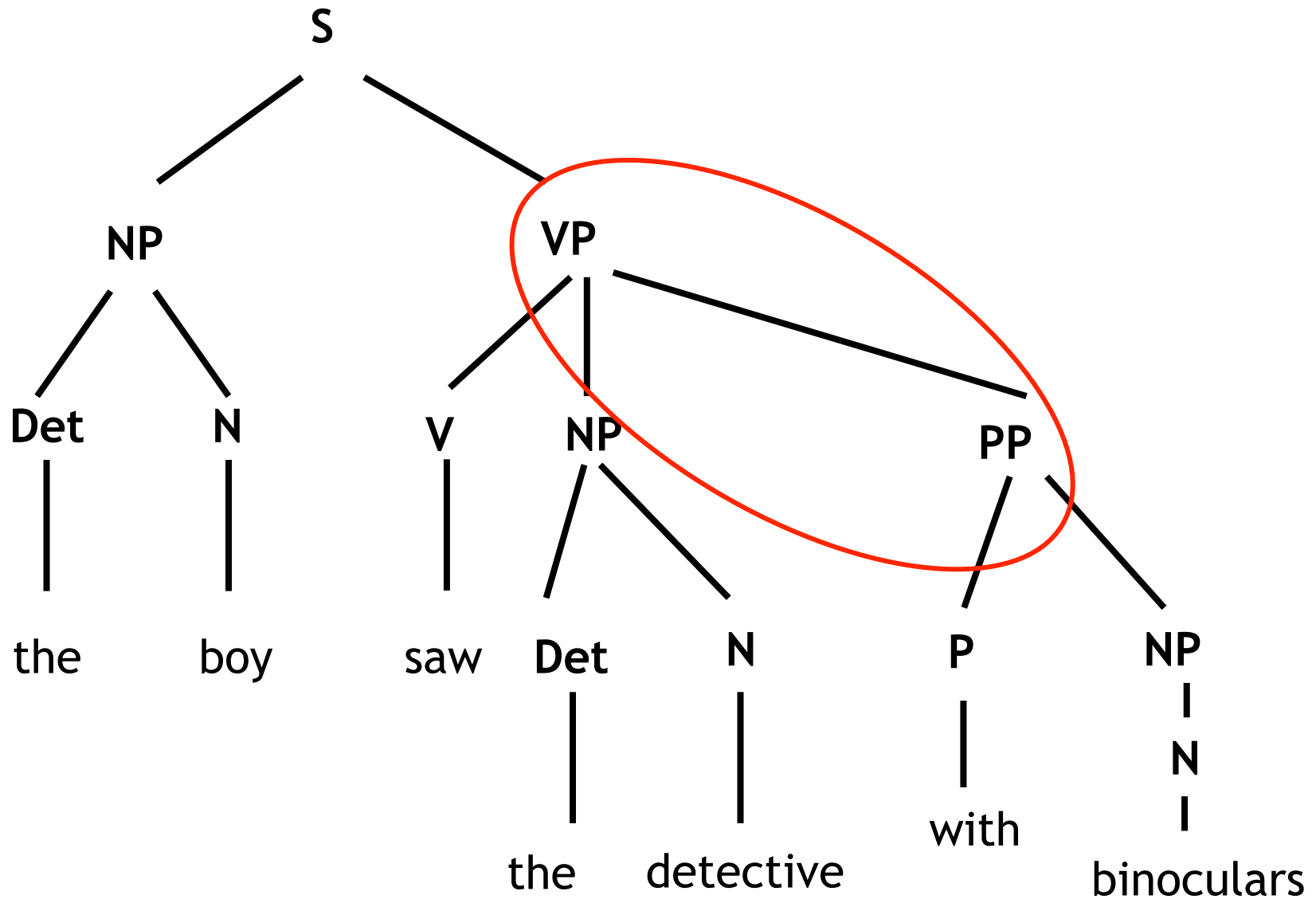*put*

donate

Deep Structure vs. Surface Structure

Ambiguous sentences

The boy saw the detective with binoculars.

Who had the binoculars?

the detective has
the binoculars
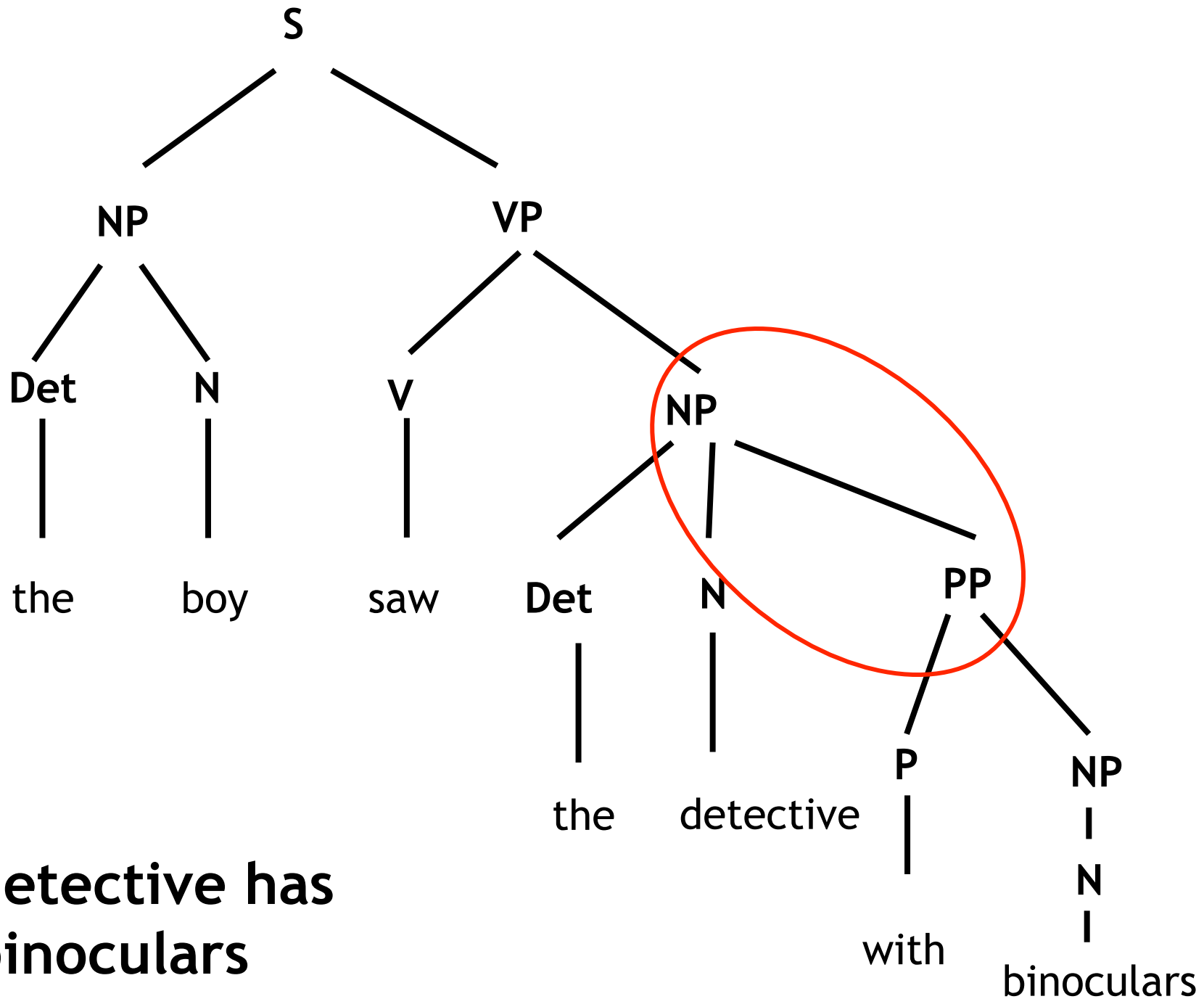
the boy has the binoculars

Relative Clauses

The reporter who attacked the senator apologized.

describes

The reporter attacked the senator. The reporter apologized.

The reporter [who _____ attacked the senator] apologized.

Relative Clauses

The reporter who the senator attacked was arrested.

describes

The reporter [who the senator attacked _____] was arrested.

Questions

What did you say?

You said *what??*

Underlying structure posited:

What did you _____ say _____

For next time…

- How do people manage to build up structure as they're processing a sentence? What heuristics or cues do they use?

- Study the processing of temporarily and globally ambiguous sentences as a window into this processing