Exploring English Phrase Structure

Generative Grammars and Grammatical Rules

Recall that our task as linguists is to provide a **generative grammar** that encapsulates our knowledge of the English language: a system of rules that will produce all and only the grammatical sentences of English.

We've also seen that these rules must capture two features of our knowledge about English sentences:

- knowledge about the linear order of the words in our sentences

- knowledge about the internal organization of sentences into constituents

Both of these aspects of our knowledge can be represented succinctly by means of **phrase structure rules.** A phrase structure rule specifies:

- which constituents can or must occur in a phrase of a particular type (such as a noun phrase, verb phrase, etc.),

- the relative order in which these constituents must appear

What do our intuitions about grammaticality tell us about the phrase structure rules of English?

Noun Phrases

What sorts of constituents may appear within an English noun phrase? What order must these constituents come in?

(1)   a. [NP Elephants] enjoy peanuts.
        b. [NP The elephants] enjoy peanuts.
        c. [NP Elephants with big appetites] enjoy peanuts.
        d. [NP Some elephants with big appetites] enjoy peanuts.

        e. *[NP Elephants the] enjoy peanuts.
        f. *[NP Some with big appetites elephants] enjoy peanuts.

(2)   a. [NP Hungry elephants] enjoy peanuts.
        b. [NP Those hungry elephants] enjoy peanuts.
        c. [NP Those hungry elephants in the hallway] enjoy peanuts.

        d. *[NP Hungry those elephants in the hallway] enjoy peanuts.

(3)   NP → (Art) (Adj) N (PP)
        'An English noun phrase may consist of an optional article,
         followed by an optional adjective, followed by a noun,
         followed by an optional prepositional phrase.'

Prepositional Phrases

Our phrase structure rule for English NPs refers to prepositional phrases. What should the phrase structure rule for English PPs look like?

(4)   a. I took a picture [$_{PP}$ of the elephant].
         b. I took a picture [$_{PP}$ of the hungry elephants with floppy ears].

         c. *I took a picture [$_{PP}$ of].

         d. *I took a picture [$_{PP}$ the elephant of].
         e. *I took a picture [$_{PP}$ the hungry elephants with floppy ears of].

(5)   PP → P NP
         'An English prepositional phrase consists of a preposition
          followed by a noun phrase.'

How do our NP and PP rules interact?

An interesting feature of our NP and PP rules so far:

    NP → (Art) (Adj) N (PP)

    PP → P NP

Our rules allow us to construct a NP containing a PP, which will in turn contain another, smaller NP:

    [$_{NP}$ the parents of [$_{NP}$ a student]]

And nothing prevents us from including another PP within this embedded NP:

    [$_{NP}$ the parents of [$_{NP}$ a student with [$_{NP}$ some friends]]]

In fact, we could continue this process *ad infinitum*, producing a never-ending supply of English NPs:

    [$_{NP}$ the parents of [$_{NP}$ a student with [$_{NP}$ some friends from [$_{NP}$ the suburbs]]]]

    [$_{NP}$ the parents of [$_{NP}$ a student with [$_{NP}$ some friends from [$_{NP}$ the suburbs
        of [$_{NP}$ a large city]]]]]

    [$_{NP}$ the parents of [$_{NP}$ a student with [$_{NP}$ some friends from [$_{NP}$ the suburbs
        of [$_{NP}$ a large city with [$_{NP}$ an angry mayor]]]]]]

    [$_{NP}$ the parents of [$_{NP}$ a student with [$_{NP}$ some friends from [$_{NP}$ the suburbs
        of [$_{NP}$ a large city with [$_{NP}$ an angry mayor [with [$_{NP}$ political enemies]]]]]]]

    and so on. . .

Recursion & the infinitude of language

This particular property of our phrase structure rules is known as **recursion**:

- a set of phrase structure rules is **recursive** if they allow a constituent of a particular category (such as the category NP) to contain another, smaller constituent of that same category

Diagrammatically:

NP

the parents of NP

a student with NP

some friends from NP

the suburbs of NP

a large city with NP

an angry mayor with NP
.
.
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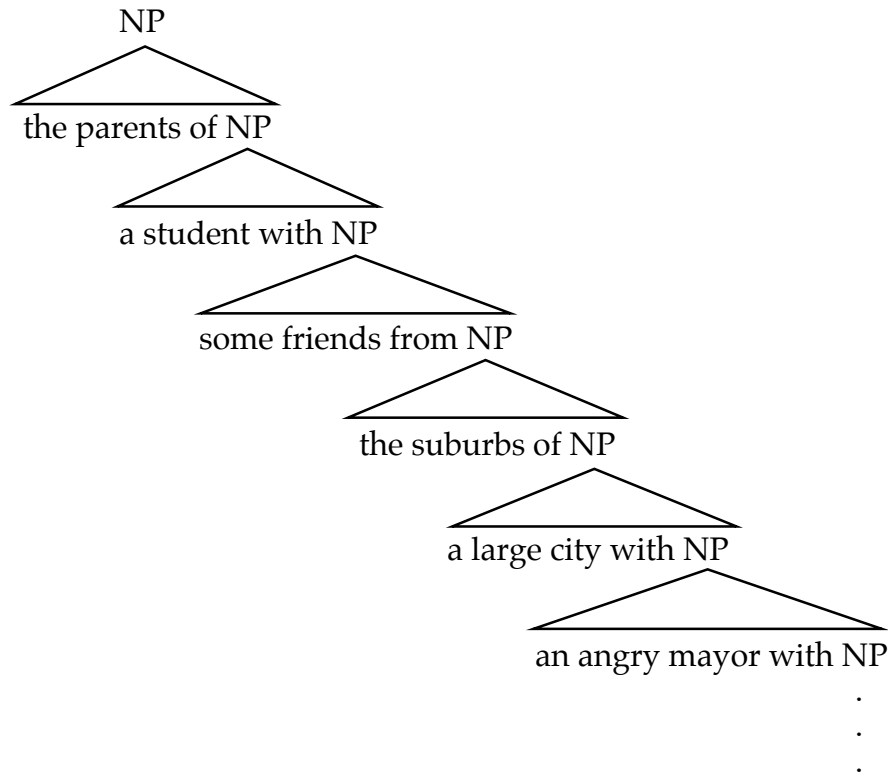
"Language makes infinite use of finite means":

- a finite, recursive system of phrase structure rules can produce an infinite number of grammatical expressions in our language

- two rules ... unlimited supply of NPs!

Recursion appears to be a universal feature of human languages:

- (almost?) all languages allow their basic structural building blocks to be used again and again in the construction of phrases of unlimited complexity

- some have even suggested that recursion is the defining feature that separates human languages from systems of animal communication

- more on both of these claims later in the semester

Verb Phrases

What should our phrase structure rule for English VPs be?

(6)   a. The chimpanzee [$_{VP}$ left].
        b. The chimpanzee [$_{VP}$ left the laboratory].
        c.   The chimpanzee [$_{VP}$ left through the open door].

        d. *The chimpanzee [$_{VP}$ the laboratory left].
        e. *The chimpanzee [$_{VP}$ through the open door left].

        f. The chimpanzee [$_{VP}$ left the laboratory through the open door].

        g. *The chimpanzee [$_{VP}$ left through the open door the laboratory].

(7)   VP → V (NP) (PP)
        'An English verb phrase consists of a verb, followed by an optional noun
         phrase, followed by an optional prepositional phrase.'

Sentences

(8)   a. [$_{NP}$ The agitated monkey] [$_{VP}$ bit the grey elephant with floppy ears].
        b. [$_{NP}$ The grey elephant with floppy ears] [$_{VP}$ is a coward].
        c. [$_{NP}$ The agitated monkey] [$_{VP}$ scampered under the bed].

        d. *[$_{NP}$ The grey elephant with floppy ears] [$_{NP}$ a coward].
        e. *[$_{NP}$ The agitated monkey] [$_{PP}$ under the bed].
        f. *[$_{PP}$ Under the bed] [$_{VP}$ bit the grey elephant with floppy ears].

(9)   S → NP VP
        'An English sentence consists of a noun phrase followed by a verb phrase.'

(Note that are still many English phrases and sentences that our rules cannot
produce. Here are just a few of them:

        [$_{NP}$ John's agitated monkey]

        [$_{NP}$ John's suspicion that the agitated monkey bit the grey elephant]

        [$_{VP}$ looks sad]

        [$_{VP}$ gave the monkey a trophy]

        [$_{S}$ John knows that the monkey is upset with him]

With more time, we could augment our current phrase structure rules so that
they could produce these expressions too. But that's a task for another class...)

But don't our rules produce too many structures?

Consider the following sentence:

(10)   The angry monkey hit the man with the banana.

In fact, our current phrase structure rules can produce (10) in two different ways. What are these two structures?

Structure #1:

Structure #2:

Is this a problem? To answer this question, we can use what we learned in our previous lecture about pronouns and *it*-cleft sentences to probe the internal constituent structure of (10):

Testing whether Structure #1 is correct:

(11)

(12)

Testing whether Structure #2 is correct:

(13)

(14)

But don't our rules produce lots of jibberish?

Here are some other sentences that our phrase structure rules can produce:

(15) a. The man in the table shone through the night.
      b. The painting of the young girl frolicked in the mud.
      c. The ship spoke of the wedding of the government.

Is this a problem? Only if we think that for a sentence to be grammatical, it must carry a sensible, coherent meaning.

What do the following examples show us about the relationship between grammaticality and intelligibility?

(16) a. John and Mary meet last night.
      b. Chomsky book attempt describe speaker knowledge language.
      c. Me talk pretty one day.

(17) a. 'Twas brillig, and the slithy toves
         did gyre and gimble in the wabe. (fr. Lewis Carroll's poem *Jabberwocky*)
      b. Colorless green ideas sleep furiously.   (Chomsky's famous example)

(18) a. Wabe 'twas the brillig in and
         gimble the and slithy gyre toves did.
      b. Sleep green colorless furiously ideas.