

Constituent Structure

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The problem

Form-meaning mapping

*The same meaning may be expressed by quite different forms in different languages. Are these differences only superficial? Are there categories and concepts that are relevant across all languages realized with relatively superficial formal differences? Alternatively, are there a few basic architectural **types** that can help explain all the diversity?*

Form-meaning anomaly

Within a single language, the same form may have more than one meaning. We call such forms **ambiguous**:

1. *Keep the promises you make to yourself.*

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Grammar

- 1 We call the formal patterns that help us recognize formal classes like Subject, Noun, Verb, Adjective **grammar**:
 - 1 Adjectives come before Nouns
 - 2 Verbs come after Subjects
 - 3 Plural Nouns end in /s/
- 2 Meaning can be conveyed without obeying the rules of grammar.
- 3 But the rules of grammar and semantic patterns involving prepositions and sound sequences help us construct meaning representations even when our grasp of word meaning is tenuous or non-existent.

Grammar: Formal patterns of the language at multiple levels

Components

SYNTACTIC	<i>The</i> ____, imperatives (verse 2), relative clauses (verse 2), poetic inversion (verse 1)
MORPHOLOGICAL	<i>-ous, -ish, -s</i>
PHONOLOGICAL	<i>brillig, gimble</i> vs. <i>bgillir, gmible</i>
PHONESTHEMIC	<i>sl-</i> → <i>slithey</i> , <i>br-</i> → <i>brillig</i>
POETIC	A-B, A-B rhyming pattern
DISCOURSE	story telling sequence: description of place, warning of peril, hunt, succesful return

Constituent patterns

- i. The promises you make are very important.
- ii. The promises you make to your self are very important.
- iii. You always forget the promises you make.
- iv. You always forget the promises you make to yourself.

Two constituents

The strings *the promises you make* and *the promises you make to yourself* are constituents (recurring partials with constant meaning consisting of **one or more words**). [To be revised.]

Constructions

- I.
 - i. He kept **his business activities** to himself.
 “He was secretive about his business activities”
 keep X to oneself \Rightarrow “be secretive about X”
 - ii. He kept **everything** to himself.
 - iii. He kept **that information** to himself.

Keep [_x **the promises you make to yourself**] to yourself.
 Keep [_x **the promises you make**] to yourself.

- II. He kept his promise/word/appointment.
 keep X \Rightarrow fulfill the obligation entailed by X.

Keep [_x **the promises you make to yourself**].
 Keep [_x **the promises you make**].

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Analysis of ambiguity

The sentence:

Keep the promises you make to yourself.

is ambiguous because it can be **derived** two different ways:

- (a) Substitute the constituent *the promises you make* into the *Keep X to yourself* construction.
- (b) Substitute the constituent *the promises you make to yourself* into the *Keep X* construction.

Thus we have an ambiguity of both constituent structure and construction.

Current definition of constituent too loose

Two constituents

Constituents are recurring partials with constant meaning consisting of **one or more words**. [To be revised.]

- i. He kept that promise.
- ii. She kept that appointment.

Better definition of constituent

Constituents

Constituents of type X are recurring partials with constant meaning consisting of **one or more words** that can be substituted into constructions allowing constituents of type X.

- i. He kept that appointment.
- * He kept [_Xkept that].
- * He kept [_Xkept that] to himself.

Intuition

Meaningful expressions

The constructions of the language define slots into which **meaningful expressions** of the right type can be substituted. *kept that* is not a constituent because there is no construction of English that treats it as a meaningful unit.

Defining meaningful expression

Meaningful expressions of type X

Words of type X are meaningful expressions of type X. Phrases that can be substituted for meaningful expressions of type X into constructions calling for meaningful expressions of type X are meaningful expressions of type X-Phrase.

	Type
a. He kept [_X <i>promises</i>].	Noun
b. He kept [_X <i>his promises</i>]	Noun Phrase
c. He kept [_X <i>the promises</i>]	Noun Phrase
d. He kept [_X <i>the promises he made</i>]	Noun phrase
e. He kept [_X <i>the promises he made to himself.</i>]	Noun Phrase

Keep [_{NP}X]: fulfill the obligation entailed by X.

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e. He kept [_X <i>the promises he made to himself.</i>]	Noun Phrase

Keep [_{NP}X]: fulfill the obligation entailed by X.

Substitutability

Intuition: Complex linguistic expressions are always related (built up out of) simpler ones:

Malay example

Lone verbs define constructions: $X \text{ makan } Y = X \text{ eats } Y$ (Malay)

- | | |
|--|---|
| (i) Ahmad makan nasi
Ahmad eats rice | (v) Orang tua itu makan ikan
Person old this eats fish |
| (ii) Orang ini makan nasi
Person this eats rice | (vi) Anjing itu makan tulang besar
Person this eats bone big |
| (iii) Anjing itu makan nasi
dog that eats rice. | |
| (iv) Orang tua itu makan pisang
Person old this eats banana | |

nasi ('rice'), *pisang* ('banana'), *tulang*, and *ikan* are Nouns, and *Ahmad*, *orang*, and *anjing* are Nouns, so we define our *makan* construction as:

$$[{}_{NP} X] \text{ makan } [{}_{NP} Y] = X \text{ eats } Y$$

Generalizations: Phrase structure

We find, across an enormous variety of languages, an enormous amount of regularity in the word order in constructions. So in Malay whenever we have $[_{NP}X]$:

Noun Adj Det

Noun Adj

Noun Det

Noun

This is NOT the same word order we find in English $[_{NP}X]$, but it is consistent in Malay. So we write a **Phrase Structure Rule** for Malay:

$NP \rightarrow \text{Noun } (\text{Adj}) (\text{Det})$

Hierarchy

So far we can **handle** a certain class of English sentences by assigning them to one of two constructions.

- ① Keep $[_{NP}X]$ to oneself = 'be secretive about X'
- ② Keep $[_{NP}X]$ = 'fulfill the obligation entailed by X'

But consider this sentence:

He kept $[_{NP}$ the appointments he kept $[_{NP}$] to himself = 'He was secretive about the appointments he kept.'

An instance of BOTH constructions simultaneously. One **inside** the other.

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But consider this sentence:

He kept $[_{NP} \text{the appointments}]_S$ he kept $[_{NP} \text{those appointments}]$]] to himself = 'He was secretive about the appointments he kept.'

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Sentences inside sentences

1 Relative clauses

He kept [_{NP} the appointments [_S he made [_{NP} those appointments]]] to himself

2 Clause complements

He believed [_S that Mary was a fool.]

3 Subordinate clauses

He liked Susan, because [_S she was a Republican like him.]

NPs inside NPs

- 1 [NP a book [PP about [NP the president]]]
- 2 [NP a dessert [PP with [NP dark chocolate]]]

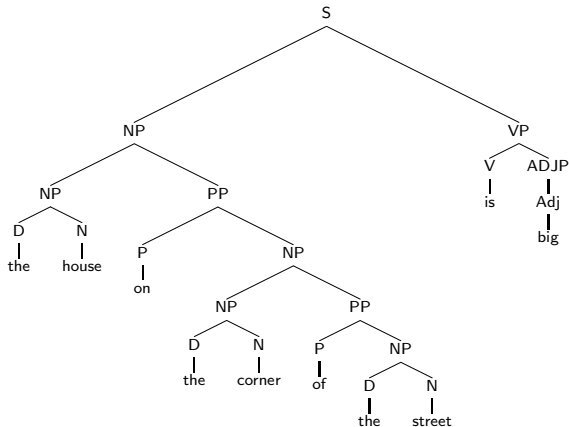
Recursion

X inside X

Whenever we find a constituent of type X inside another constituent of type X, we call it **recursion**.

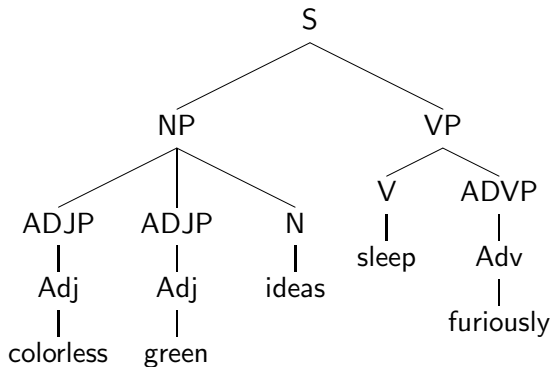
- 1 S: [_S John believed [_S Mary was a fool]]
- 2 NP: [_{NP} the shop [_{PP} at [_{NP} the end [_{PP} of the street]]]]
- 3 PP: [_{NP} the shop [_{PP} at [_{NP} the end [_{PP} of the street]]]]
- 4 VP: [_S John [_{VP} believed [_S Mary [_{VP} was a fool]]]]

Representing hierarchical structure



Colorlessness

The autonomy of syntax: This is grammatical; that is, it obeys the language's formal requirements, while remaining hard to interpret;



Constituency

- (a.) Substitutability: Constituents of types X can be substituted into construction slots of type X. As a result, we expect to find constituent of type X in more than one construction.

NPs

Can be subjects, direct objects, objects of preposition, possessors, ...

- (b.) Type of construction slot: We determine the type of a construction slot by finding one word fillers. The part of speech of the word determines the type of the slot. (But what about S slots?)
- (c.) Constructions: regular syntactic patterns in the language defining a fixed meaning when all of the slots are filled.
1. Idioms (keep X to yourself)
 2. Verb constructions (Give $[_{NP} X]$ to $[_{PP} Y]$ Give $[_{NP} Y]$ $[_{NP} X]$, believe that $[_S X]$, * walk that $[_S X]$)

Phrase structure

- Generalizations across constructions
- Regularities in the order of the words in $[_{NP}X]$, $[_{PP}X]$, $[_{VP}X]$, and so on.
- Phrase structure rules are quite variable from language to language:

NP rules

English	$NP \rightarrow (D) (Adj) N (PP) (S)$
Malay	$NP \rightarrow N (Adj) (D)$
Japanese	$NP \rightarrow (D) (Adj) (PP) (S) N$

English phrase structure: Version 1

S → NP (Aux) VP

PP → P NP

NP → (D) (AdjP)* N (PP)* (S)

VP → (AdvP) V (NP) (PP) (S) (AdvP)*

AdjP → (AdvP)* Adj

AdvP → (AdvP)* Adv