***CHALLENGE PROBLEM SET 8: IMPLICIT ARGUMENTS***[16]

*[Creative Thinking; Challenge]*

Above we claimed that the verb *give* requires either an NP and a PP or two NPs (i.e. *Dave gave a punchbowl to Andrew* and *Dave gave Andrew a headache*). But consider sentences like the following:

1) I gave blood.
2) I don't give a darn.
3) Andy gives freely of his time.
4) Dan gave his life.

Each of these might lead us to conclude that *give* requires fewer arguments than we have claimed. Are these simply counterexamples to the claim that *give* is of subcategory $V_{[NP\ \_\_\ NP\ \{NP/PP\}]}$ or is something more complicated going on here?

A related but slightly different issue arises with sentences like those in (5) and (6).

5) Dan gives to charity.
6) Sorry, I gave last week.

Will your solution for 1–4 work for these examples too?

[16] Thanks to Dave Medeiros for suggesting this problem set.

chapter 3

# Constituency, Trees, and Rules

**Learning Objectives**

After reading chapter 3 you should walk away having mastered the following ideas and skills:

1. Be able to explain what a constituent is.
2. Show whether a string of words is a constituent or not.
3. Using phrase structure rules, draw the trees for English sentences.
4. Explain and apply the Principle of Modification.
5. Produce paraphrases for ambiguous sentences and draw trees for each meaning.
6. Using data, be able to extract a set of phrase structure rules for another language.
7. Define recursion and give an example.

## 0. INTRODUCTION

Syntax is about the study of sentence *structure*. So let's define what we mean by "structure." Consider the sentence in (1):

1) The student loved his syntax assignments.

*Syntax: A Generative Introduction*, Third Edition. Andrew Carnie.

One way to describe this sentence is as a simple linear string of words. Certainly this is how it is represented on the page. We could describe the sentence as consisting of the words *the, student, loved, his, syntax,* and *assignments* in that order. As you can probably figure out, if that were all there was to syntax, you could put down this book here and not bother with the next fifteen chapters. But that isn't all there is to syntax. The statement that sentence (1) consists of a linear string of words misses several important generalizations about the internal structure of sentences and how these structures are represented in our minds. In point of fact, we are going to claim that the words in sentence (1) are grouped into units (called ***constituents***) and that these constituents are grouped into larger constituents, and so on until you get a sentence.

Notice that on a purely intuitive level, certain words seem to be closely related to one another. For example, the word *the* seems to be tied more to the meaning of *student* than it is to *loved* or *syntax*. A related intuition can be seen by looking at the sentences in (2).

2) a) The student loved his phonology readings.
   b) The student hated his morphology professor.

Compare these sentences to (1). You'll see right away that the relationship between *the student* and *his syntax assignments* in (1) and *the student* and *his phonology readings* in (2a) is the same. Similarly, the relation between *the student* and *his morphology professor* in (2b), while of a different kind (hating instead of loving), is similar: There is one entity (*the student*) who is either hating or loving another entity (*his syntax assignments, his phonology readings* or *his morphology professor*). In order to capture these intuitions (the intuition that certain words are more closely connected than others, and the intuitions about relationships between words in the sentence), we need a more complex notion. The notions we use to capture these intuitions are ***constituency*** and ***hierarchical structure***. The idea that *the* and *student* are closely related to one another is captured by the fact that we treat them as part of a bigger unit that contains them, but not other words. We have two different ways to represent this bigger unit. One of them is to put square brackets around units:

3) [the student]

The other is to represent the units with a group of lines in what is called a tree structure:

4)



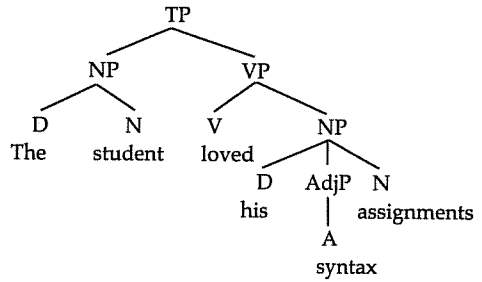


These bigger units are called ***constituents***. An informal definition for a constituent is given in (5):

5) *Constituent*: A group of words that function together as a unit.

Constituency is the most important and basic notion in syntactic theory. Constituents form the backbone of the rest of this book. They capture the intuitions mentioned above. The "relatedness" is captured by membership in a constituent. As we will see it also allows us to capture the relationships between constituents exemplified in (1).

Constituents don't float out in space. Instead they are embedded one inside another to form larger and larger constituents. This is ***hierarchical structure***. Foreshadowing the discussion below a bit, here is the structure we'll develop for (1):

6)



This is a typical hierarchical ***tree structure***. The sentence constituent (represented by the symbol TP) consists of two constituents: a subject ***noun phrase*** (NP) *[the student]* and a predicate phrase or ***verb phrase*** (VP) *[loved his syntax assignments]*. The subject NP in turn contains a ***noun*** (N) *student* and a ***determiner*** (or article) (D) *the*. Similarly the VP contains a ***verb*** (V), and an object NP *[his syntax assignments]*. The object NP is further broken down into three bits: a determiner *his*, an adjective *syntax*, and a noun *assignments*. As you can see this tree has constituents (each represented by the point where lines come together) that are inside other constituents. This is hierarchical structure. Hierarchical constituent structure can also be represented with brackets. Each pair of brackets ([ ]) represents a constituent. We normally put the label of the constituent on the left member of the pair. The ***bracketed diagram*** for (6) is given in (7):

7) $[_{TP}[_{NP}[_{D}\text{The}][_{N}\text{student}]][_{VP}[_{V}\text{loved}][_{NP}[_{D}\text{his}][_{AdjP}[_{Adj}\text{syntax}]][_{N}\text{assignments}]]]]$.

As you can see, bracketed diagrams are much harder to read, so for the most part we will use tree diagrams in this book. However, sometimes bracketed

diagrams have their uses, so you should be able to translate back and forth between trees and bracketed diagrams.

**The Psychological Reality of Constituency**

In the 1960s, Merrill Garrett and his colleagues showed that constituency has some reality in the minds of speakers. The researchers developed a series of experiments that involved placing a click in a neutral place in the stream of sounds. People tend to perceive these clicks not in the place where they actually occur, but at the edges of constituents. The italicized strings of words in the following sentences differ only in how the constituents are arranged.

i) [In her *hope of marrying*] *An/na was impractical.*
↑

ii) [Harry's *hope of marrying An/na*] *was impractical.*
↑

Syntactic constituency is marked with square brackets [ ]; the placement of the click is marked with a slash /. People perceive the click in different places (marked with a ↑) in the two sentences, corresponding to the constituent boundaries – even though the click actually appears in the same place in each sentence (in the middle of the word *Anna*).

## 1. Rules and Trees

Now we have the tools necessary to develop a simple theory of sentence structure. We have a notion of constituent, which is a group of words that functions as a unit, and we have labels (parts of speech) that we can use to describe the parts of those units. Let's put the two of these together and try to develop a description of a possible English sentence. In generative grammar, generalizations about structure are represented by rules. These rules are said to "generate" the tree. So if we draw a tree a particular way, we need a rule to generate that tree. The rules we are going to consider in this chapter are called ***phrase structure rules*** (PSRs) because they generate the phrase structure tree of a sentence.

### *1.1 Noun Phrases (NPs)*

Let's start with the constituents we call noun phrases (or NPs) and explore the range of material that can appear in them. The simplest NPs contain only a noun (usually a proper noun [+proper], pronoun [+pron], mass noun [−count] or a plural noun [+plural]):

8) a) John b) water c) cats



Our rule must minimally generate NPs that contain only an N. The format for PSRs is shown in (9a); we use X, Y, and Z here as variables to stand for any category. (9b) shows our first pass at an NP rule:

9) a) XP → X Y Z

*the label for the constituent* — *"consists of"* — *the elements that make up the constituent*

b) NP → N

This rule says that an NP is composed of (written as →) an N. This rule would generate a tree like (10):

10)
NP
|
N

There are many NPs (e.g., those that are [+count]) that are more complex than this of course:

11) a) the box
b) his binder
c) that pink fluffy cushion

We must revise our rule to account for the presence of determiners:

12) a) NP → D N

This generates a tree like:

b)
NP
D N
the box

Compare the NPs in (8) and (11): You'll see that determiners are optional. This being so, we must indicate their optionality in the rule. We do this with parentheses ( ) around the optional elements:

13) NP → (D) N

Nouns can also be optionally modified by adjectives, so we will need to revise our rule as in (14) (don't worry about the "P" in AdjP yet, we'll explain that below).

14) a) the big box b) his yellow binder

15) NP → (D) (AdjP) N

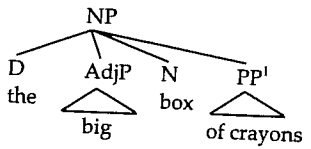
Nouns can also take prepositional phrase (PP) modifiers (see below where we discuss the structure of these constituents), so once again we'll have to revise our rule:

16) a) the big box of crayons
b) his yellow binder with the red stripe

17) NP → (D) (AdjP) N (PP)

For concreteness, let's apply the rule in (17):

18)




The NP constituent in (18) consists of four subconstituents: D, AdjP, N and PP.

For the moment, we need to make one more major revision to our NP rule. It turns out that you can have more than one adjective and more than one PP in an English NP:

19) The [$_{AdjP}$ big] [$_{AdjP}$ yellow] box [$_{PP}$ of cookies] [$_{PP}$ with the pink lid].

In this NP, the noun *box* is modified by *big, yellow, of cookies,* and *with the pink lid*. The rule must be changed then to account for this. It must allow more than one adjective and more than one PP modifier. We indicate this with a +, which means "repeat this category as many times as needed":

20) NP → (D) (AdjP+) N (PP+)

We will have cause to slightly revise this rule in later sections of this chapter and later chapters, but for now we can use this rule as a working hypothesis.

*You now have enough information to try CPS 1–3.*

*1.2 Adjective Phrases (AdjPs) and Adverb Phrases (AdvPs)*

Consider the following two NPs:

21) a) the big yellow book
b) the very yellow book

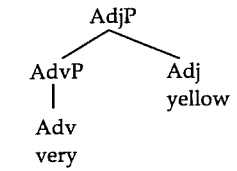
[1] I'm using a triangle here to obscure the details of the PP and AdjP. Students should avoid using triangles when drawing trees, as you want to be as explicit as possible. I use it here only to draw attention to other aspects of the structure.



On the surface, these two NPs look very similar. They both consist of a determiner, followed by two modifiers and then a noun. But consider what modifies what in these NPs. In (21a) *big* modifies *book*, as does *yellow*. In (21b) on the other hand, only *yellow* modifies book; *very* does not modify *book* (**very book*) – it modifies *yellow*. On an intuitive level then, the structures of these two phrases are actually quite different. (21a) has two adjective constituents that modify the N, whereas (21b) has only one *[very yellow]*. This constituent is called an adjective phrase (AdjP). The rule for the adjective phrase is given in (22a):

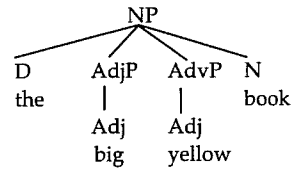
22) a) AdjP → (AdvP) Adj

b)

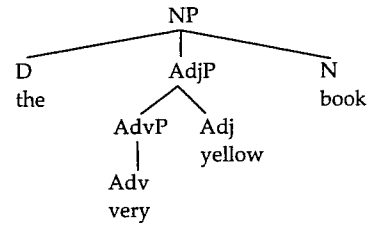



This will give us the following structures for the two NPs in (21):

23) a)




b)




So despite their surface similarity, these two NPs have radically different structures. In (23a) the N is modified by two AdjPs, in (23b) by only one. This leads us to an important restriction on tree structures:

24) *Principle of Modification (informal):* Modifiers are always attached within the phrase they modify.

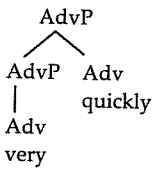
The adverb *very* modifies *yellow*, so it is part of the *yellow* AdjP in (23b). In (23a) by contrast, *big* doesn't modify *yellow*, it modifies *book*, so it is attached directly to the NP containing *book*.

A very similar rule is used to introduce AdvPs:

25) AdvP → (AdvP) Adv

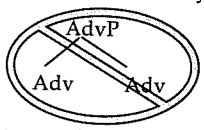
26) very quickly

27)



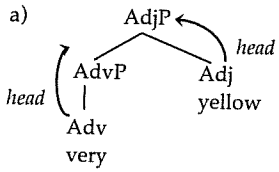

Here is a common mistake to avoid: Notice that the AdvP rule specifies that its modifier is another AdvP: AdvP → (AdvP) Adv. The rule does NOT say *AdvP → (Adv) Adv, so you will never get trees of the form shown in (28):

28)

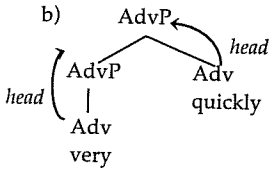



You might find the tree in (27) a little confusing. There are two Advs and two AdvPs. In order to understand that tree a little better, let's introduce a new concept: ***heads***. We'll spend much more time on heads in chapters 6 and 7, but here's a first pass: The head of a phrase is the word that gives the phrase its category. For example, the head of the NP is the N, the head of a PP is the P, the head of the AdjP is Adj and the head of an AdvP is Adv. Let's look first at an adjective phrase (29a) and compare it to a complex AdvP:

29) a)




b)



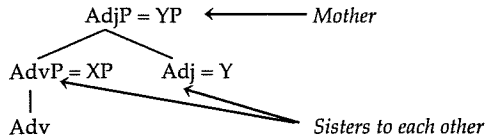

In (29a), the heads should be clear. The adverb *very* is the head of the adverb phrase and the adjective *yellow* is the head of AdjP. In (29b) we have the same kind of headedness, except both elements are adverbs. *Very* is the head of the lower AdvP, and *quickly* is the head of the higher one. We have two adverbs, so we have two AdvPs – **each has its own head.**



With this in mind, we can explain why the "very" AdvP is embedded in the AdjP. Above we gave a very informal description of the Principle of Modification. Let's try for a more precise version here:

30) ***Principle of Modification*** (revised): If an XP (that is, a phrase with some category X) modifies some head Y, then XP must be a sister to Y (i.e., a daughter of YP).

31)




The diagram in (31) shows you the relations mentioned in the definition in (30). If we take the AdjP to be the ***mother,*** then its ***daughters*** are the AdvP and the head Adj. Since AdvP and Adj are both daughters of the same mother, then we say they are ***sisters***. In (30) X and Y are variables that stand for any category. If one XP (AdvP) modifies some head Y (Adj), then the XP must be a sister to Y (i.e., the AdvP must be a sister to the head Adj), meaning they must share a mother. You'll notice that this relationship is asymmetric: AdvP modifies Adj, but Adj does *not* modify AdvP.

*You now have enough information to try WBE 1 and GPS 1.*

### *1.3 Prepositional Phrases (PPs)*

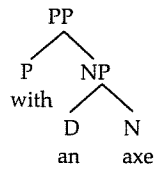
The next major kind of constituent we consider is the prepositional phrase (PP). Most PPs take the form of a preposition (the head) followed by an NP:

32) a) [$_{PP}$ to [$_{NP}$ the store]]
b) [$_{PP}$ with [$_{NP}$ an axe]]
c) [$_{PP}$ behind [$_{NP}$ the rubber tree]]

The PP rule appears to be:

33) a) PP → P NP

b)



In the rule we've given here, the NP in the PP is obligatory. There may actually be some evidence for treating the NP in PPs as optional. There is a class of prepositions, traditionally called particles, that don't require a following NP:

34) a) I haven't seen him *before.*
b) I blew it *up.*
c) I threw the garbage *out.*

If these are prepositions, then it appears as if the NP in the PP rule is optional:

35) PP → P (NP)

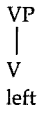
Even though all these particles look similar to prepositions (or are at least homophonous with them), there is some debate about whether they are or not. As an exercise you might try to think about the kinds of phenomena that would distinguish particles from prepositions without NPs.

*You now have enough information to try WBE 2 and GPS 2 & 3.*

### *1.4 Verb Phrases (VPs)*

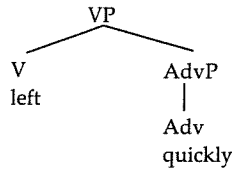
Next we have the category headed by the verb: the verb phrase (VP). Minimally a VP consists of a single verb. This is the case of intransitives ($V_{[NP\ \_]}$):

36) a) VP → V
b) Ignacious [$_{VP}$ left].
c)




Verbs may be modified by adverbs (AdvPs), which are, of course, optional:

37) a) Ignacious [$_{VP}$ left quickly].
b) VP → V (AdvP)
c)

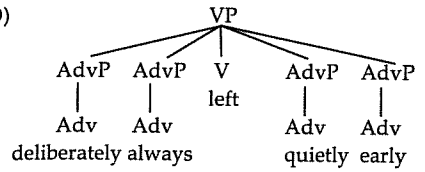





Interestingly, many of these adverbs can appear on either side of the V, and you can have as many AdvPs as you like:

38) a) Ignacious [$_{VP}$ quickly left].
b) Ignacious [$_{VP}$ [$_{AdvP}$ deliberately] [$_{AdvP}$ always] left [$_{AdvP}$ quietly] [$_{AdvP}$ early]].
c) VP → (AdvP+) V (AdvP+)

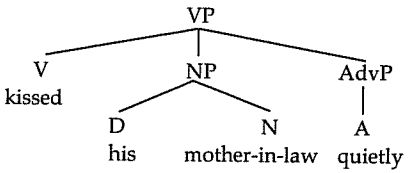
39)




You'll recall from chapter 2 that there is a subcategory of verbs that can take an NP object (the transitive $V_{[NP\ \_\ NP]}$); these NPs appear immediately after the V and before any AdvPs:

40) a) VP → (AdvP+) V (NP) (AdvP+)
b) Bill [$_{VP}$ frequently kissed *his mother-in-law*].
c) Bill [$_{VP}$ kissed *his mother-in-law* quietly]. (cf. *Bill [$_{VP}$ kissed quietly *his mother-in-law*].)

41)



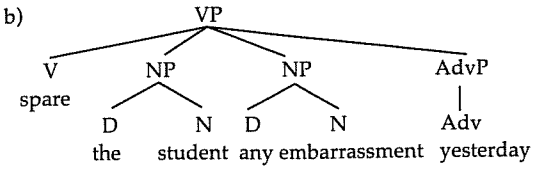

It is also possible to have two NPs in a sentence, for example with a double object verb like *spare* ($V_{[NP\ \_\ NP\ NP]}$). Both these NPs must come between the verb and any AdvPs:

42) I spared [$_{NP}$ the student] [$_{NP}$ any embarrassment] [$_{AdvP}$ yesterday].

Note that you are allowed to have a maximum of only two argument NPs. For this reason, we are not going to use the Kleene plus (+) which allows you to have as many as you like. Instead we are going to simply list both NPs in the rule:

43) a) VP → (AdvP+) V (NP) (NP) (AdvP+)

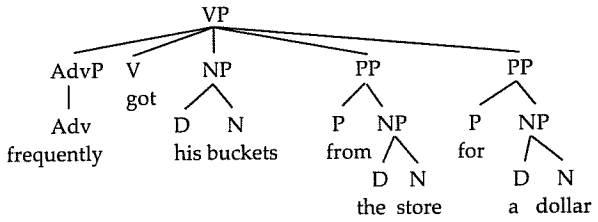
b)




Verbs can be modified by PPs as well. These PPs can be arguments as in ditransitive verbs of the type V[$_{NP}$ _ $_{NP\ PP}$] (e.g., the PP argument of the verb *put*) or they can be simple modifiers like *for a dollar* below. These PPs can appear either after an adverb or before it.

44) a) Bill [$_{VP}$frequently got his buckets [$_{PP}$*from the store* ] [$_{PP}$*for a dollar*]].
b) VP → (AdvP+) V (NP) (NP) (AdvP+) (PP+) (AdvP+)

c)




The rule in (44b) is nearly our final VP rule for this chapter; we'll need to make one further adjustment to it once we look at the structure of clauses.

*You now have enough information to try WBE 3, GPS 4, and CPS 4.*

### *1.5 Clauses*

Thus far, we have NPs, VPs, APs, and PPs, and we've seen how they can be hierarchically organized with respect to one another. One thing that we have not accounted for is the structure of the sentence (or more accurately ***clause***).[2] A clause consists of a subject NP and a VP. The label we use for clause is TP (which stands for tense phrase).[3]

45) [$_{TP}$[$_{NP}$ Bill ] [$_{VP}$ frequently got his buckets from the store for a dollar]].

This can be represented by the rule in (46):

[2] We'll give a proper definition for clause in a later chapter.

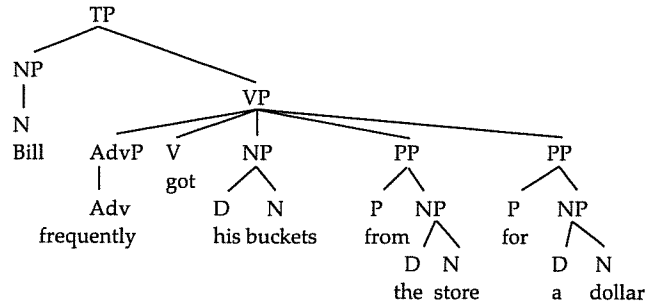
[3] In other books you might find sentences labeled as S or IP. S and IP are essentially the same thing as TP. We'll use TP here since it will make the transition to X-bar theory (in chapter 6) a little easier.



46) TP → NP VP

A tree for (45) is given in (47):

47)




TPs can also include other items, including (unsurprisingly) elements of the category T, such as modal verbs and auxiliary verbs like those in (48):

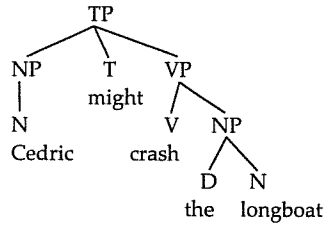
48) a) Cedric *might* crash the longboat.
b) Gustaf *has* crashed the semi-truck.

It may surprise you that we won't treat these as verbs. The reason for this will become clear in later chapters. Note that the T in the TP is optional.

49) TP → NP (T) VP

A tree showing the application of this rule is given in (50):

50)




Clauses don't always have to stand on their own. There are times when one clause is embedded inside another:

51) [$_{TP}$ Shawn said [$_{TP}$ he decked the janitor]].

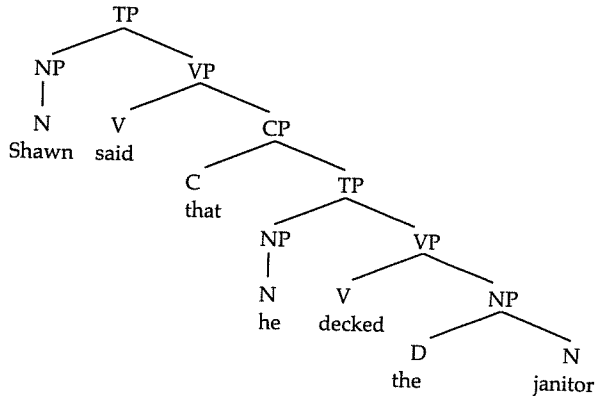
In sentence (51) the clause *he decked the janitor* lies inside the larger main clause. Often embedded clauses are introduced by a complementizer like *that* or *if*:

52) [$_{TP}$ Shawn said [$_{CP}$ [$_{C}$ that ] [$_{TP}$ he decked the janitor]]].

We need a special rule to introduce complementizers (C):

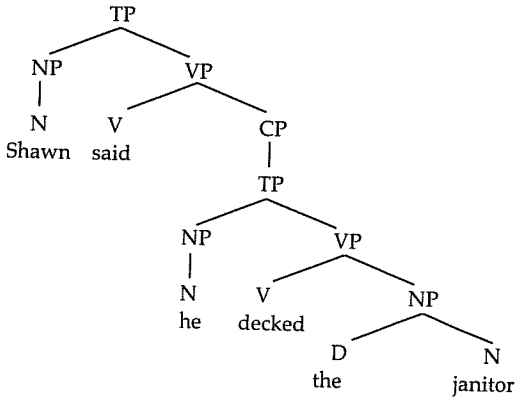
53) a) CP → (C) TP

b)




For the moment we will assume that *all* embedded clauses are CPs, whether or not they have a complementizer. We'll show evidence for this in chapter 7. This means that a sentence like *Shawn said he decked the janitor* will have a CP in it even though there is no complementizer *that*.

54)




Embedded clauses appear in a variety of positions. In (54), the embedded clause appears in essentially the same slot as the direct object. Embedded clauses can also appear in subject position:

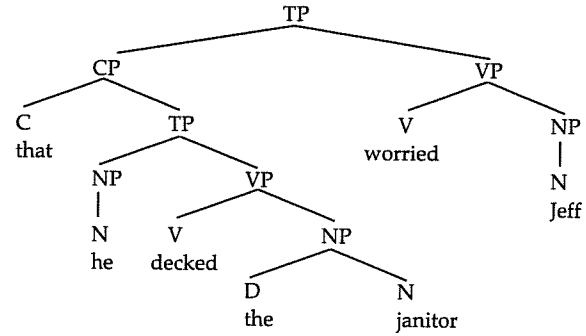


55) [$_{TP}$ [$_{CP}$ That he decked the janitor] worried Jeff].

Because of this we are going to have to modify our TP and VP rules to allow embedded clauses. Syntacticians use curly brackets { } to indicate a choice. So {NP/CP} means that you are allowed *either* an NP or a CP but not both. The modification to the TP rule is relatively straightforward. We simply allow the choice between an NP and a CP in the initial NP:

56) a) TP → {NP/CP} (T) VP

b)

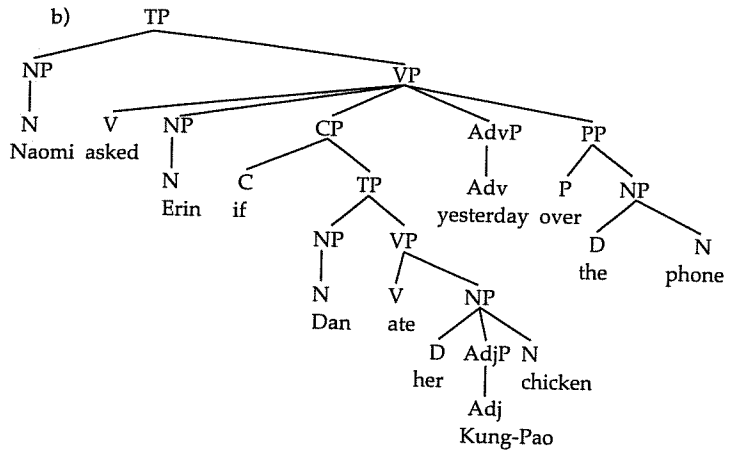



The revised VP rule requires a little more finesse. First observe that in verbs that allow both an NP and a CP ($V_{[NP\_\ NP\ \{NP/CP\}]}$ such as *ask*), the CP follows the NP but precedes the PP (in the following sentence *yesterday* and *over the phone* should be interpreted as modifying *ask*, not *ate*), essentially in the position of the second NP in the rule:

57) Naomi asked [$_{NP}$ Erin] [$_{CP}$ if [$_{TP}$ Dan ate her Kung-Pao chicken]] yesterday over the phone.

This gives us the rule :

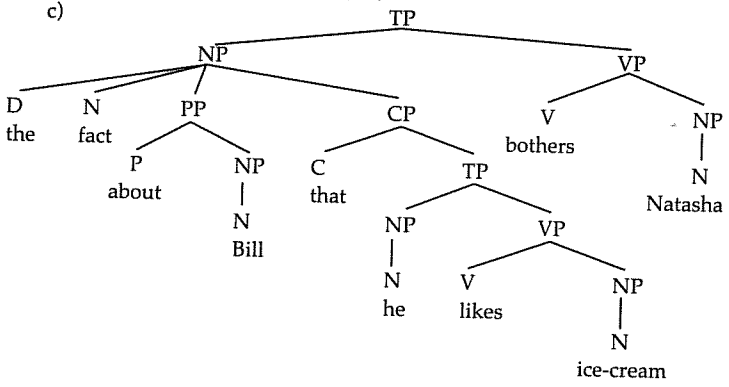
58) a) VP → (AdvP+) V (NP) ({NP/CP}) (AdvP+) (PP+) (AdvP+)




This rule is by no means perfect. There is no way to draw the tree for sentences where an AdvP can appear before the CP (*Naomi asked Erin quietly if Dan ate her Kung-Pao chicken*). We don't want to add an optional AdvP before the ({CP/NP}) in the rule because AdvPs cannot appear before the NP. For the moment, we'll go with the VP rule as it is written, although we return to the issue in chapter 6.

The last revision we have to make to our PSRs is to add the CP as a modifier to NPs to account for cases like (59).

59) a) [$_{NP}$ The fact about Bill [$_{CP}$ that he likes ice-cream]] bothers Natasha.
b) NP → (D) (AdjP+) N (PP+) (CP)
c)






**Relative Clauses**

In addition to the CPs that modify Ns as in the above cases, there is another kind of CP modifier to an N. This is called a ***relative clause.*** We aren't going to include relative clauses in our rules yet. This is because they often contain what is called a "gap" or a place where some part of the clause is missing. For example:

i) The man [whose car I hit ____ last week] sued me.

The underscore in the sentence indicates where the gap is – the object of the verb *hit* is in the wrong place. It should be where the underscore is. Corresponding to the gap we also have the *wh*-word *whose* and the noun *car*. These are appearing at the beginning of the clause. Because of these gaps and fronted *wh*-elements, we aren't going to worry about the internal structure of these clauses until chapter 12.

Here's a challenge: relative clauses actually appear in a different position than the CPs that follow nouns like *the fact*. Can you figure out what the difference is? (Hint: it has to do with the relative position of the CP and the PP in the NP rule.)

### *1.6 Coordination (Conjunction)*

One type of constituent that we haven't yet considered is the coordinated or conjoined constituent. This is a constituent like those in (60) below, where we have two elements with identical categories that are joined together with words like *and, or, but, nor*, etc.

60) a) the [blue and red] station wagon
b) I saw [these dancers and those musicians] smoking something suspicious.
c) I am [drinking lemonade and eating a brownie].
d) [I've lost my wallet or I've lost my mind.]
e) We went [through the woods and over the bridge].

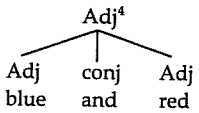
The coordination in (a) combines two adjectives into a single modifier, (b) combines two NPs, (c) combines two VPs, (d) two sentences and (e) two PPs. Coordination seems to be able to join together two identical categories and create a new identical category out of them. In order to draw trees with conjunction in them, we need two more rules. These rules are slightly different than the ones we have looked at up to now. These rules are not category-specific. Instead they use a variable (X). This X can stand for N or V or A or P, etc. Just like in algebra, it is a variable that can stand for different

categories. We need two rules, one to conjoin phrases (*[The Flintstones] and [the Rubbles]*) and one to conjoin words (*the [dancer] and [singer]*):

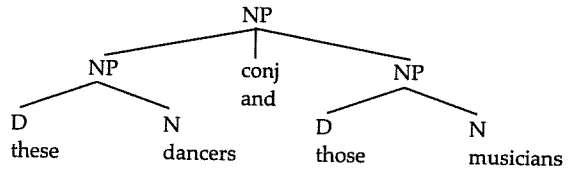
61) a) XP → XP conj XP
b) X → X conj X

These result in trees like the following for the phrases and sentences in (60).

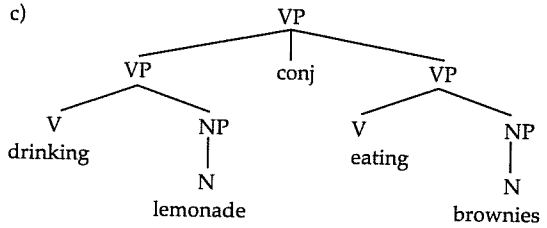
62) a)



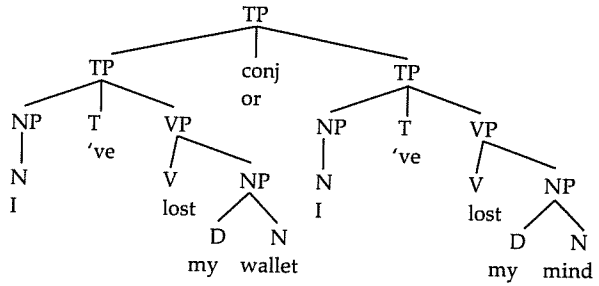

b)




c)




d)

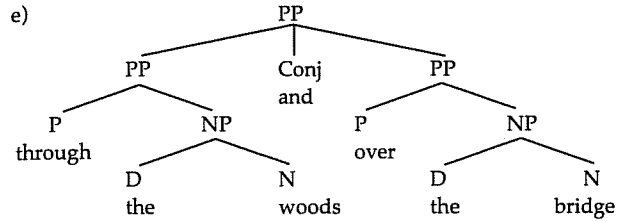



[4] This could also have been drawn with a conjoined AdjP since the category of red and blue is ambiguous between a head word and a phrase:

[$_{AdjP}$ [$_{AdjP}$ blue] and [$_{AdjP}$ red]]



e)




*You now have enough information to try WBE 4 and GPS 5.*

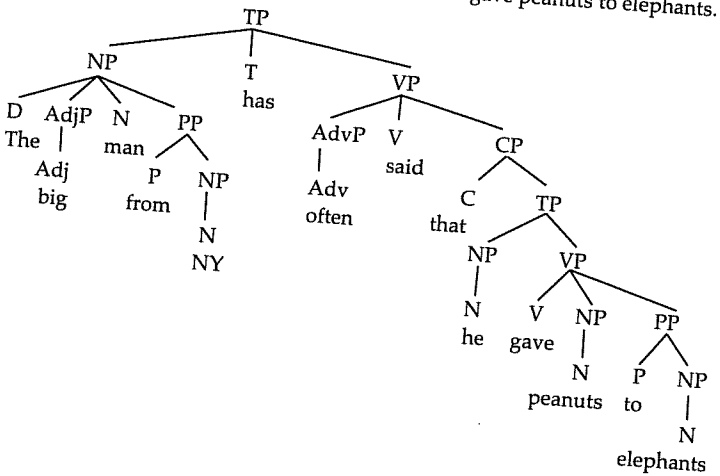
## 1.7 *Summary*

In this section we've been looking at the PSRs needed to generate trees that account for English sentences. As we'll see in later chapters, this is nothing but a first pass at a very complex set of data. It is probably worth repeating the final form of each of the rules here:

63) a) CP → (C) TP
b) TP → {NP/CP} (T) VP
c) VP → (AdvP+) V (NP)({NP/CP}) (AdvP+) (PP+) (AdvP+)
d) NP → (D) (AdjP+) N (PP+) (CP)
e) PP → P (NP)
f) AdjP → (AdvP) Adj
g) AdvP → (AdvP) Adv
h) XP → XP conj XP
i) X → X conj X

These rules account for a wide variety of English sentences. It's quite a complicated set, but it captures the basic generalizations about the constituency of English. Later, in Chapter 6, we'll propose a simplified set of rules that isn't quite so stipulative. A sentence using each of the rules in (63) is shown in (64):

64) The big man from NY has often said that he gave peanuts to elephants.




**Recursion**

Notice the following thing: The TP rule has a VP under it. Similarly, the VP rule can take a CP under it, and the CP takes a TP. This means that the three rules can form a loop and repeat endlessly:

i) Fred said that Mary believes that Susan wants that ... etc.

This property, called ***recursion***, accounts partially for the infinite nature of human language. Because you get these endless loops, it is possible to generate sentences that have never been heard before.

## 2. How to Draw a Tree

You now have the tools you need to start drawing trees. You have the rules, and you have the parts of speech. I suspect that you'll find drawing trees much more difficult than you expect. It takes a lot of practice to know which rules to apply and apply them consistently and accurately to a sentence. You won't be able to draw trees easily until you literally do dozens of them. Drawing syntactic trees is a learned skill that needs lots of practice, just like learning to play the piano.

There are actually two ways to go about drawing a tree. You can start at the bottom and work your way up to the TP, or you can start with the TP



and work your way down. Which technique you use depends upon your individual style. For most people who are just starting out, starting at the bottom of the tree with the words works best. When you become more practiced and experienced you may find starting at the top quicker. Below, I give step-by-step instructions for both of these techniques.

### *2.1 Bottom-up Trees*

This method for tree drawing often works best for beginners. Here are some (hopefully helpful) steps to go through when drawing trees.

1. Write out the sentence and identify the parts of speech:

   D Adv Adj N V D N
   The very small boy kissed the platypus.

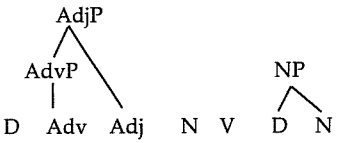
2. Identify what modifies what. Remember the modification relations. If the word modifies something then it is contained in the same constituent as that thing.

   *Very* modifies *small*. *Very small* modifies *boy*.
   *The* modifies *boy*. *The* modifies *platypus*.
   *The platypus* modifies *kissed*.

3. Start linking together items that modify one another. It often helps to start at the right edge. Always start with adjacent words. If the modifier is modifying a noun, then the rule you must apply is the NP rule:

   
   
   The very small boy kissed the platypus.

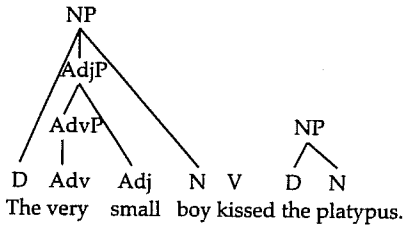
   Similarly if the word that is being modified is an adjective, then you must apply the AdjP rule:

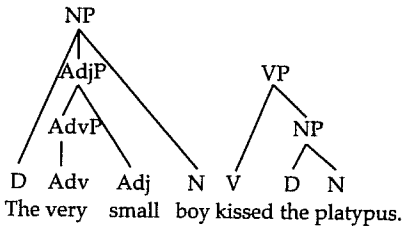
   
   
   The very small boy kissed the platypus.

4. Make sure you apply the rule *exactly* as it is written. For example the AdjP rule reads AdjP → (AdvP) Adj. This means that the Adv must have an AdvP on top of it before it can combine with the Adj.

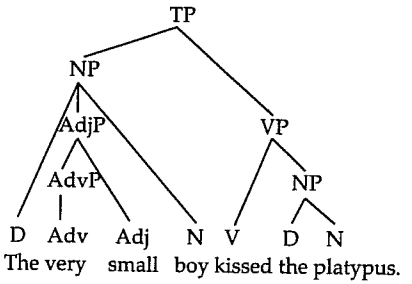
5. Keep applying the rules until you have attached all the modifiers to the modified constituents. Apply one rule at a time. Work from right to left (from the end of the sentence to the beginning). Try doing the rules in the following order:

   a) AdjPs & AdvPs
   b) NPs & PPs
   c) VPs
   d) TP
   e) If your sentence has more than one clause in it, start with the most embedded clause.




6. When you've built up the subject NP and the VP, apply the TP (and if appropriate the CP) rule:




7. *This is the most important step of all*: Now go back and make sure that your tree is really generated by the rules. Check each level in the tree and make sure your rules will generate it. If they don't, apply the rule correctly and fix the structure.

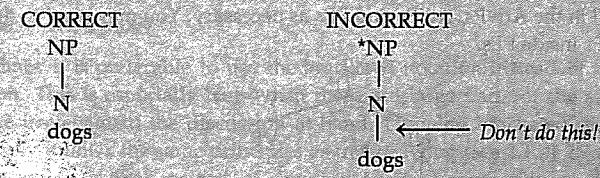


8. Some important considerations:
   a) Make sure that everything is attached to the tree.
   b) Make sure that every category has only *one* line immediately on top of it (it can have more than one under it, but only one immediately on top of it).
   c) Don't cross lines.
   d) Make sure all branches in the tree have a part of speech label.
   e) Avoid triangles.

Skill at tree drawing comes only with practice. At the end of this chapter are a number of sentences that you can practice on. I also encourage you to try some of the trees in the workbook. Use the suggestions above if you find them helpful. Another helpful idea is to model your trees on ones that you can find in this chapter. Look carefully at them, and use them as a starting point. Finally, don't forget: Always check your trees against the rules that generate them.

**To Line or Not?**

In many works on syntax you will find trees that have the word connected to the category with a line, rather than writing the word immediately under its category as we have been doing. This is a historical artifact of the way trees used to be constructed in the 1950s. The lines that connect elements in trees mean "created by a phrase structure rule." There are no phrase structure rules that connect words with their categories (i.e., there is no rule V → *kissed*), so technically speaking any line between the word's category and the word is incorrect.



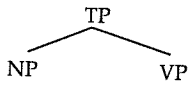

## 2.2 *The Top-down Method of Drawing Trees*

Most professional syntacticians use a slightly quicker means of drawing trees. Once you are practiced at identifying the structure of trees, you will probably want to use this technique. But be warned, sometimes this technique can lead you astray if you are not careful.

1. This method starts out the same way as the other: write out the sentence and identify the parts of speech.

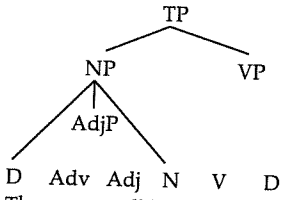
D Adv Adj N V D N
The very small boy kissed the platypus.

2. Next draw the TP node at the top of the tree, with the subject NP and VP underneath:



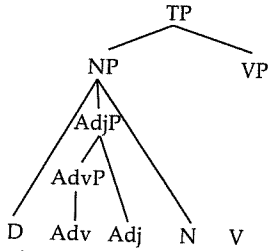

D Adv Adj N V D N
The very small boy kissed the platypus.

3. Using the NP rule, flesh out the subject NP. You will have to look ahead here. If there is a P, you will probably need a PP. Similarly, if there is an Adj, you'll need at least one AdjP, maybe more. Remember the Principle of Modification: elements that modify one another are part of the same constituent.




D Adv Adj N V D N
The very small boy kissed the platypus.

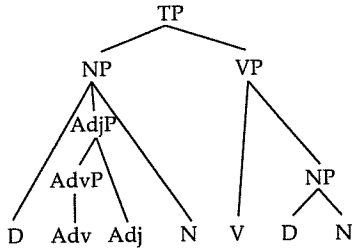
4. Fill in the AdvPs, AdjPs and PPs as necessary. You may need to do other NPs inside PPs.




D Adv Adj N V D N
The very small boy kissed the platypus.



5. Next do constituents inside the VP, including object NPs, and any APs and PPs inside them.




D Adv Adj N V D N
The very small boy kissed the platypus.

6. Again, the most important step is to go back and make sure that your tree obeys all the rules, as well as the golden rule of tree structures.

Again, I strongly recommend that you start your tree drawing using the bottom-up method, but after some practice, you may find this latter method quicker.

**Tree Drawing Software**

There are some software tools that can help you draw trees. There are many such programs, but I particularly recommend two:

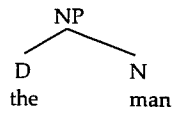
http://www.ece.ubc.ca/~donaldd/treeform.htm
http://www.yohasebe.com/rsyntaxtree/

Both these programs will generate graphics files that can be pasted into most word processors.

## 2.3 *Bracketed Diagrams*

Sometimes it is preferable to use the bracketed notation instead of the tree notation. This is especially true when there are large parts of the sentence that are irrelevant to the discussion at hand. Drawing bracketed diagrams essentially follows the same principles as tree drawing (see 2.1 or 2.2 above). The exception is that instead of drawing to lines connecting at the top, you put square brackets on either side of the constituent. A label is usually put on the left member of the bracket pair as a subscript.

65)




= [NP[D the] [N man]]

Both words and phrases are bracketed this way. For each point where you have a group of lines connecting, you have a pair of brackets.

To see how this works, let's take our sentence from sections 2.1 and 2.2 above and do it again in brackets:

1. First we mark the parts of speech, this time with labeled brackets:

[D The] [Adv very] [Adj small] [N boy] [V kissed] [D the] [N platypus].

2. Next we apply the AP, NP, and PP rules:
[D The] [AdvP[Adv very]] [Adj small] [N boy] [V kissed] [D the] [N platypus].
[D The] [AdjP[AdvP[Adv very]] [Adj small]] [N boy] [V kissed] [D the] [N platypus].
[NP[D The][AdjP[AdvP[Adv very]][Adj small]][N boy]] [V kissed] [D the] [N platypus].
[NP[D The][AdjP[AdvP[Adv very]][Adj small]][N boy]][V kissed][NP[Dthe][Nplatypus]].

3. Now the VP and TP rules:

[NP[DThe][AdjP[AdvP[Advvery]][Adjsmall]][Nboy]][VP[Vkissed][NP[Dthe][Nplatypus]]].
[TP[NP[DThe][AdjP[AdvP[Advvery]][Adjsmall]][Nboy]][VP[Vkissed][NP[Dthe]
[Nplatypus]]]].

*You now have enough information to try WBE 5 and GPS 6.*

## 3. Modification and Ambiguity

Syntactic trees allow us to capture another important fact about syntactic structure: Sentences often are ambiguous. Let's start with the following sentence:

66) The man killed the king with the knife.

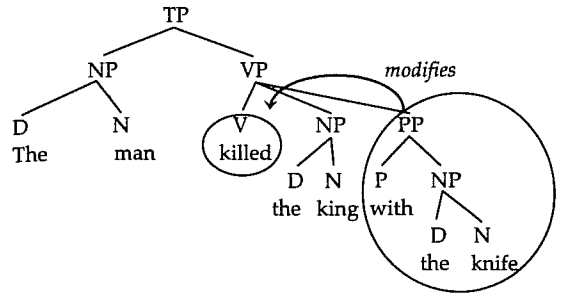
This sentence turns out to have more than one meaning, but for the moment consider only the least difficult reading for it (the phrase in quotes that follows is called a ***paraphrase***): "the man used the knife to kill the king." Remember the Principle of Modification:

67) *Principle of Modification* (revised): If an XP (that is, a phrase with some category X) modifies some head Y, then XP must be a sister to Y (i.e., a daughter of YP).



In this first meaning, the PP *with the knife* modifies *killed*, so the structure will look like (68):

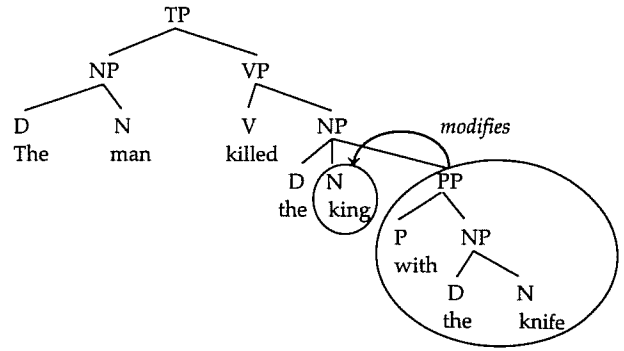
68)




*[With the knife]* describes how the man killed the king. It modifies the verb *killed*, so it is attached under the VP.

Now consider a paraphrase of the other meaning of (66). "the king with the knife was killed by the man (who used a gun)." This meaning has the PP *with the knife* modifying *king*, and thus attached to the NP:

69)




These examples illustrate an important property of syntactic trees. Trees allow us to capture the differences between ambiguous readings of the same surface sentence.

*You now have enough information to try WBE 6 and GPS 7 & 8.*

## 4. Constituency Tests

In chapter 1, we held linguistics in general (and syntax specifically) up to the light of the scientific method. That is, if we make a hypothesis about something, we must be able to test that hypothesis. In this chapter, we have proposed the hypothesis that sentences are composed of higher-level groupings called constituents. Constituents are represented in tree structures and are generated by rules. If the hypothesis of constituency is correct, we should be able to test it in general (as well as test the specific instances of the rules).

In order to figure out what kinds of tests we need, it is helpful to reconsider the specifics of the hypothesis. The definition of a constituent states that it is a group of words that functions as a unit. If this is the case, then we should find instances where groups of words behave as single units. These instances can serve as tests for the hypothesis. In other words, they are ***tests for constituency***. There are a lot of constituency tests listed in the syntactic literature. We are going to look at only four here: replacement, stand-alone, movement, and coordination.

First, the smallest constituent is a single word, so it follows that if you can replace a group of words with a single word then we know that group forms a constituent. Consider the italicized NP in (70). It can be replaced with a single word (in this case a pronoun). This is the ***replacement*** test.

70) a) *The man from NY* flew only ultra-light planes.
b) *He* flew only ultra-light planes.

There is one important caveat to the test of replacement: There are many cases in our rules of optional items (those things marked in parentheses like the AdjP in NP → (D) (AdjP+) N). When we replace a string of words with a single word, how do we know that we aren't just leaving off the optional items? To avoid this problem, we have to keep the meaning as closely related to the original as possible. This requires some judgment on your part. None of these tests is absolute or foolproof.

The second test we will use is the ***stand-alone*** test (sometimes also called the ***sentence fragment*** test). If the words can stand alone in response to a question, then they probably constitute a constituent. Consider the sentence in (71a) and repeated in (71b). We are going to test for the constituency of the italicized phrases.

71) a) Paul *ate at a really fancy restaurant.*
b) Paul *ate at* a really fancy restaurant.

If we ask the question "What did Paul do yesterday afternoon?" we can answer with the italicized group of words in (74a), but not in (74b):



72) a) Ate at a really fancy restaurant.
b) *Ate at.

Neither of these responses is proper English in prescriptive terms, but you can easily tell that (74a) is better than (74b).

***Movement*** is our third test of constituency. If you can move a group of words around in the sentence, then they form a constituent – because you can move them as a unit. Some typical examples are shown in (73). ***Clefting*** (73a) involves putting a string of words between *It was* (or *It is*) and a *that* at the beginning of the sentence. ***Preposing*** (73b) (also called ***pseudoclefting***) involves putting the string of words before a *is/are what* or *is/are who* at the front of the sentence. We discuss the ***passive*** (73c) at length in chapters 9 and 11. Briefly, it involves putting the object in the subject position, the subject in a "by phrase" (after the word *by*) and changing the verb form (for example from *kiss* to *was kissed*).

73) a) Clefting: It was [a brand new car] that he bought.
(from *He bought a brand new car*)

b) Preposing: [Big bowls of beans] are what I like.
(from *I like big bowls of beans*)

c) Passive: [The big boy] was kissed by [the slobbering dog].
(from *The slobbering dog kissed the big boy*)

Again, the movement test is only reliable when you keep the meaning roughly the same as in the original sentence.

Finally, we have the test of ***coordination*** (also called ***conjunction***). Coordinate structures are constituents linked by a conjunction like *and* or *or*. Only constituents of the same syntactic category can be conjoined:

74) a) [John] and [the man] went to the store.
b) *John and very blue went to the store.

If you can coordinate a group of words with a similar group of words, then they form a constituent.

*You now have enough information to try GPS 9 & 10 and CPS 5 & 6.*

**When Constituency Tests Fail**

Unfortunately, sometimes it is the case that constituency tests give false results (which is one of the reasons we haven't spent much time on them in this text). Consider the case of the subject of a sentence and its verb. These do not form a constituent. However, under certain circumstances you can conjoin a subject and verb to the exclusion of the object:

i) Bruce loved and Kelly hated phonology class.

Sentences (i) seems to indicate that the verb and subject form a constituent, which they don't. As you will see in later chapters, it turns out that things can move around in sentences or be deleted. This means that sometimes the constituency is obscured by other factors. For this reason, to be sure that a test is working correctly you have to apply more than one test to a given structure. Always perform at least two different tests to check constituency, as one alone may give you a false result.

## 5. Constituency in Other Languages

The rules and processes we have seen so far describe a significant chunk (but by no means all) of English sentence constituent structures. In this section, we investigate the ways in which languages vary from one another with respect to phrase structure. We'll also look at languages that appear to have no phrase structure at all as well as languages with very free word order, and conclude with some tips for doing foreign language problems.

### 5.1 *Head Ordering*[5]

As discussed above, the ***head*** of a phrase is the word that gives its category to the phrase. So prepositions are the heads of prepositional phrases, nouns are the heads of noun phrases, etc. English tends towards having the heads of phrases on the left of phrases. Prepositions come before the NPs they are associated with, complementizers come before the clause they modify, etc. Leaving aside adjectives, adverbs and determiners, which mess up the picture a bit, it is also the case that nouns come before prepositional modifiers, and verbs come before noun phrase and prepositional phrase modifiers. Therefore we often say that English is *left-headed*. But other languages exhibit different headedness properties.

[5] Much of the data in this section is taken from the World Atlas of Language Structures Online (http://wals.info).



There are many languages where the predominant order has heads on the right (i.e., are *right-headed*). Take for example the sentence in (75) from Lezgian, a Caucasian language spoken in Azerbaijan (data from Haspelmath 1993: 218). In this language prepositions (or more accurately postpositions) come after their noun phrase.

75) duxturrin patariw fena.
doctors to go.PAST
"She went to doctors."

The phrase structure rule for Lezgian PPs is given in (76), where the head P follows the NP rather than preceding it.

76) PP → NP P

In English adjectives appear before the noun they modify, but in French, for example (77), they typically follow the noun they modify. So we would use a rule like that in (78).

77) les gars beaux
the.PL guys handsome.PL
"The handsome guys"

78) NP → (D) N (AdjP+)

In English, object NPs follow the verb they are associated with, but in many languages, including Japanese, the object comes before the verb as in (79) (Kuno 1973: 10). A partial phrase structure rule (leaving out the adverbs and PPs) for the Japanese VP is given in (80).

79) John-ga tegami-o yonda.
John-SUBJ letter-OBJECT read.PAST
"John read the letter."

80) VP → (NP) V

Even in the order of the subject and the VP (predicate), we find major differences among languages. For example, in Nias, a language spoken in Sumatra, the subject of the sentence follows both the verb and its object:

81) Irino vakhe inagu.
cook rice mother.1S.POSS
"My mother cooked rice."

So the right half of the sentence rule is the reverse of that in English:

82) TP → VP NP

To summarize what we've seen in this section, phrase structure rules can vary between languages. Often this is an effect of headedness. Japanese and Lezgian for example, tend to put their heads on the right-hand side of the phrase. But the patterns can be subtler and involve more variation than this. What remains the same among all these cases is that one is usually able to describe the sentence structure of basic clauses using variations on our phrase structure rules. This is a very strong claim, and there are at least two kinds of language that challenge it: (i) languages where sentences seem to be largely composed of single, very heavily inflected, words and (ii) languages with apparently free word order. These two kinds of languages are the topics of the next two sections.

### 5.2 *Languages without Phrase Structure and Free Word Order Languages*

There are many languages in the world in which it appears that there are no sentences. Instead, one finds very complicated words. Take for example Nahuatl (spoken in Mexico), where we find sentences like that in (83) (data from Merlan 1976: 184):

83) Nimictomimaka.
"I'll give you money."

Languages like this are called ***polysynthetic*** languages. At first blush one might think that the existence of such forms means that phrase structure is not universal to the world's languages. A more careful investigation suggests that this might be an oversimplification, however. If you have ever taken a course in morphology, you'll know that even in English words are structured entities. One speculation syntacticians have about polysynthetic languages is that "words" like that in (83) are actually syntactically complex. The basic idea is that the rules that govern syntactic form in some languages are similar to the rules that govern word form in other languages.

Another challenge to the idea that much syntactic structure can be captured using phrase structure comes from languages with relatively free word order. Take the famous case of the Australian language Warlpiri (data from Hale 1983). In this language the verb and the noun phrases can appear in any order, as long as the auxiliary particle (in 84, *ka*) appears in the second position in the sentence.

84) a) Ngarrka-ngku ka wawirri panti-rni.
man-ERG AUX kangaroo spear-NONPAST
"The man is spearing the kangaroo."

b) Wawarri ka panti-rni ngarrka-ngku.
c) Panti-rni ka ngarrka-ngku panti-rni. ... and so on.



If you've ever taken lessons in Latin, you'll know that something similar is true in that language as well. One can find all of the following possible word orders:

85) a) Mīlitēs urbem dēlēbunt.
Soldiers city destroy.FUT.3PL
"The soldiers will destroy the city."

b) Mīlitēs dēlēbunt urbem.
c) Urbem mīlitēs dēlēbunt.
d) Urbem dēlēbunt mīlitēs.
e) Dēlēbunt mīlitēs urbem.
f) Dēlēbunt urbem mīlitēs.

Sentence (85a) was the most normal order (subject object verb, i.e. TP → NP VP, VP → (NP) V), but all the other orders were possible too.

What do we make of languages that exhibit freedom in word order? In the past 15 or so years, linguists such as the Persian linguist Simin Karimi and the Hungarian linguist Katalin É. Kiss have shown that these orders aren't really "free". In fact, with each ordering there is a special semantics applied. For example, in Latin (and Persian) the thing that comes first in the sentence is most typically the "topic" of the sentence. Topics are the old information in the sentence or the information that follows from previously understood discourse. So for example, we'd use sentences (85c and d) when we had been talking about some particular city immediately before uttering this sentence. Other times the order can be affected by emphasis (known as contrastive focus), where an especially important idea contrasted with other ideas is drawn into highlight. Often these focuses (or foci) are put at the beginning of sentences. Sometimes there is a complex interplay between topic and focus structures.

In each language that exhibits "free" word order, we find that there is one "neutral" order. Typically this is the order used when a sentence has no special topic or focus and is used "out of the blue". In Latin this is SOV. The neutral orders can typically be created by phrase structure rules. The various word orders determined by topic and focus are created by a special kind of rule called a "transformational rule". We return to transformational rules in later chapters in this book, and to both polysynthetic and non-configurational languages in chapter 18.

*5.3 Doing Foreign Language Problem Sets*

Often, linguistic examples from languages other than English will take the following form (example from Sinhala – a language spoken in Sri Lanka; data from Lehmann 1978):

86) Jōn ballavə däkka. ← *Actual language data*
John dog saw ← *Word-by-word gloss*
"John saw the dog." ← *Idiomatic translation*

There are three lines: the actual data, a word-by-word gloss and an idiomatic translation into English. Of these, the most important for doing the problem set is the second line – the word-by-word gloss. The glosses are lined up word for word (and sometimes morpheme for morpheme) with the foreign language on the line above. This line tells you (1) what each word in the foreign language example means, and more importantly, (2) the order of the words in the foreign language. When trying to determine the phrase structure of a foreign language or the behavior of a word or phrase, this is the line to look at! (However, when drawing trees and citing examples in your answer, it is considered more respectful of the language to use the actual foreign language words.) Remember: *don't* do an analysis of the idiomatic translation of the sentence, because then you are only doing an analysis of English!

Here's a more complete paradigm of Sinhala, along with a series of typical problem set questions:

87) Jōn ballavə däkka.
John dog saw
"John saw the dog."

88) Jōn janēle iñdəla ballavə däkka.
John window from dog saw
"John saw the dog from the window."

89) Jōn eyāge taḍi ballavə däkka.
John his big dog saw
"John saw his big dog."

a) Assume there is an AdjP rule: AdjP → Adj. What is the NP rule?
b) What is the PP rule of Sinhala?
c) What is the VP rule of Sinhala? (Assume all non-head material is optional.)
d) What is the TP rule of Sinhala?
e) Draw the tree for sentences (88) and (89).



The first step in analyzing a language like this is to determine the parts of speech of each of the words. Be very careful here. Do not assume because English has certain categories that the language you are looking at has the same categories; however, all other things being equal you can assume that there will be some parallels (unless we have evidence to the contrary):

90) Jōn ballavə däkka.
John dog saw
N N V

91) Jōn janēle iñdəla ballavə däkka.
John window from dog saw
N N P N V

92) Jōn eyāge taḍi ballavə däkka.
John his big dog saw
N D Adj N V

Next let's answer question (a). We can observe from sentence (90) that an NP in Sinhala (just like in English) can be an N by itself (e.g., *Jōn*). This means that anything other than the noun has to be optional. Consider now the sentence in (92); from the literal English translation we can tell that the words meaning "big" and "his" modify the word "dog", and are thus part of the NP headed by "dog". We're told in (a) to assume that there is an AdjP rule (AdjP → Adj), and we are treating the word for "his" as a determiner. Thus it follows that the Sinhala NP rule is at least the following: NP → (D) (AdjP) N. You'll notice that the order of elements in this rule is the same as the order of elements in the Sinhala sentence.

You should also note that the PP meaning "from the window" does not modify the N, so is not part of the NP rule at this point. Since it modifies the V, it will be part of the VP rule.

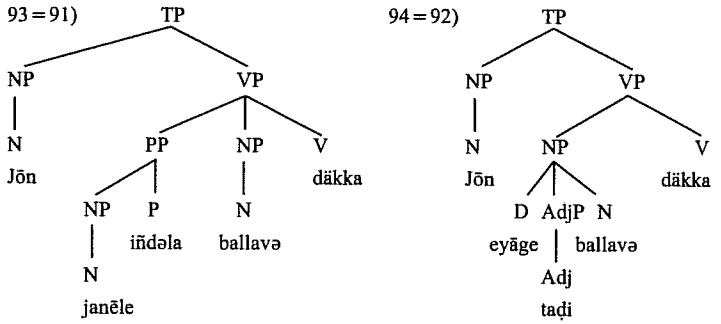
Question (b) asks us about the PP rule. We have one P in the data – the word meaning "from" in sentence (91). Pay careful attention here. This P appears between two nouns; but the noun associated with the P is the one meaning "window". This means that the P in Sinhala *follows* the NP; so the rule is PP → NP P. We have no evidence if the NP here is optional.

The VP rule is next in (c). Sentence (91) is the most informative here. Looking at what would be in the VP in English, we have the PP meaning "from the window" and the NP meaning "dog". These both precede the V. This is true in sentences (90) and (92) too. The PP is clearly optional, but there is no evidence in the data about whether the NP is or not. However,

you are told to assume that "all non-head material is optional." So the rule is VP → (PP) (NP) V.

Finally we have the TP rule. Like English, the subject NP precedes the VP. So the rule is TP → NP VP. We have no evidence for a T node so we have not posited one.

Here are the trees for (91) and (92).




*You now have enough information to try WBE 7–11, GPS 11–15, and CPS 7*

## 6. Summary and Conclusion

We've done a lot in this chapter. We looked at the idea that sentences are hierarchically organized into constituent structures. We represented these constituent structures in trees and bracketed diagrams. We also developed a set of rules to generate those structures. We looked at constituency tests that can be used to test the structures. And finally we looked at the way constituent structure can vary across languages.

### Ideas, Rules, and Constraints Introduced in this Chapter

i) ***Constituent***: A group of words that function together as a unit.

ii) ***Hierarchical Structure***: Constituents in a sentence are embedded inside of other constituents.

iii) ***Syntactic Trees and Bracketed Diagrams***: These are means of representing constituency. They are generated by rules.

iv) ***English Phrase Structure Rules***
   a) CP → (C) TP
   b) TP → {NP/CP} (T) VP
   c) VP → (AdvP+) V (NP) ({NP/CP}) (AdvP+) (PP+) (AdvP+)
   d) NP → (D) (AdjP+) N (PP+) (CP)
   e) PP → P (NP)
   f) AdjP → (AdvP) Adj
   g) AdvP → (AdvP) Adv
   h) XP → XP conj XP
   i) X → X conj X

v) ***Head***: The word that gives its category to the phrase.

vi) ***Recursion***: The possibility of loops in the phrase structure rules that allow infinitely long sentences, and explain the creativity of language.

vii) ***The Principle of Modification***: If an XP (that is, a phrase with some category X) modifies some head Y, then XP must be a sister to Y (i.e., a daughter of YP).

viii) ***Constituency Tests***: Tests that show that a group of words functions as a unit. There are four major constituency tests given here: ***movement, coordination, stand-alone,*** and ***replacement.***



**Further Reading:** Carnie (2011), Chomsky (1957, 1965)

## General Problem Sets

**GPS1. Trees: NPs, AdjPs and AdvPs**
*[Application of Skills; Basic]*
Draw the trees for the following AdjPs, AdvPs, and NPs:
a) very smelly
b) too quickly
c) much too quickly
d) very much too quickly
e) the old shoelace
f) the soggy limp spaghetti noodle *[assume* spaghetti = *Adj]*
g) these very finicky children

**GPS2. Trees II: English PPs**
*[Application of Skills; Basic]*
Draw the trees for the following English NPs and PPs:
a) the desk with the wobbly drawer
b) in my black rubber boots *[assume* rubber = *Adj]*
c) that notebook with the scribbles in the margin
d) the pen at the back of the drawer in the desk near the bright yellow painting

**GPS3. STARBUCKESE**
*[Critical and Creative Thinking; Basic]*
In standard English, one can't put a PP before a head noun that the preposition modifies. For example, the NP in (a) is completely ungrammatical.

a) *The with milk coffee.

But there is a major chain of coffee stores whose employees seem to allow a different ordering of elements in NPs:

b) A venti with room Americano.[6]

Let's call this dialect Starbuckese. Starbuckese also appears to allow *with soy* and *with skim* to precede the head noun. The phenomenon might also be seen in certain fixed phrases like *at issue content*, *in house lawyer* and *over the counter medicine*, which are not limited to the employees of ubiquitous coffee dispensaries.[7]

What changes would you have to make to the English phrase structure rules to allow Starbuckese NPs like (b) above?

**GPS4. TREES III: THE VICES OF VPS**
*[Application of Skills; Intermediate]*
Draw the trees for the following English VPs:

a) snores
b) eats burgers
c) always smokes in the car
d) drinks frequently in the car
e) smokes in the car frequently
f) smokes cigars in the car
g) sent Gregory a dirty email on Friday

**GPS5. TREES IV: COORDINATION**
*[Application of Skills; Intermediate]*
Draw the trees for the following English coordinations:

a) buttons and bows
b) to and from the house
c) very big and ugly *(note: this is ambiguous and could have 2 trees; try to draw them both!)*
d) kiss and hug your dad *(this is a VP)*
e) kiss your dad and hug your mom *(this is a VP)*
f) He likes cookies and he hates crumbcake.

[6] For those not familiar with this chain: *venti* is the size; an *Americano* is an espresso with hot water; and *with room* means that they leave space for you to add milk.
[7] Thanks to my linguistically oriented Facebook® friends who came up with all these examples.

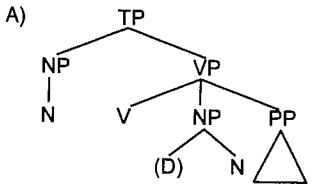


**GPS6. ENGLISH**
*[Application of Skills and Knowledge; Basic to Advanced]*
Draw phrase structure trees *and* bracketed diagrams for each of the following sentences. Indicate all the categories (phrase (e.g., NP) and word level (e.g., N)) on the tree. Use the rules given above in the "Ideas" summary of this chapter. Be careful that items that modify one another are part of the same constituent. Treat words like *can*, *should*, *might*, and *was* as instances of the category T (tense). (Sentences d–h are from Sheila Dooley.)

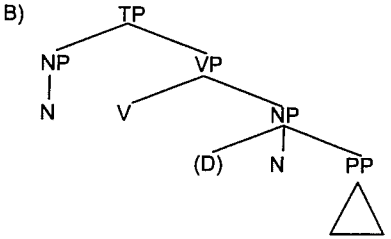
a) The kangaroo hopped over the truck.
b) I haven't seen this sentence before. *[before is a P, haven't is a T]*
c) Susan will never sing at weddings. *[never is an Adv]*
d) The officer carefully inspected the license.
e) Every cat always knows the location of her favorite catnip toy.
f) The cat put her catnip toy on the plastic mat.
g) The very young child walked from school to the store.
h) John paid a dollar for a head of lettuce.
i) Teenagers drive rather quickly.
j) A clever magician with the right equipment can fool the audience easily.
k) The police might plant the drugs in the apartment.
l) Those Olympic hopefuls should practice diligently daily.
m) The latest research on dieting always warns people about the dangers of too much cholesterol.
n) That annoying faucet was dripping constantly for months.
o) Marian wonders if the package from Boston will ever arrive.
p) I said that Bonny should do some dances from the Middle East.
q) That Dan smokes in the office really bothers Alina.
r) The belief that syntactic theory reveals the inner structure of sentences emboldened the already much too cocky professor.

**GPS7. AMBIGUITY I**
*[Application of Skills and Knowledge; Basic]*
Consider the two trees below in (A) and (B). These abstractly represent the structure of the sentences below them. Determine whether each sentence has the structure in (A), the structure in (B), or both! (A triangle indicates that the structure below that node is not important to the question.)

A)




B)




1) I bought the parrot in the store
2) I put the milk in the fridge

3) I mailed the sweater to Mary
4) They chased the man with the car
5) I knew the man with the brown hair

**GPS8. AMBIGUITY II**
*[Application of Knowledge and Skills; Basic to Intermediate]*
The following English sentences are all ambiguous. Provide a paraphrase (a sentence with roughly the same meaning) for each of the possible meanings, and then draw (two) trees of the *original* sentence that distinguish the two meanings. Be careful not to draw the tree of the paraphrase. Your two trees should be different from one another, where the difference reflects which elements modify what. (For sentence (b) ignore the issue of capitalization.) You may need to assume that *old* and *seven* can function as adverbs. Sentences (c), (d), (e), and (f) are ambiguous newspaper headlines taken from http://www.fun-with-words.com/ambiguous_headlines.html.

a) John said Mary went to the store quickly.
b) I discovered an old English poem.
c) Two sisters reunited after 18 years in checkout counter
d) Enraged cow injures farmer with ax
e) Hospitals are sued by seven foot doctors
f) Dealers will hear car talk after noon

**GPS9. STRUCTURE**
*[Application of Knowledge; Intermediate]*
In the following sentences a sequence of words is marked as a constituent with square brackets. State whether or not it is a real constituent, and what criteria (that is constituency tests) you applied to determine that result.

a) Susanne gave [the minivan to Petunia].
b) Clyde got [a passionate love letter from Stacy].

**GPS10. ENGLISH PREPOSITIONS**
*[Critical Thinking; Intermediate]*
In the text, we claimed that perhaps the NP in PPs was optional, explaining why we can say *He passed out*, where the preposition *out* has no object. Consider an alternative: the expression *[passed out]* is really a "complex" verb. Using constituency tests, provide arguments that the structure of expressions like (a–d) is really [[V P] NP] rather than: [V [P NP]].

a) He blew out the candle.
b) He turned off the light.
c) He blew up the building.
d) He rode out the storm.



**GPS11. SWEDISH NPS**
*[Application of Skills and Knowledge; Basic]*
Consider the following data from Swedish. (If you speak Swedish, please confine yourself to this data; do *not* try to include definite forms, e.g., the umbrella.) You may wish to review section 5.4.2 before attempting this problem. (Data courtesy of Sheila Dooley.)

| | | |
|---|---|---|
| a) | folk | "people" |
| b) | ett paraply | "an umbrella" |
| c) | tre paraplyer | "three umbrellas" |
| d) | ett äpple | "an apple" |
| e) | ett rött paraply | "a red umbrella" |
| f) | ett gult äpple | "a yellow apple" |
| g) | ett mycket fint paraply | "a very fine umbrella" |
| h) | ett gammalt fint paraply | "a fine old umbrella" |
| i) | ett rött paraply med ett gult handtag | "a red umbrella with a yellow handle" |

1) Assume the Adv rule of Swedish is AdvP → Adv. What is the AdjP rule?
2) Are determiners obligatory in Swedish NPs?
3) Are AdjPs obligatory in Swedish NPs?
4) What is the PP rule for Swedish?
5) Are PPs obligatory in Swedish NPs?
6) What is the NP rule for Swedish?
7) Draw the trees for (g), (h), and (i).
8) Give the bracketed diagrams for (f) and (i).

**GPS12. BAMBARA**
*[Application of Skills; Basic]*
Consider the following data from Bambara, a Mande language spoken in Mali. (The glosses have been slightly simplified.) Pay careful attention to the second line, where the word order of Bambara is shown. (Data from Koopman 1992.)

a) A kasira.
he cried
"He cried."

b) Den ye ji min.
child PAST water drink
"The child drank water."

c) N sonna a ma.
I agreed it to
"I agreed to it."

Answer the following questions about Bambara. Do not break apart words in your analysis.

1) Do you need a T category in Bambara?
2) Do you need a D category in Bambara?

3) What is the NP rule for Bambara? (You do not need any AdjP or PPs in the rule.)
4) What is the PP rule for Bambara?
5) What is the VP rule for Bambara?
6) What is the TP rule for Bambara? (Keep in mind your answers to the above questions; be consistent.)
7) Draw trees for (a), (b), and (c) using your rules.
8) Draw bracketed diagrams for (b) and (c).

**GPS13. HIXKARYANA**

*[Application of Skills; Basic/Intermediate]*

Look carefully at the following data from a Carib language from Brazil (the glosses have been slightly simplified from the original). In your analysis do not break apart words. (Data from Derbyshire 1985.)

a) Kuraha yonyhoryeno biyekomo.
bow made boy
"The boy made a bow."

b) Newehyatxhe woriskomo komo.
take-bath women all
"All the women take a bath."

c) Toto heno komo yonoye kamara.
person dead all ate jaguar
"The jaguar ate all the dead people."

Now answer the following questions about Hixkaryana:

1) Is there any evidence for a determiner category in Hixkaryana? Be sure to consider quantifier words (like *some* and *all*) as possible determiners.
2) Posit an NP rule to account for Hixkaryana. (Be careful to do it for the second line in these examples, the word-by-word gloss, not the third line.) Assume there is an AdjP rule: AdjP → Adj.
3) Posit a VP rule for Hixkaryana.
4) Posit a TP rule for Hixkaryana.
5) What is the part of speech of *newehyatxhe*? How do you know?
6) Draw the trees for (a) and (c) using the rules you posited above. (Hint: if your trees don't work, then you have probably made a mistake in the rules.)
7) Give bracketed diagrams for the same sentences.

**GPS14. DUTCH**

*[Application of Skills; Intermediate]*

Consider the following sentences of Dutch. (Data from Ferdinand de Haan.)

a) De man in de regenjas is naar Amsterdam gegaan.
the man in the raincoat is to Amsterdam going
"The man in the raincoat is going to Amsterdam."



b) De man heeft een gele auto met een aanhanger gekocht.
the man has a yellow car with a trailer bought
"The man has bought a yellow car with a trailer."

c) De vrouw heeft een auto gekocht.
the woman has a car bought
"The woman has bought a car."

d) Jan is vertrokken.
John is gone
"John left."

1) Assume an AdjP rule, AdjP → Adj; what is the NP rule of Dutch?
2) What is the PP rule of Dutch?
3) What is the VP rule of Dutch? (Assume that *is* and *heeft* are of the category T and are not part of the VP.)
4) What is the TP rule for Dutch?
5) Draw the trees for (a) and (b).

**GPS15. LIVONIAN**

*[Application of Skills; Intermediate]*

Consider the following sentences of Livonian,[8] a highly endangered language spoken in Latvia. It belongs to the Finnic language family. I've simplified some of the glosses here for pedagogical reasons.

1) Min kovāl sõbrā mōļtõb
my smart friend paint
"My smart friend is painting."

2) Līvõd lapst jūobõd kõļimtõ
Livonian children drink juice
"(The) Livonian children are drinking juice."

3) Nänt vanāāma kutsūb mēǫi kuodāj sillõ
their grandmother invite us house into
"Their grandmother is inviting us into the house."

Now answer the following questions:

a) Assume that possessive pronouns are determiners. Are determiners optional or obligatory in Livonian NPs?
b) Assume the following rule exists in Livonian: AdjP → Adj. Now what is the NP rule of Livonian?
c) What is the PP rule of Livonian?
d) What is the VP rule of Livonian?
e) What is the TP rule of Livonian?

[8] Examples adapted from: Boiko, Kersti (2000) *Līvõ Kēļ*. Līvõd Īt. Many thanks to Uldis Balodis for his help constructing this problem set.

f) Using the rules you figured out above, draw the trees for sentences (1), (2) and (3).

## Challenge Problem Sets

***Challenge Problem Set 1: Quantifiers***
*[Critical Thinking; Challenge]*
Our NP rule only allows one determiner. How can we deal with NPs like (a), (b), and (c), but still rule out NPs like (d)?

a) the two CDs
b) the many reasons
c) all the books
d) *the those books

***Challenge Problem Set 2: Icelandic***
*[Data analysis and Critical Thinking; Challenge]*
This problem set builds on Challenge Problem Set 1. Consider the complex NP given in (a):[9]

a) allir hinir litlu sniglarnir mínir fjórir
all other little snails.the my four
"all my other four little snails"

Leaving aside the definite ("the") marking on the noun, think about all the things in this NP that fall under the category of determiner as we defined it in chapter 2. How might we explain how all of these are possible in this NP? Hint: think about the possibility that phrase structure rules might refer to subcategories.

***Challenge Problem Set 3: Possessive NPs***
*[Critical Thinking; Challenge]*
*Part 1:* Our NP rule reads NP → (D) (AdjP+) N (PP+) (CP). Consider the following NPs. What problem do these NPs cause our rule?

a) Patrick's box
b) the man's box

*Part 2:* Consider the following data:

c) *Patrick's the box
d) *the man's the box

[9] Data from Norris (2011).



How might you revise the NP rule to account for NPs like (a) and (b), keeping in mind that a possessive NP (like *Patrick's*) cannot appear in the same NP as a determiner? Given the rule you develop, draw the tree for (b).

***Challenge Problem Set 4: Nominal Adverbials***
*[Critical Thinking and Data Analysis; Challenge]*
In the text we observed that NPs must appear adjacent to the verb in VPs; they cannot come after a post-verbal AdvP:

a) *Shannon kissed quietly the kitten.
b) Shannon kissed the kitten quietly

However, there appears to be a class of nouns that can appear in this position. These are nouns expressing quantities of time:

c) Shannon left quietly *every day*.

Other examples are *last year, every day, each week.*

*Part 1:* How do we know that these constituents are NPs and not AdvPs? (Pay attention to what can modify the N.)

*Part 2:* Is there a way to incorporate such NPs into our PSR system? Explain your answer.

***Challenge Problem Set 5: Constituency Tests***[10]
*[Application of Knowledge; Challenge]*
Do the words in boldface in the following sentence form a *single* constituent? That is, is there a *[Barbie and Ken kissing]* constituent? How do you know? Use all the tests available to you.

***Barbie and Ken*** were seen by everyone at the party ***kissing***.

A couple of things may help you in this problem. (1) Remember that constituents can be inside other constituents. (2) This sentence is a passive, which means that some movement has happened, so don't let the fact that there is other stuff in between the two bits throw you off.

***Challenge Problem Set 6: Using Constituency Tests***[11]
*[Application of Knowledge; Challenge]*
Consider the following sentence.

a) Juliet says that Romeo lies to his parents a lot.

*Part 1:* Note that this sentence is ambiguous as to which verb the adverb *a lot* modifies. Paraphrase the two interpretations in your own words.

*Part 2:* Draw two phrase structure trees for this sentence each corresponding

[10] Sheila Dooley is the source of this problem set.
[11] Thanks to Yosuke Sato for this problem set.

to one of its meanings you stated in part 1.

*Part 3:* Recall that VP-constituency can be established by using VP-preposing. Sentence (b) shows that *eat apples* is a VP constituent. A string that can be preposed by VP-preposing qualifies as VP.

b) Eat apples, Julian does every day.

Explain why the VP-preposed version of sentence (b) given in (c) is not ambiguous anymore.

c) Lie to his parents a lot, Juliet says that Romeo does.

*Part 4:* Explain why the following VP-preposed version of sentence (b) is still ambiguous.

d) Lie to his parents, Juliet says that Romeo does a lot.

***CHALLENGE PROBLEM SET 7: WHY ARE OVS LANGUAGES RARE?***
*[Application of Knowledge; Challenge]*
Given the basic units of subject NPs (S), object NPs (O), and verbs (V), there are logically 6 possible word orders of the world's languages: SOV, SVO, VSO, VOS, OSV, and OVS. Of these possible orders, the first two are very common, the second two are found throughout the world but are much rarer, and the last two are almost unheard of. (The exceptions seem to be limited to a set of Carib languages spoken in South America.) Tomlin (1986) claims that 45% of the world's languages are SOV, 42% are SVO, 9% are VSO, 3% are VOS, and less than 1% of the world's languages exhibit OSV or OVS. Let's concentrate on the rare OVS order.

*Part 1.* What would the TP and VP phrase structure rules for an OVS language look like?

*Part 2.* Do phrase structure grammars make any predictions about the frequency of word orders? In other words, is there any reason that OVS languages should be rare if they are possible in a phrase structure notation? Does our grammatical system correctly predict that object-initial languages should be so very rare?

*Part 3.* Are there any common word orders that phrase structure grammars predict would not exist? (Assume that subjects are always the NP introduced by the TP rule, and objects are always introduced by the VP rule, and that you can't cross lines in a tree.)

chapter 4

# Structural Relations

**Learning Objectives**

After reading chapter 4 you should walk away having mastered the following ideas and skills:

1. Identify dominance in a tree.
2. Distinguish dominance from immediate dominance.
3. Understand the relationship between exhaustive domination and constituency.
4. Identify precedence in a tree.
5. Understand the constraint against crossing lines.
6. Identify c-command in a tree.
7. Distinguish symmetric from asymmetric c-command.
8. Identify different government relations.
9. Define structurally subject, object, oblique, object of a preposition and indirect object.

## 0. INTRODUCTION

In chapter 3, we developed the notion of constituency. Constituents are groups of words that function as single units. In order to systematically identify these, we proposed a set of rules. These rules generate trees, which in turn represent constituency. Take a careful look at any tree in the last chapter and you'll notice that it is a collection of labels and lines; within this

*Syntax: A Generative Introduction*, Third Edition. Andrew Carnie.