

Week 2, Lectures 1&2

**Review:** So, the syntax of any language consists of words (the lexicon), rules, and transformations (rules for re-arranging the structure to get to another structure). We will deal with transformations later. Now, let's look more at rules.

**0.1 Identifying word classes**

→ the basic categories: N, V, Adj/Adv, P

→ where does the determiner belong? how can you tell?

→ *distribution is the key!*

*I was glad to \_\_\_\_\_* [\*homework / \*relaxation/ travel / work / study

*\_\_\_\_\_ can be terrifying* [\*study/ \*write / \*run / cats/ dogs/ work]

*John was too /very / quite / really \_\_\_\_\_* [\*happiness/ \*energy/\* work/ \*travel/  
\*write/ tired/ nice/ rude]

→ **Morphology:** a morpheme is the smallest meaningful unit, which need not be an independent word (e.g. -s, -er, -ed, -ness, -ly). Morphemes can be inflectional or derivational. The latter change the meaning of the word or its category, while the former only add grammatical information (e.g. past or present tense, plural vs. singular)

→ **Morphemes are picky, e.g. the tense morpheme will not get attached to a noun or an adjective**

→ **The function, i.e. the job the word performs in a sentence can help too**

**[[grammatical functions = subject, predicate, direct object, indirect object, object of preposition. We will talk more about those later, just keep in mind the terminology]]**

→ **ambiguity in word classes: p. 33**

**0.2 Semantic roles of NPs**

*The fat cat chases John*

Agent = the fat cat; theme = John

*John gave the cat a toy / John gave a toy to the cat*

Goal = the cat

*John fears the fat cat*

Experiencer = John

Grammatical functions / relations = subject, object, indirect object, object of a preposition. They DO NOT always co-relate with the semantic role of the NP!!
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*John saw/feared the fat cat vs. The fat cat was seen/feared by John*

→ What's the subject of these sentences ?

→ What do subjects in English have in common? Let's test it on 5 sentences.

Case = morphological indication of the NP's grammatical role/function in the sentence

Nom = subject; Accusative = object

We will refine this later in the course

### **0.3 Grammatical categories (Morphosyntactic categories)**

Gr. Cats for Nouns: number, gender, definiteness, noun class (Bantu languages)  
case (relational category)

Gr. Cats for Verbs: tense, aspect, mood, transitivity  
voice (relational category)  
agreement category [subject/object/i.object]

Gr. Cats for Adjectives: degree of comparison (equative, comparative, superlative)  
agreement in attributive adjectives with the head noun;  
agreement in predicate adjective with the subject

Some examples p. 53 -61

Gr. Cats for Adjectives

## **1. Phrase structure rules = rules for putting words together**

- phrase structure rules combine words into groupings / units called **constituents**. Words in a sentence are not strung together in a linear fashion like beads on a string. They are hierarchically grouped together with some words belonging closer together than others.
- Hierarchical structure pervades language: it exists at the phonological (syllable), morphological (word), and sentence level. Hierarchy plays a crucial role in sentence processing because the representation we assign to the sentence we hear is also non-linear
- For now consider smaller units that comprise a sentence - phrases

### **1. From words to phrases**

→ some important aspects of phrase structure.

**All phrases have heads.** English is a left-headed language, but other languages may have the head on the right.

## Phrase structure rules are recursive

John runs

The cat runs

The fat white cat runs

The fat white silly cat runs

The fat white silly cat with a spotted tail and funny feet runs

The fat white cat and a small thin cat run

- In the above sentences, what is the subject?
- In order to represent the idea that more than one word than be the subject of a sentence we say that the subject is a Noun Phrase – NP – which is a constituent, or another words, a unit
- Importantly, every NP has a head – the noun. It may or may not also have a complement. For example: *The man with the telescope*. The noun “man” is the head of the phrase that determines its category. “with the telescope” is a complement. It is optional.
- The same can be done with the verb:

*[The man [with the telescope]]*

John runs

John runs and screams

John sees a fat white cat

John put the fat white cat on the floor

→ the Verb Phrase constituent can consist of only a single verb, but it may also have one or more *complements*, *ie.* An object, an indirect object.

→ A noun phrase as well as a verb phrase are constituents. That an NP is a constituent is seen from our ability to replace a very long NP with a single pronoun “it”/”she”. This means that for syntactic purposes even though the NP is very long, it occupies only one – a single – syntactic position.

Ex. The big fat white cat with a spotted tail and a funny pink nose runs = She runs

→ verb phrases (VPs) are constituents as well. Interestingly verbs that take direct objects (transitive verbs) form a constituent with the object, but not with the subject:

Ex. John sees the big fat white cat that runs around and Bill does too. / so does Bill  
Does too/ so does = sees the big fat cat that runs around

→ we can replace the entire VP with a VP-“pronoun” such as “Does too” which replaces not just the verb but V+Object. There is no such pronoun that would replace V+Subject

even though it is conceivable in theory: \* *John sees the fat cat and so does the dog*  $\neq$  *John sees the dog as well*

→ In addition, constituents don't like to be broken up. Consider the following:

*John saw the fat cat and the skinny cat*  
*Who did John see?*  
*\*Who did John see and?*  
*John saw the fat cat with the skinny cat*  
*Who did John see the fat cat with?*

→ now to see that constituents are hierarchically structured, consider the following NPs

*Fat cats and dogs*

→ what are the two possible readings?

→ knowing what we know from morphology and ambiguous words, how do we represent the above ambiguity via tree diagrams?

[[Fat cats] and dogs] vs. [fat [cats and dogs]

Fat cats and dogs

→ more will be said about constituents and the tests we have to determine them. For now we can explain the above effect as follows: the verb and the object belong structurally "closer" together than the verb and the subject

→ Other phrases: PPs, AdjP

## 2. From phrases to sentences

→ Let's build a sentence. Below I give you a formal grammar, i.e a lexicon and a set of rules for putting the words together.

Our lexicon: { john, sees, likes, the, a, fat, man, cat, cats, run, walk, scream, -s, -ed, will, can }

Our rules: S → NP Infl VP  
NP → det N;  
NP → PN (proper name);  
NP → Adj, N;  
VP → Vtr NP  
VP → Vintr  
VP → Vintr Conj Vintr  
VP → Vtr Cons V intr  
NP → det N  
NP → det (Adj) N(sg)  
NP → det (Adj )N(pl)

NP  $\rightarrow$  (Adj) N(pr)  
 N(sg)  $\rightarrow$  {cat, man}  
 N(pl)  $\rightarrow$  {cats}  
 N(pr)  $\rightarrow$  {John}  
 Adj  $\rightarrow$  {fat}  
 V(tr)  $\rightarrow$  {like, see}  
 V(intr)  $\rightarrow$  {scream, run, walk}  
 Det  $\rightarrow$  {a, the}  
 Infl  $\rightarrow$  {-ed, -s, will, can}

$\rightarrow$  phrase structure rules are sometimes referred to as “re-write” rules. The symbol on the left (e.g. S or VP) is rewritten on the right (NP VP). This is our first step in looking at natural language as a formal language

$\rightarrow$  phrase structure rule are intended to generate only the grammatical sentences and none of the ungrammatical ones.

$\rightarrow$  let’s test our grammar. Does it generate the sentence *John sees the fat cat*

S					
NP	Infl	VP			
N(pr)		Vtr	NP		
John		sees	Det	Adj	N
			The	fat	cat

What about a sentence *John the fat cat sees* ?

### 3. On Recursion<sup>1</sup>

$\rightarrow$  a sentence can take another sentence as a complement – **phrase structure rules are recursive!** That is, they include rules of the form:

S  $\rightarrow$  NP VP

VP  $\rightarrow$  V ( that) S

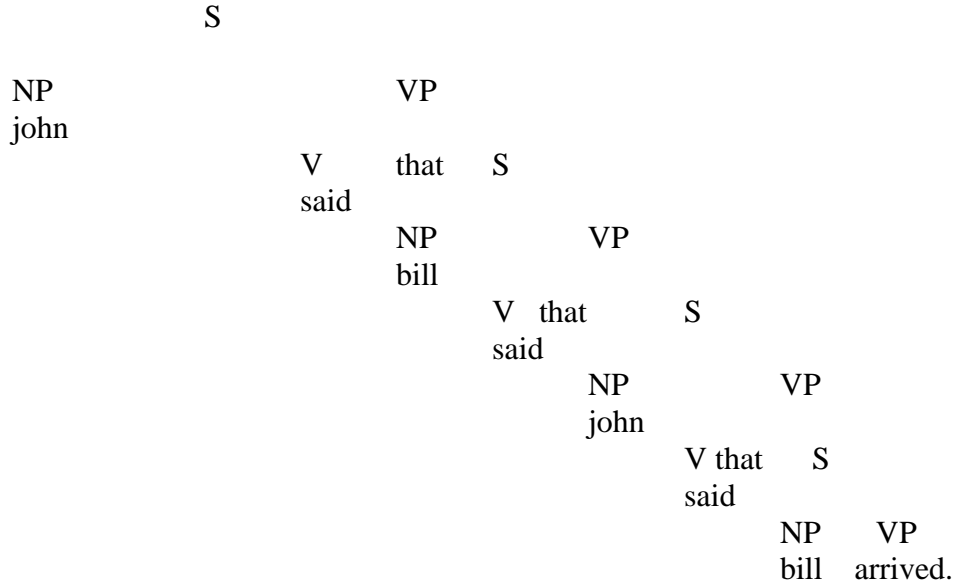
Or

NP  $\rightarrow$  Det Adj(+) N = the big, fat, scary, hairy, .....white... cat

$\rightarrow$  the two rules above allow us to create an infinite number of new sentences from a finite lexicon:

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<sup>1</sup> See section title



*John said that bill arrived*

*John said that bill said that john said that bill arrived*

*John said that bill said that john said that bill said that john said that bill arrived*

*John said that bill said that john said that bill said that john said that bill said that john said that bill arrived*

→ the point is: for any sentence S you can create a sentence of the form V that S. while the resulting sentences would not be interesting, and would be very hard to process, they are possible and they can be generated by our grammar!

#### 4. Sentential Ambiguity

→ phrase structure rules also explain why sentences can be structurally ambiguous:

→ A noun phrase as well as a verb phrase are constituents that have an internal hierarchical structure.

*John sees a bug with a telescope*

a. *john sees a bug who is holding a telescope*

b. *john sees a bug through a telescope*

→ how do we arrive at these two different readings? We need to add some rules to our grammar:

NP → Det N PP = [a bug with a telescope]

VP → V NP PP = [sees a bug with a telescope]

PP → P NP = [with a telescope]

→ let us now draw the two representations that will account for the ambiguity in the sentence.

→ Again, why does the existence of sentential ambiguity indicate that there is hierarchy in syntax?

### 5. Constituents and constituency tests – now in more detail

→ But how do you know whether two or more words form a constituent?

→ below are several tests we can use to determine whether two or more words in the sentence form a constituent. Just because they are next to each other does not mean that they are a constituent!

→ For example, the subject and the verb stand next to each other, yet they do not form a constituent: *John see Bill and so does Mary* ≠ *John sees Mary as well*

**Test 1. substitution by a pronoun:** only a constituent can be replaced by a pronoun-like element. For example, as we saw before:

- (1) The big fat white cat chases the small cat → She chases the small cat
- (2) The cat hid in the closet = > She hid there
- (3) The fat white cat likes the small cat and I do so too.

**Test 2. the movement / clefting test:** only a constituent can be moved to a different position in the sentence. This is also referred to as “clefting” or “topicalization”. (A word of caution: some constituents may resist being topicalized for independent reasons.)

- (4) In the closet she sat for a long time; Into the woods they came carrying sticks
- (5) \*In the she sat for a long time closet
- (6) The fat white cat, I like! (the brown one, I just find cute)
- (7) \*The fat I like white cat

**Test 3. the ellipsis test: only constituents can be omitted in the sentence (elided).**  
**This test is similar to substitution in some respects**

- (8) The fat cat likes to eat too much, but the thin cat does not  
Does not = [like to eat too much]
- (9) The fat cat can't run fast, but the skinny one can. [run fast]
- (10) ?/\* The fat cat can't run fast, but the skinny one can run.

**Test 4. Question-answer test:** only a constituent can serve as an answer to questions that start with *who*, *what*, *where*

- (11) Who does John like? – the fat cat
- (12) Who likes John? – the small brown cat
- (13) Where is the fat cat? – in the closet
- (14) What does the fat cat do? – run around; make a mess