Syntax: The Sentence Patterns of Language

Fromkin et al. Chapter 2 (9th Ed.)

Syntax

Any speaker of any human language can produce and understand an infinite number of possible sentences

Thus, we can't possibly have a mental dictionary of all the possible sentences

Rather, we have the rules for forming sentences stored in our brains

Syntax is the part of grammar that pertains to a speaker's knowledge of sentences and their structures

What the Syntax Rules Do

- The rules of syntax combine **words into phrases** and **phrases into sentences**

- They also specify **the correct word order for a language**

- For example, English is a **Subject-Verb-Object** (SVO) language
- The President nominated a new Supreme Court justice
- *President the new Supreme justice Court a nominated

- They also describe the relationship **between the meaning of a group of words and the arrangement of the words**

- I mean what I say vs. I say what I mean

What the Syntax Rules Do

- The rules of syntax also specify the **grammatical relations of a sentence**, such as the **subject and the direct object**
  - *Your dog chased my cat* vs. *My cat chased your dog*
- Syntax rules specify constraints on sentences based on the verb of the sentence

**The boy found*
**The boy found in the house*
The boy found the ball

**Disa slept the baby*
Disa slept
Disa slept soundly

Zack believes Robert to be a gentleman
**Zack believes to be a gentleman*
Zack tries to be a gentleman
**Zack tries Robert to be a gentleman*

Grammatical judgments are neither idiosyncratic nor capricious, but are determined by rules that are shared by all speakers of a language.

What the Syntax Rules Do

- Sentences have syntactic structures associated with them.

10. (a) Jack and Jill ran up the hill.
    (b) Jack and Jill ran the hill up.
    (c) Up the hill ran Jack and Jill.
    (d) Jack and Jill ran up the bill.
    (e) Jack and Jill ran the bill up.
    (f) Up the bill ran Jack and Jill.

He ran [up the hill]

In (10) we see that the phrase ***ran up the hill*** *behaves differently from the* phrase ***ran up the bill,*** *even though the* ***two phrases are superficially quite similar.*** For the expression *ran up the hill, the rules of the syntax allow the word* orders in (10a) and (10c), but **not (10b).** In *ran up the bill, in contrast, the rules* allow the order in (10d) and (10e), but **not (10f).**

What the Syntax Rules Do

- Syntax rules also tell us how words form groups and are hierarchically ordered in a sentence

  "The captain ordered the old men and women off the ship"

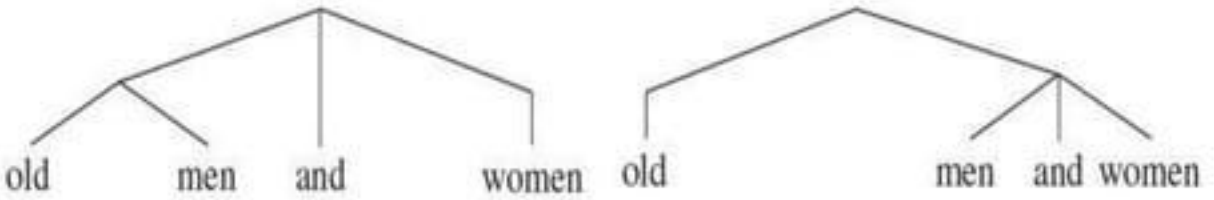
- This sentence has two possible meanings:

  - 1. The captain ordered the old men and the old women off the ship
  - 2. The captain ordered the old men and the women of any age off the ship

- The meanings depend on how the words in the sentence are grouped (specifically, to which words is the adjective 'old' applied?)

  - 1. The captain ordered the [old [men and women]] off the ship
  - 2. The captain ordered the [old men] and [women] off the ship

- These groupings can be shown hierarchically in a tree



- These trees reveal **the structural ambiguity** in the phrase "old men and women"
  - Each structure corresponds to a different meaning

- Structurally **ambiguous sentences** can often be humorous:
- For sale: an antique desk for lady with thick legs and large drawers.
- [a desk] [for lady with thick legs and large drawers]
- [a desk for lady] [with thick legs and large drawers]

What Grammaticality Is Not Based On

- People can judge grammaticality without ever having heard the sentence before

  "Enormous crickets in pink socks danced at the prom."

- Grammaticality is not based on **meaningfulness**

  "Colorless green ideas sleep furiously."

  "A verb crumpled the milk."

  'Twas brillig, and the slithy toves
  Did gyre and gimble in the wabe

- Grammaticality is not based on **truthfulness**

Sentence Structure

- Sentences have a **hierarchical organization**; that is, the words are **grouped into natural units**.

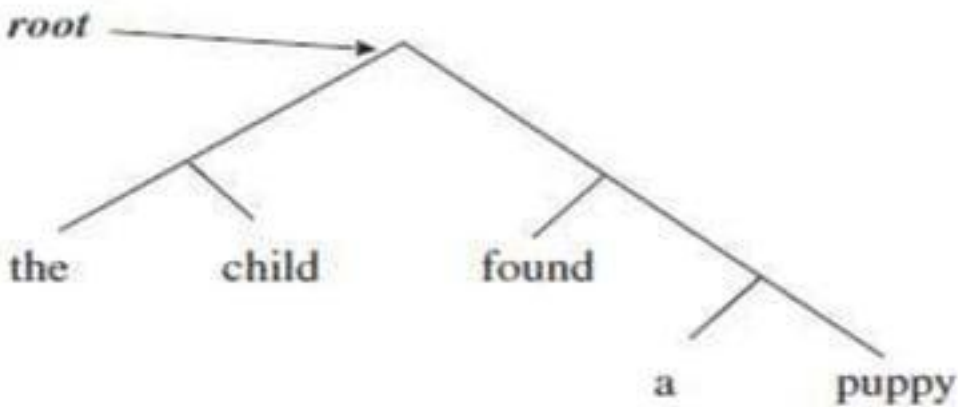
The child found a puppy

[the child] [found a puppy]

[the child] [[found] [a puppy]]

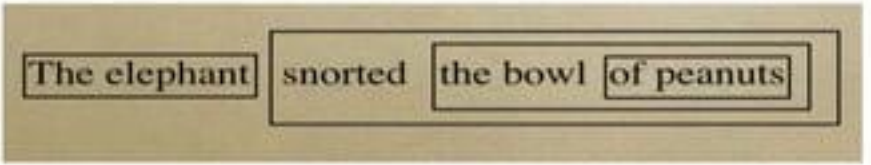
[[the] [child]] [[found] [[a] [puppy]]]

- We could say that the sentence "The child found a puppy" is based on the template Det—N—V—Det—N
- A **tree diagram** can be used to show the hierarchy of the sentence:



Constituents and Constituency Tests

- **Constituents** are the natural groupings in a sentence



- Tests for constituency include:
  - 1. "**stand alone test**": if a group of words can stand alone, they form a constituent
    - A: "What did you find?"
    - B: "A puppy." NOT *found a*

    Q: What did Heidi buy at the market?

    A: A bag of vacuum cleaner parts
    - Q: What did Heidi do at the market?
    - A: Buy some cheap T-shirts.

    - Q: Where did Heidi put them?
    - A: In the back of her car.

2. "**replacement by a pronoun**": pronouns can replace constituents

- A: "Where did you find a puppy?"
- B: "I found *him* in the park."

I have always loved the man in a natty suit.
I have always loved John.
I have always loved him.

3. "**move as a unit**" test: If a group of words can be moved together, they are a constituent

- **Passive:** "The child found a puppy." → "A puppy was found by the child."
- **Clefting**: It is/was_____that.....
- **Preposing**: Big bowls of beans are what I like.

John [eats at really fancy restaurants]

- Stand Alone?
  - What does John do in his spare time?
  - Eat at really fancy restaurants.
- Replace by a Pro-form (pronoun, pro-verb)?
  - John [eats at really fancy restaurants] and Bill [does (so) too]
- Move?
  - Eating at really fancy restaurants, that's John's favorite pastime.
  - I told John to eat at really fancy restaurants, and [eat at really fancy restaurants] he will!

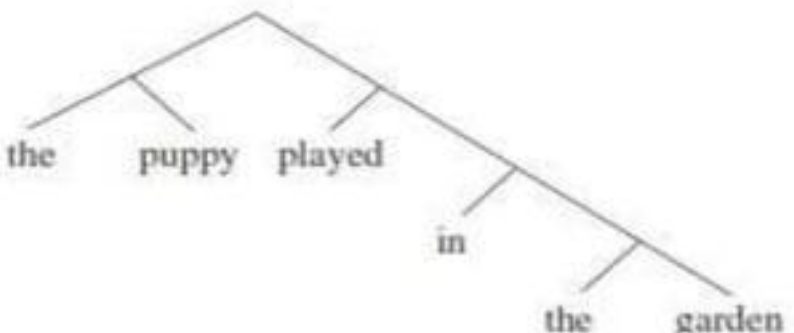
John [eats at really] fancy restaurants

- Stand Alone?
  - What does John do in his spare time?
  - *Eat at really.
- Replace by a Pro-form (pronoun, proverb)?
  - *John [eats at really] fancy restaurants and Bill [does so too] fancy restaurants
- Move?
  - *Eating at really, that's John's favorite pastime.
  - *Eating at really is what John does fancy restaurants.

The puppy played in the garden.

We can use our tests to show that *in the garden* is also a constituent, as follows:

Where did the puppy play? *In the garden* (stand alone)
The puppy played *there*. (replacement by a pronoun-like word)
In the garden is where the puppy played. (move as a unit)
It was *in the garden* that the puppy played.



Constituents and Constituency Tests

- Experimental evidence shows that people perceive sentences in groupings corresponding to constituents

- Every sentence has at least one constituent structure

    - If a sentence has more than one constituent structure, then it is ambiguous and each constituent structure corresponds to a different meaning

Syntactic Categories

- A **syntactic category** is a family of expressions that can substitute for one another without loss of grammaticality

The child found a puppy.	The child ***found a puppy***.
A police officer found a puppy.	The child ***ate the cake***.
Your neighbor found a puppy.	The child ***slept.***

- All the underlined groups constitute a syntactic category known as a **noun phrase (NP)**
  - NPs may be a subject or an object of a sentence, may contain a determiner, proper name, pronoun, or may be a noun alone
- All the bolded groups constitute a syntactic category known as a **verb phrase (VP)**
  - VPs must always contain a verb but may also contain other constituents such as a noun phrase or a **prepositional phrase (PP)**
  - Phrasal categories: NP, VP, PP, AdjP, AdvP

Syntactic Categories (1)

Lexical categories	Examples
• Noun (N)	• moisture, policy
• Verb (V)	• melt, remain
• Adjective (A)	• good, intelligent
• Preposition (P)	• to, near
• Adverb (Adv)	• slowly, now

Syntactic Categories (2)

Non-lexical categories	Examples
◆ Determiner (Det)	◆ the, this, each, every
◆ Degree word (Deg)	◆ very, more
◆ Qualifier (Qual)	◆ always, perhaps
◆ Auxiliary (Aux)	◆ will, can, have, be
◆ Conjunction (Conj)	◆ and, or
◆ Complementizer (Comp)	◆ that (clause)

Indicate the category of each word in the following sentences:

a. The glass suddenly broke.

Det / N / Adv / V

b. A jogger ran towards the end of the lane.

Det / N / V / P / Det / N / P / Det / N

c. The peaches never appear quite ripe.

Det / N / Qual / V / Deg / A

d. Gillian will play the trumpet and the drums in the orchestra.

N / Aux / V / Det / N / Conj / Det / N / P / Det / N

Phrases

- NP : Noun Phrase

  The car, a clever student
- VP : Verb Phrase

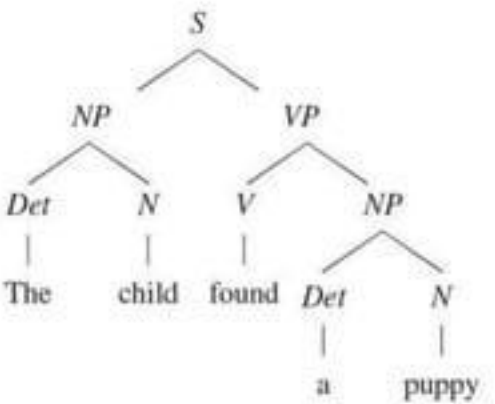
  study hard, play the guitar
- PP : Prepositional Phrase

  in the class, above the earth
- AP : Adjective Phrase

  very tall, quite certain

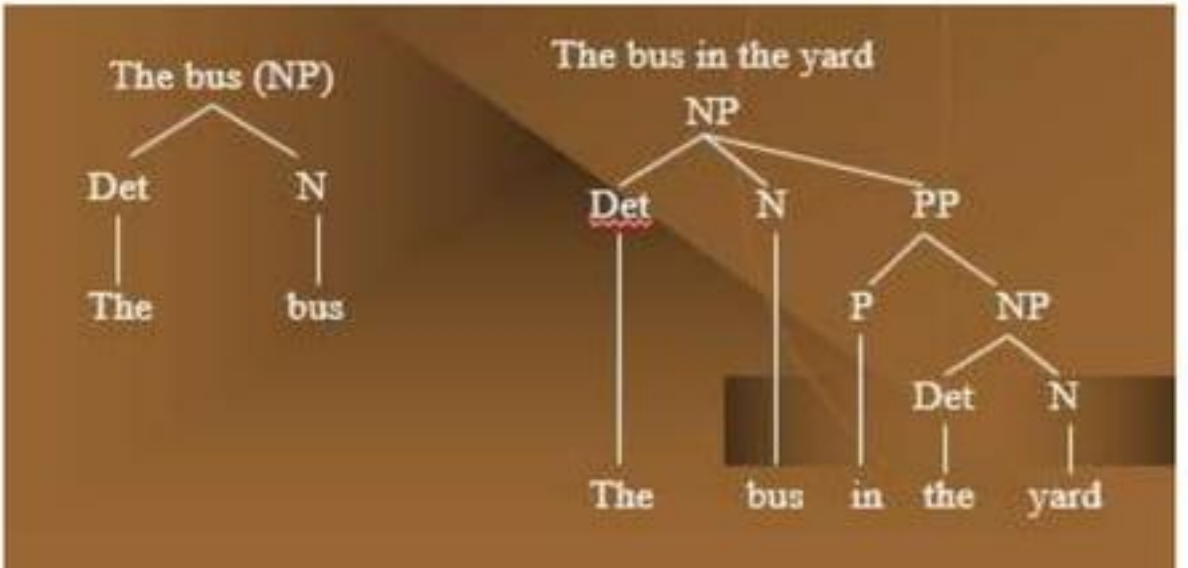
Phrase Structure Trees and Rules

- A **phrase structure (PS) tree** (or **constituent structure tree)** is a tree diagram with syntactic category information:



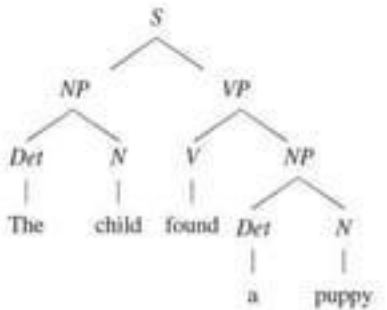
Phrase Structure Rules

- NP → (Det) N (PP)
- PP → P NP



Phrase Structure Trees and Rules

- In a PS tree, every higher node **dominates** all the categories beneath it
  - S dominates everything
- A node **immediately dominates** the categories directly below it
  - The VP immediately dominates the V and the NP

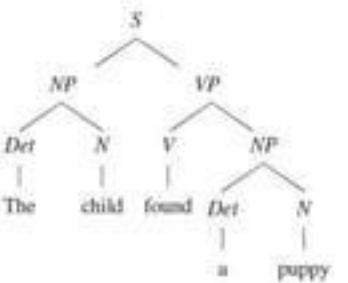


- **Sisters** are categories that are immediately dominated by the same node
  - The V and the NP are sisters

Phrase Structure Trees and Rules

- Phrase structure rules specify the well-formed structures of a sentence
  - A tree must match the phrase structure rules to be grammatical
- This tree is formed using the following rules:

S → NP VP
NP → Det N
VP → V NP



Phrase Structure Trees and Rules

- But, a VP could also contain:
  - A verb only: *The woman laughed*.
  - A PP: *The woman laughed in the garden*.
  - A CP: *The man said that the woman laughed*.

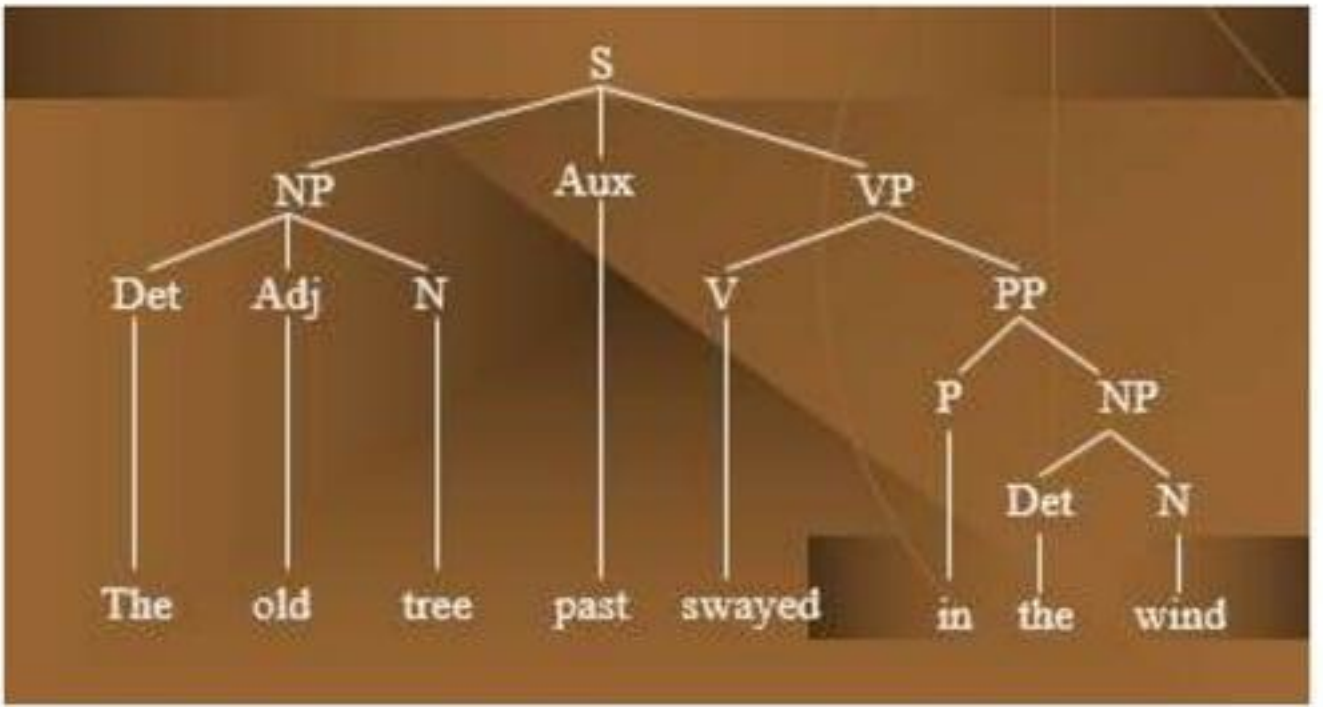
- We therefore have to account for these possible sentences in our phrase structure rules and need the following rules so far:

1. S → NP VP
2. NP → Det N
3. VP → V NP
4. VP → V
5. VP → V PP
6. PP → P NP
7. VP → V CP
8. CP → C S

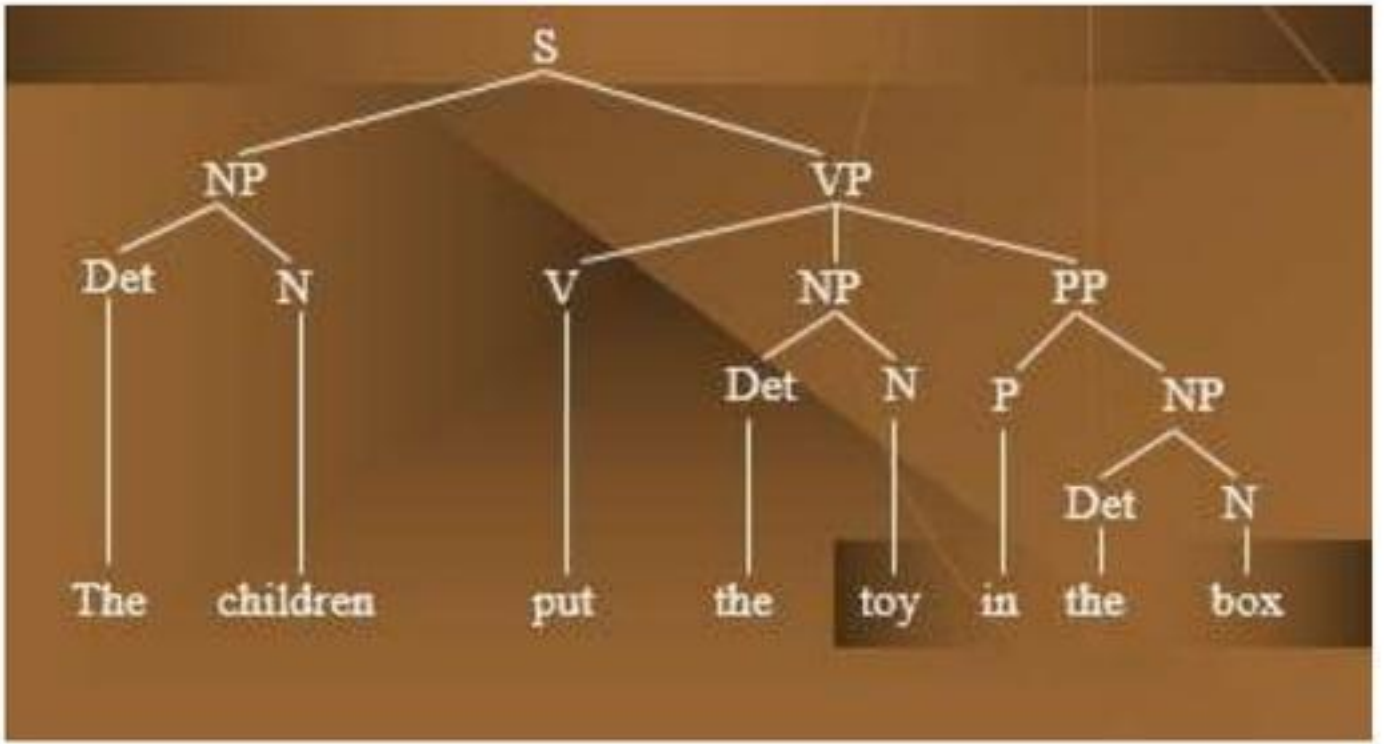
Phrase Structure Trees and Rules

- Phrase structure rules are used as a guide for building trees
- To build a tree you expand every phrasal category until only the lexical categories remain
- By following the guidelines in the phrase structure rules, we can generate all the possible grammatical sentences in a language
    - Any tree that violates the phrase structure rules will represent an ungrammatical sentence

The old tree swayed in the wind



The children put the toy in the box

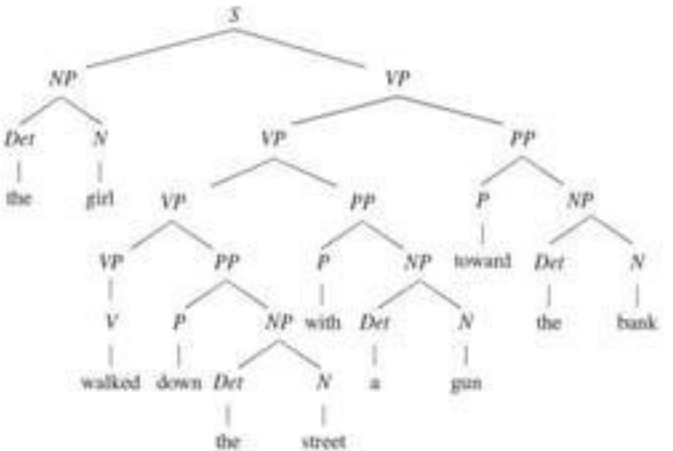


The Infinity of Language: Recursive Rules

- **Recursive** rules are rules in which a phrasal category can contain itself
  - Such as an NP containing another NP…
    - NP → NP PP allows for the sentence: *I saw the man with the telescope in a box.*
  - …or a VP containing a VP…
    - VP → VP PP allows for a sentence like: *The girl walked down the street in the rain.*
  - …or a CP containing a S…
    - CP → C S allows for embedding sentences inside sentences such as: *The children hope that the teacher knows that they are good students.*
- Recursive rules allow a grammar to generate an infinite number of sentences (in this case by adding PPs indefinitely)

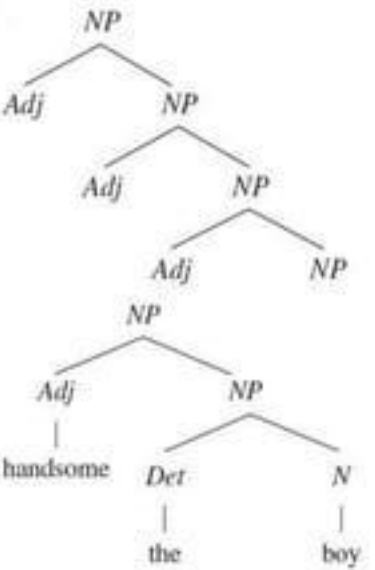
The Infinity of Language: Recursive Rules

- The recursive phrase structure rule VP → VP PP allows the following tree:



Recursive Adjectives and Possessives

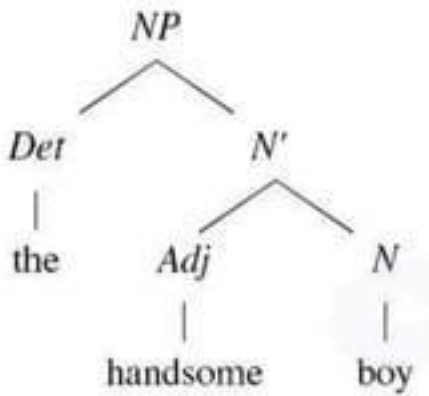
- The case of multiple adjectives leads us to revise our PS rules:
  - *The kindhearted, intelligent, handsome boy had many girlfriends* leads us to create the PS rule NP → Adj NP
  - However, this rule would allow an adjective to come before a determiner, which is not possible in English



Recursive Adjectives and Possessives

- The problem is that determiners and adjectives function differently
  - They both modify a noun
  - But, while an NP can have multiple adjectives, it can only have one determiner
  - Also, an adjective directly modifies a noun whereas a determiner modifies the chunk of Adj + N
    - Therefore the determiner must be the sister of the group [Adj + N]
    - So, we need to add one more level of structure between the NP and the N which is called N'
    - Now we have the necessary sisterhood requirements and we must revise our phrase structure rules to account for N'

      NP → Det N'
      N' → Adj N
      N' → N



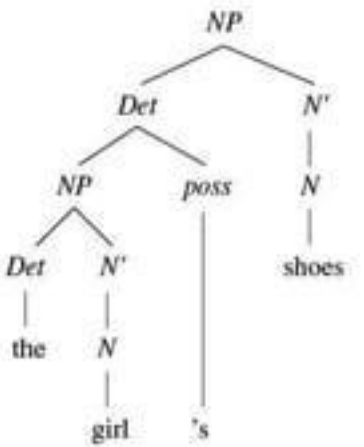
Recursive Adjectives and Possessives

- Possessor NPs such as in *the girl's shoes* function as a determiner with the *'s* representing possession (*poss*)

- So, we need to add another PS rule to our inventory:
  Det → NP poss

- This new rule forms a recursive set with the rule NP → Det N'

- The recursive nature of PS rules is common to all languages



Heads and Complements

- Phrase structure trees also show the relationships among the elements in a sentence
  - The NP immediately dominated by the S is the subject
  - The NP immediately dominated by the VP is the direct object
- Another relationship is between the **head** of a phrase and its sisters
  - The head of a phrase names the phrase (e.g. the noun is the head of a noun phrase, a verb is the head of a verb phrase, etc.)
  - Every phrase has a head, but may or may not take a **complement**, or sister category
    - For example, a VP will have a head (a verb) and may take a complement such as an NP or a CP

Heads and Complements: Selection

- Some heads require a certain type of complement and some don't
  - The verb *find* requires an NP: *Alex found the ball.*
  - The verb *put* requires both an NP and a PP: *Alex put the ball in the toy box.*
  - The verb *sleep* cannot take a complement: *Alex slept.*
  - The noun *belief* optionally selects a PP: *the belief in freedom of speech.*
  - The adjective *proud* optionally selects a PP: *proud of herself*

- **C-selection** or **subcategorization** refers to the information about what types of complements a head can or must take

Heads and Complements: Selection

- Verbs also select subjects and complements based on semantic properties (**S-selection**)
  - The verb murder requires a human subject and object

    !The beer murdered the lamp.
  - The verb drink requires its subject to be animate and its optional complement object to be liquid

    !The beer drank the lamp.
- For a sentence to be well-formed, it must conform to the structural constraints of PS rules and must also obey the syntactic (C-selection) and semantic (S-selection) requirements of the head of each phrase

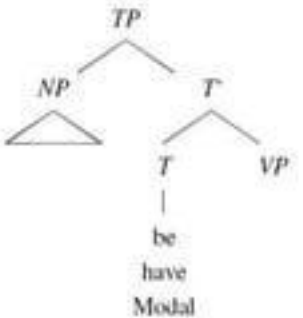
What Heads the Sentence

- The category of Auxiliary verbs (such as *will*, *has, is,* and *may* as well as modals *might, could, would*, and *can*) heads a sentence because a sentence is about a situation of state of affairs that happens at some point in time

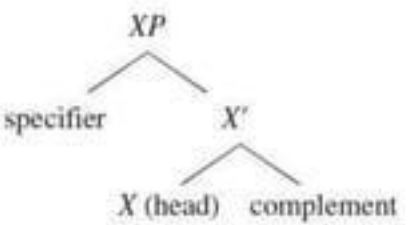
- Particular kinds of auxiliaries go with certain kinds of VPs
  - *be* selects the progressive form of the verb
    - *The baby is eating.*
  - *have* selects the past participle form of the verb
    - *The baby has eaten.*
  - The modals select the infinitival form of the verb
    - The baby must eat.

What Heads the Sentence

- Many linguists use the symbols **T (tense)** and **TP (tense phrase)** instead of Aux and S, with the TP having an intermediate **T'** category

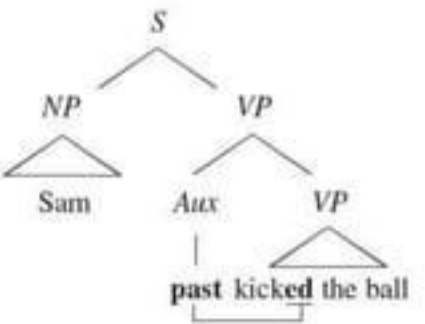


- **X-bar theory** is the theory that all XPs have three levels of structure
  - 1. the XP
  - 2. the specifier (modifier)
  - 3. X' with head X and a complement



What Heads the Sentence

- We can now add the rule VP → Aux VP into our PS rules
- However, not all sentences seem to have auxiliaries
  - *Sam kicked the soccer ball.*
- But, this sentence does have the past tense morpheme *–ed,* and in sentences without an auxiliary, the tense is the head of the S
  - Instead of having a word under Aux, there is a tense specification
  - The tense specification must match the inflection on the verb



Structural Ambiguities

- The following sentence has two meanings:

  The boy saw the man with the telescope

- The meanings are:

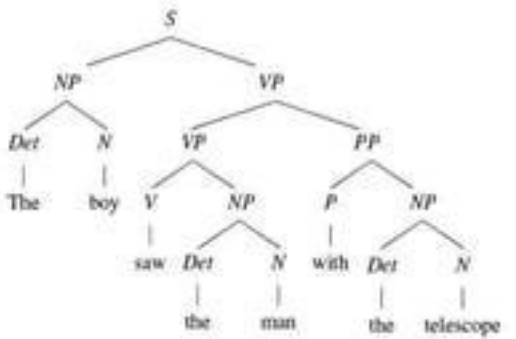
  - 1. The boy used the telescope to see the man
  - 2. The boy saw the man who had a telescope

- Each of these meanings can be represented by a different phrase structure tree

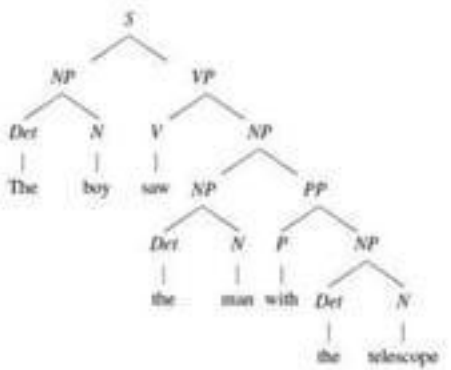
  - The two interpretations are possible because the PS rules allow more than one structure for the same string of words

Structural Ambiguities

The boy used a telescope to see the man



- The boy saw the man who had a telescope



Other Structures

- Thus far we have fourteen phrase structure rules in our inventory

- However, this set is not complete and cannot account for sentences such as:

  - 1. *The dog completely destroyed the house.*
  - 2. *The cat and the dog are friends.*
  - 3. *The cat is coy.*

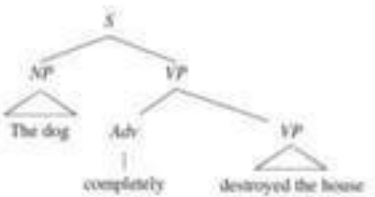
1. S → NP VP
2. NP → Det N'
3. Det → NP poss
4. NP → N'
5. NP → NP PP
6. N' → Adj N'
7. N' → N
8. VP → V
9. VP → V NP
10. VP → V CP
11. VP → Aux VP
12. VP → VP PP
13. PP → P NP
14. CP → C S

Other Structures

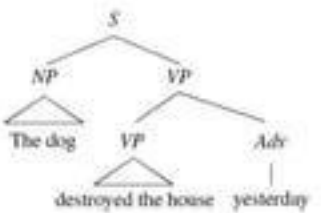
- Adverbs are modifiers that can specify how (*quickly, slowly*) and when (*yesterday, often*) an event happens

- Adverbs are sisters to phrasal categories and can go to the right or left of the phrasal categories VP and S

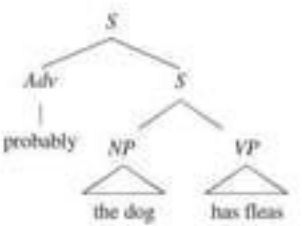
VP → Adv VP



VP → VP Adv



S → Adv S



Other Structures

- A **coordinate structure** is formed when two constituents of the same category are joined with a conjunction such as *and* or *or*
  - In a coordinate structure, the second element of the coordination (NP_2) forms a constituent with *and* (see "move as a unit" test)
  - *The cat and the dog were friends* (p.148)
- Sentences can also have the verb *be* followed by an adjective
  - In these cases the main verb *be* acts like the auxiliaries *be* and *have*
  - *The cat is coy.*

Sentence Relatedness

- Recognizing that some sentences are related to each other is another part of our syntactic competence

The boy is sleeping. *Is the boy sleeping?*

- The first sentence is a **declarative sentence**, meaning that it asserts that a particular situation exists

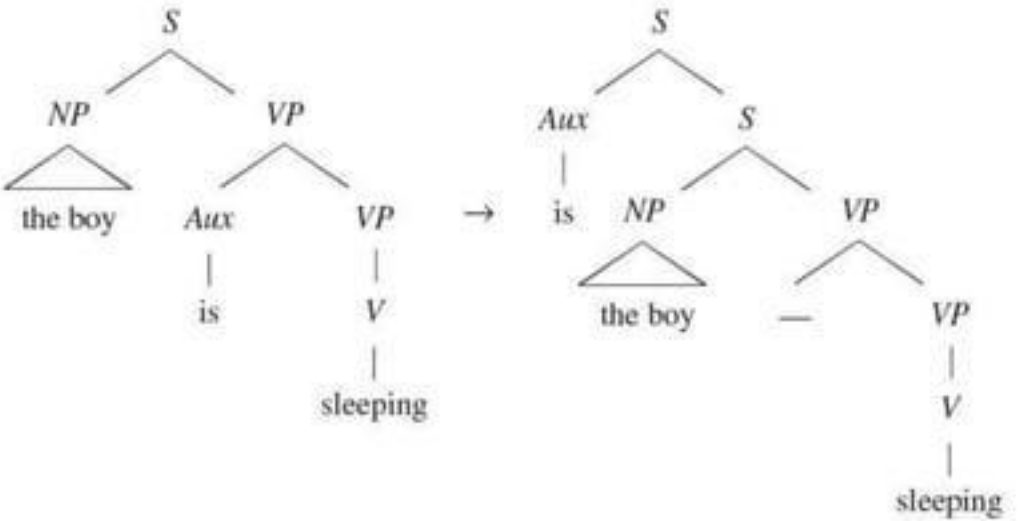
- The second sentence is a **yes-no question**, meaning that asks for confirmation of a situation

- The difference in meaning is indicated by different word orders, which means that certain structural differences correspond to certain meaning differences
  - For these sentences, the difference lies in where the auxiliary occurs in the sentence

Transformational Rules

- Yes-no questions are generated in two steps:
  - 1. The PS rules generate a declarative sentence which represents the basic structure, or **deep structure** (**d-structure**) of the sentence
  - It was Charlie who broke the window. VS Was the window broken by Charlie?
  - 2. A **transformational rule** then moves the auxiliary before the subject to create the **surface structure** (**s-structure**)
    - The "Move Aux" rule: Move the highest Aux to adjoin to (the root) S.
    - When the Aux is moved, this results in a gap in the tree, which is represented by a "__"
    - The gap represents the position from which a constituent has been moved
    - He broke the window. VS The window was broken by him.

Transformational Rules



Transformational Rules

- Other sentence pairs that involve transformational rules are:
  - Active to passive
    - *The cat chased the mouse.* → *The mouse was chased by the cat.*
  - *there* sentences
    - *There was a man on the roof.* → *A man was on the roof.*
  - PP preposing
    - *The astronomer saw the quasar with the telescope.* → *With the telescope, the astronomer saw the quasar.*

The Structural Dependency of Rules

- Transformations are structure-dependent, which means they act on phrase structures without caring what words are in the structures
  - PP preposing can be applied to any PP if it is immediately dominated by a VP
  - *The boy saw a man with a telescope.* ⟶ *With a telescope, the boy saw a man.*
  - The complementizer *that* may be omitted when it precedes an embedded sentence as long as the embedded sentence does not occur in subject position
    - *I know that you know.* *I know you know*
    - *That you know bothers me.* **You know bothers me.*
  - Subject-verb agreement stretches across all structures between the subject and the verb. The guy seems…The guys seem….

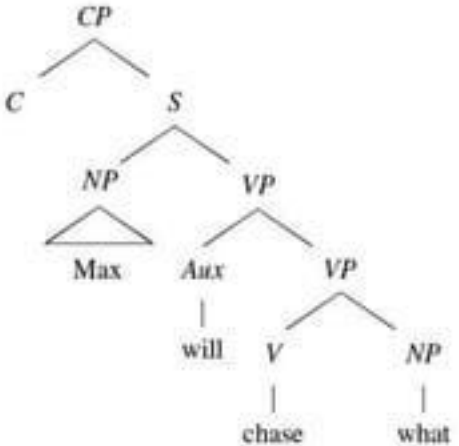
Wh Questions

Example: *What will Max chase?*

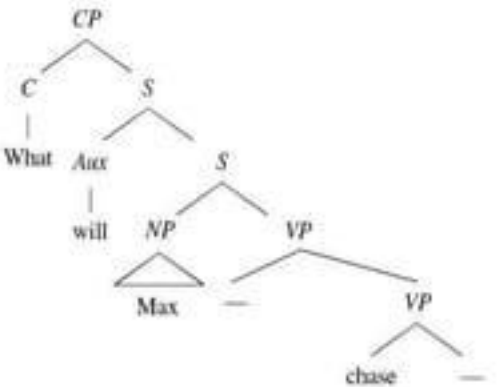
- *Wh* questions are formed in three steps:
  - 1. The PS rules generate a CP d-structure with the *wh* phrase occupying an NP position within the S (in this case a direct object position)
  - *Max will chase what?*
  - 2. The transformational rule Move Aux moves the auxiliary (in this case *will)* to adjoin with the S
  - Will Max chase?
  - 3. The transformational rule Move *wh* moves the *wh* word (in this case *what*) to the beginning of the sentence
  - What will Max chase?

Wh Questions

- Deep structure for *What will Max chase?*



Surface structure for *What will Max chase?*



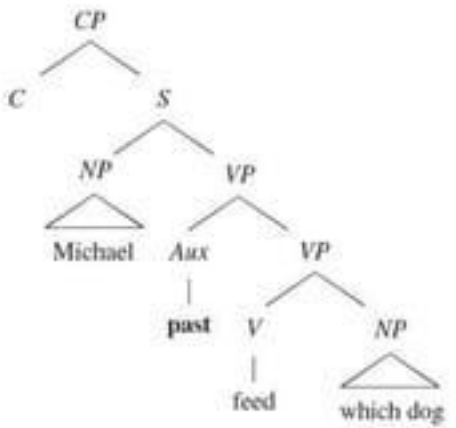
Wh Questions

Example: *Which dog did Michael feed?*

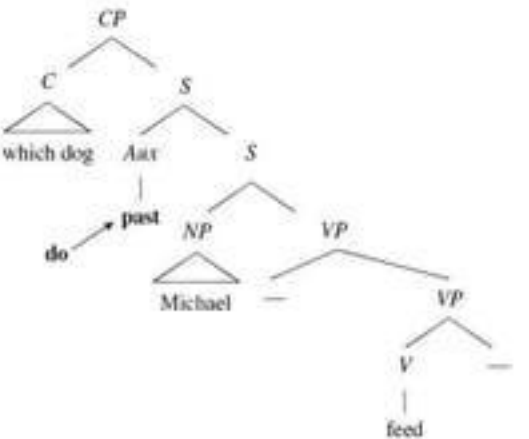
- Here the auxiliary *do* is not a part of the d-structure of the sentence
  - The d-structure is: *Michael fed which dog?*
- The Move Aux rule will move the auxiliary, in this case only the past tense
- Another rule called "*do* support" will then insert a *do* in the Aux spot to carry the tense

Wh Questions

- Deep structure for *Which dog did Michael feed*?



- Surface structure for *Which dog did Michael feed*?



UG Principles and Parameters

- Universal Grammar (UG) provides the basic design for all languages, and each language has its own **parameters**, or variations on the basic plan

  - All languages have PS rules that generate d-structures
  - All phrases consist of heads and complements
  - All sentences are headed by Aux (or T)
  - All languages seem to have movement rules

  - However, languages have different word orders within phrases and sentences, so heads and complements may be present in different orders across languages

UG Principles and Parameters

- Not all languages have *wh* movement, but for those that do:
  - The question element always moves to C
    - But this is done in various ways (Italian vs. English vs. German vs. Czech)
  - A *wh* phrase cannot move out of certain relative clauses or clauses beginning with whether or if
  - A wh phrase cannot be extracted from inside a possessive NP
- These features of wh movement are present in all languages that allow wh movement and are part of the innate blueprint for language that is UG

Sign Language Syntax

- The syntax of sign languages also follow the principles of UG and has:
  - Auxiliaries
  - Transformations such as **topicalization**, which moves the direct object to the beginning of a sentence for emphasis, and *wh* movement
  - Constraints on transformations

- That UG is present in signed languages and spoken languages shows that the human brain is designed to learn *language*, not just speech.