chapter 6

X-bar Theory

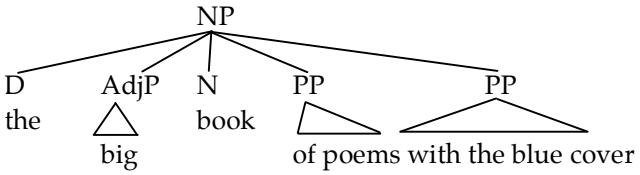
0. Introduction

As we saw in the last chapter, the theory of sentence structure that we've developed is quite powerful. It correctly predicts constituency and – along with structural relations and the binding theory – it also accounts for the structural restrictions on the interpretation of pronouns, anaphors and R-expressions. This said, if we look a little more closely at sentence structure in many languages, we see that our theory has some empirical inadequacies. (It can't account for all the data.) Consider, for example, the subject NP in the sentence in (1):

1) [The big book of poems with the blue cover] is on the table.

The structure our NP rule NP → (D) (AdjP+) N (PP+) assigns to this is:

2)



We can call this a *flat structure*. The PP *of poems* and the PP *with the blue cover* are on the same level hierarchically; there is no distinction between them in terms of dominance or c-command. In other words they are "flat" with respect to the head word *book*. From the point of view of constituency, we see

that a number of tests point towards a more complicated structure. Consider first the constituency test of *replacement*. There is a particular variety of this process, called **one-*replacement***, that seems to target precisely a group of nodes that don't form a constituent in the tree in (2):

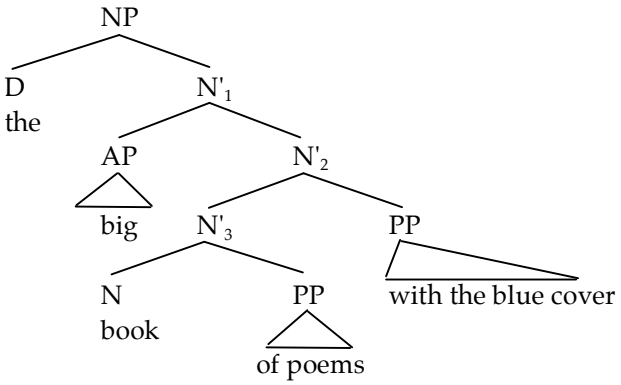
3) I bought the big [book of poems with the blue cover] not the small [one].

Here, *one*-replacement targets *book of poems with the blue cover*, this group of words does not form a constituent in the tree in (2). Furthermore, *one*-replacement seems to be able to target other subgroups of words that similarly don't form constituents in (2):

4) I bought the big [book of poems] with the blue cover not the small [one] with the red cover.

These facts seem to point to a more deeply embedded structure for the NP:

5)



The *one*-replacement in (4) targets the node labeled N'_3. The *one*-replacement in (3) targets the node labeled N'_2. We have to change the NP slightly to get evidence for N'_1. If we change the determiner *the* to the determiner *that*, we can use *one*-replacement to target N'_1.

6) I want [$_{NP}$ this [$_{N'}$ big book of poems with the red cover]] not [$_{NP}$ that [$_{N'}$ one]].

Similar evidence comes from conjunction:

7) Calvin is [the [dean of humanities] and [director of social sciences]].
8) Give me [the [blue book] and [red binder]].

We need these "intermediate" N' (pronounced "en-bar") categories to explain the items that are conjoined in these sentences.

The flat structure seen in (2) is clearly inadequate and a more articulated structure is needed. This chapter is about these articulated trees. The theory that accounts for these is called X-bar theory.

Before getting into the content of this chapter, a few bibliographic notes are in order. The first presentation of X-bar theory appeared in Chomsky (1970). Jackendoff's (1977) seminal book *X-bar Syntax* is the source of many of the ideas surrounding X-bar theory. Perhaps the most complete description of X-bar theory comes from an introductory syntax textbook (like this one). This is Radford's (1988) *Transformational Grammar: A First Course*. That textbook presents one of the most comprehensive arguments for X-bar theory. This chapter draws heavily on all three of these sources. If you are interested in reading a more comprehensive (although slightly out-of-date) version of X-bar theory, then you should look at Radford's book.

1. BAR-LEVEL PROJECTIONS

In order to account for the data seen above in the introduction, let us revise our NP rules to add the intermediate structure:

9) NP → (D) N'
10) N' → (AP) N' *or* N' (PP)
11) N' → N (PP)

Equivalent Notations

The name "X-bar theory" comes from the original mechanism for indicating intermediate categories. N' was written $\bar{N}$ with a bar over the letter. This overbar is the origin of the "bar" in the name of the theory. "X" is a variable that stands for any category (N, Adj, V, P, etc.). The following notations are all equivalent:

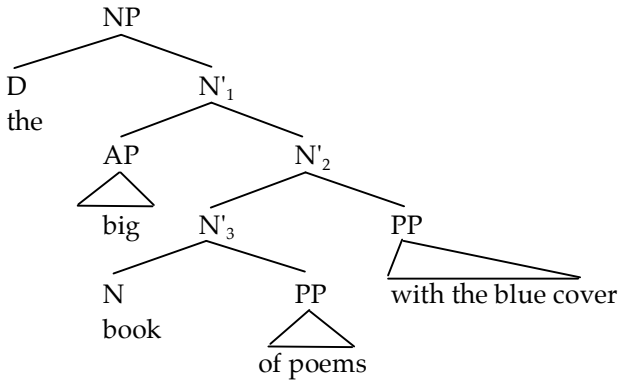
	our notations	
Phrase level	NP	= N″= N''= $\bar{\bar{N}}$ = N^{max}
Intermediate level	N'	= N′= $\bar{N}$
Word/Head level	N	= N°

The same is true of all other categories as well (e.g., PP = $\bar{\bar{P}}$ = P″= P''= P^{max}, etc.). Since overbars are hard to type, even with Unicode fonts, most people use a prime (') or apostrophe (') for the intermediate level and write the phrasal level as NP (or more rarely, N'').

These rules introduce a new character to our cast of nodes, seen briefly above. This is the N' node. It plays the role of the intermediate constituent

replaced by *one* above. The tree in (5) is repeated here showing how these rules (9–11) apply.

(12)



Rule (9) generates the NP node of this tree, with its daughters D and N'. The first version of rule (10) generates N'_1. The second version of rule (10) generates N'_2. Finally the last rule (11) spells out N'_3 as N and its PP sister.

We can now straightforwardly account for the *one*-replacement sentences. *One*-replacement is a process that targets the N' node:

13) One-*replacement:* Replace an N' node with *one.*

Without the intermediate N' node, we would have no way of accounting for *one*-replacement or conjunction facts. With N', explaining these sentences is easy, since there is more structure in each phrase.

The rule system in (9–11) has a number of striking properties (including the facts that it is binary branching and the first N' rule is iterative or self-recursive). We will return to these properties in a later section and show how they account for a number of surprising facts about the internal structure of phrases. First, however, let's see if any other categories also have intermediate structure.

1.1 V-bar

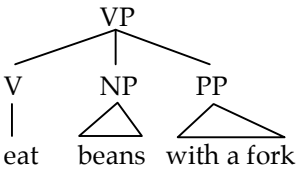
There is a similar process to *one*-replacement found in the syntax of VPs. This is the process of **do-so-**[1] (or **did-so-**) ***replacement***. Consider first the VP in the following sentence, which has both an NP and a PP in it.

14) I [eat beans with a fork].

[1] Depending upon which dialect of English you speak, you may prefer "did too" over "did so too" or "did so." If the VPs below sound odd, try substituting "did too" for "did so."

The rule we developed for VPs in chapter 3 generates the following flat tree:

15)



In this tree, there is no constituent that groups together the V and NP and excludes the PP. However, *do-so*-replacement targets exactly this unit:

16) I [eat beans] with a fork but Janet [does (so)] with a spoon.

Let's formalize this rule as:

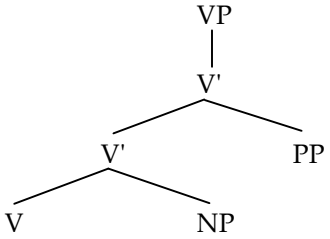
17) Do-so-*replacement:* Replace a V' with *do so (*or *do* or *do so too* or *do too)*

For this to work we need the following rules[2]:

18) VP → V'
19) V' → V' (PP) or V' (AdvP)
20) V' → V (NP)

The tree structure for the VP in (14) will look like (21).

21)



Rule (18) generates the VP and the V' under it; the next rule (19) expands the top V' into another V' and a PP. Finally, the lower V' is expanded into V and NP by rule (20).

The rule of *do-so*-replacement seen in (17) targets the lower V' and replaces it with *do so*. Evidence for the higher V' comes from sentences like (22):

---

[2] The rule in (18) may appear a little mysterious right now (since it appears to introduce a vacuous structure) but we will have need of it in a later chapter. For the moment, just assume that it is necessary, and we will provide additional justification for it later. You can note for now that in order to account for sentences like (22) below, we will need to assume that the entire replaced structure is a V', if we assume that *do-so*-replacement only targets V' nodes (and not VP nodes).

22) Kevin [ate spaghetti with a spoon] and Geordi [did so] too.

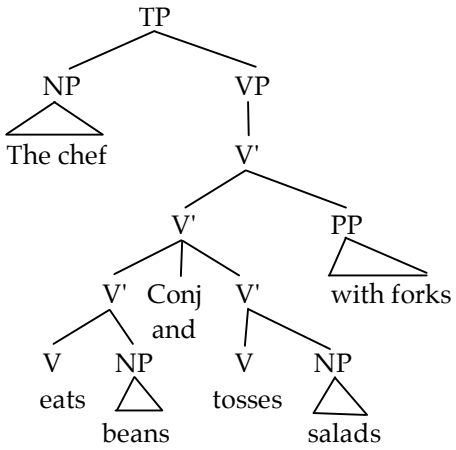
In this sentence, *did so* replaces the higher V' (which includes the V, the lower V', the NP, and the PP).

Similarly, conjunction seems to show an intermediate V' projection:

23) The chef [eats beans] and [tosses salads] with forks.

The tree for a structure like this requires a V' node (a description of the conjunction rule can be found below in the ***additional rules*** in the Ideas section at the end of the chapter.):

24)



You now have enough information to try Challenge Problem Set 1

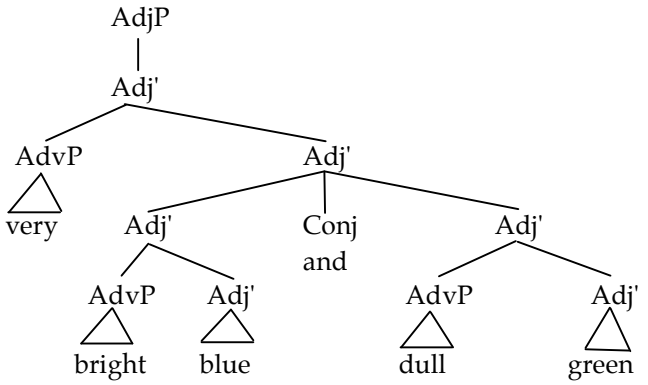
1.2 Adj-bar and Adv-bar

The arguments for intermediate structure in AdjPs are a little more tricky, as English seems to limit the amount of material that can appear in an AdjP. However, we do see such structure in phrases like (25):

25) the [very [[bright blue] and [dull green]]] gown

In this NP, *bright* clearly modifies *blue*, and *dull* clearly modifies *green*. One possible interpretation of this phrase (although not the only one) allows *very* to modify both *bright blue* and *dull green*. If this is the case then the structure must minimally look like (26) (note: we will have reason to revise this tree later).

26)



This must be the structure so that the AdvP can modify both *bright blue* and *dull green*.

Under certain circumstances, some adjectives appear to allow prepositional modifiers to follow them:

27) I am afraid/frightened of tigers.
28) I am fond of circus performers.

These post-adjectival PPs parallel the direct object of related verbs:

29) I fear tigers.
30) I like circus performers.

Consider now:

31) I am [[afraid/frightened of tigers] and [fond of clowns] without exception].

Under one reading of this sentence, *without exception* modifies both *afraid of tigers* and *fond of circus performers*. Again this would seem to suggest that the sentence has the constituency represented by the above bracketing, which points towards an intermediate category of Adj'.

There is also a replacement phenomenon that seems to target Adj's. This is *so*-replacement:

32) Bob is [very [serious about Mary]], but [less [so]] than Paul.

The adjective phrase here is *very serious about Mary*, but *so*-replacement only targets *serious about Mary*.

The rules that generate these structures are:

33) AdjP → Adj'
34) Adj' → (AdvP) Adj'
35) Adj' → Adj (PP)

For reasons of parsimony, we might presume that a similar set of rules governs Adverbs as well, although the evidence is very scarce.

1.3 P-bar

Consider the following sentences:

36) Gwen placed it [right [in the middle of the spaghetti sauce]].
37) Maurice was [[in love] with his boss].
38) Susanna was [utterly [in love]].

In these examples, we have what appear to be prepositional phrases (*in the middle of the spaghetti sauce, in love*) that are modified by some other element: *right*, *with his boss*, and *utterly* respectively. Note, however, that you can target smaller units within these large PPs with constituency tests:

39) Gwen knocked it [right [off the table] and [into the trash]].
40) Maurice was [[in love] and [at odds] with his boss].
41) Susanna was [utterly [in love]], but Louis was only [partly [so]].

Examples (39) and (40) show conjunction of the two smaller constituents. Example (41) is an example of *so*-replacement. Let us call the smaller constituent here P' on a parallel with N', Adj', and V'. The rules that generate PPs are given below:

42) PP $\rightarrow$ P'
43) P' $\rightarrow$ P' (PP)
44) P' $\rightarrow$ P (NP)

With this, we complete our tour of intermediate structure. In developing our phrase structure system, we've managed to complicate it significantly. In the next section we look at ways to simplify the rule system yet capture all the constituency facts we've considered here.

2. GENERALIZING THE RULES: THE X-BAR SCHEMA

For each of the major phrase types (NPs, VPs, AdjPs, AdvPs and PPs) we have come up with three rules, where the first and second rules serve to introduce intermediate structure. Let's repeat all the rules here. (Rules (48), (51), (54), and (57) are admittedly here simply by stipulation, we've seen no evidence for them. We're positing them now for reasons of parsimony with rule (45), but we'll see in the next chapter and the chapter that follows that the structures these rules introduce will be useful to us. Please allow me this

one mysterious stipulation for the moment, I promise we'll return to the issue later in the book.)

45) NP → (D) N'
46) N' → (AdjP) N' *or* N' (PP)
47) N' → N (PP)
48) VP → V'
49) V' → V' (PP) or V' (AdvP)
50) V' → V (NP)
51) AdvP → Adv'
52) Adv' → (AdvP) Adv'
53) Adv' → Adv' (PP)
54) AdjP → Adj'
55) Adj' → (AdvP) Adj'
56) Adj' → Adj (PP)
57) PP → P'
58) P' → P' (PP)
59) P' → P (NP)

This is quite a complicated set, but seems to be more empirically motivated than the set of rules we set out in chapter 3. We can now ask, are we missing any generalizations here?

Indeed, we seem to be missing several. First, note that in all the rules above, the category of the rule is the same as the only element that is not optional. For example, in the NP rule, the element that isn't optional is N'. This is the same part of speech. Similarly, the only obligatory element in N' is either another N' or N. This is a very general notion in phrase structure; we call this headedness. All phrases appear to have ***heads***. Heads are the most prominent element in a phrasal category and give their part of speech category to the whole phrase. Note that we don't have any rules of the form:

60) NP → V AdjP

This rule not only seems meaningless, it is unattested in the system we've developed here. This property is called ***endocentricity***, meaning that every phrase has a head. The only obligatory element in a phrase is the head.

Second, note that with the exception of the determiner in the NP rule, all non-head material in the rules is both phrasal and optional. We never find rules of the form:

61) V′ → Adv V

With the exception of the determiner (an exception that we'll resolve in chapter 7), anything in an X-bar rule that isn't a head must be a phrase and optional.

Finally, notice that for each major category, there are three rules, one that introduces the NP, VP, AdvP, AdjP and PP, one that takes a bar level and repeats it (e.g., $\underline{N'} \rightarrow \underline{N'}$ (PP)), and one that takes a bar level and spells out the head (e.g., N' → N (PP)). We seem to be missing the generalization that for each kind of phrase, the *same kinds of rules* appear. X-bar theory is an attempt to capture these similarities between rules.

We can condense the rules we've proposed into a simple set. To do this we are going to make use of variables (like variables in algebra) to stand for particular parts of speech. Let X be a variable that can stand for any category N, V, Adj, Adv, P. An XP is a catch-all term to cover NP, VP, AP, PP, similarly X' stands for N', V', Adj', Adv', P', and X represents N, V, Adj, Adv, and P.

Using this variable notation we can capture the generalizations that we have missed. Let's start with the rules that introduce heads:

62) a) N' → N (PP)
    b) V' → V (NP)
    c) Adj' → Adj (PP)
    d) Adv' → Adv' (PP)
    e) P' → P (NP)

By using the variable notation we can generalize across these rules with the single general statement:

63) X' → X' (WP) (*to be revised)*

Both X and W here are variables for categories. This rule says that some bar level (on the left of the arrow) consists of some head followed by an optional, phrasal[3] element.

Now turn to the recursive N', A', V' and P' rules:

64) a) N' → (AdjP) N' *or* N' (PP)
    b) V' → V' (PP) or V' (AdvP)
    c) Adj' → (AdvP) Adj'
    d) Adv' → (AdvP) Adv'
    e) P' → P' (PP)

[3] The D in the NP rule is, of course, not phrasal. This is a problem we will return to in the next chapter.

For each of these rules, a category with a single bar level is iterated (repeated), with some optional material either on the right or the left. Again using X as a variable, we can condense these into a single statement:

65) X' → (ZP) X' *or* X' (ZP) (*to be revised*)

Again the Xs here must be consistent in part of speech category. The material that is not the head (i.e., not X) must be phrasal and optional. Note that the categories of these non-head items is also indicated with variables (in this case: ZP).

Finally, let's consider the rules that introduce the last layer of structure:

66) a) NP → (D) N'
b) VP → V'
c) AdjP → Adj'
d) AdvP → Adv'
e) PP → P'

These rules can also be collapsed into a single rule:

67) XP → (YP) X' (*to be revised*)

We haven't motivated the existence of the YP here, except in the form of determiners. I know you're naturally suspicious of me saying "trust me on this" (and rightly so); but I promise we will resolve this in the next chapter.

The system we've come up with here is simple. We've reduced our phrase structure rules down to three general rules using variables: Because they use variables, these rules can generate the correct constituent of the sentences of English. This analysis isn't without problems, however. Before we turn to resolving these problems and drafting a final version of the X-bar rules, we need to introduce some new terminology.

3. Complements, Adjuncts, and Specifiers

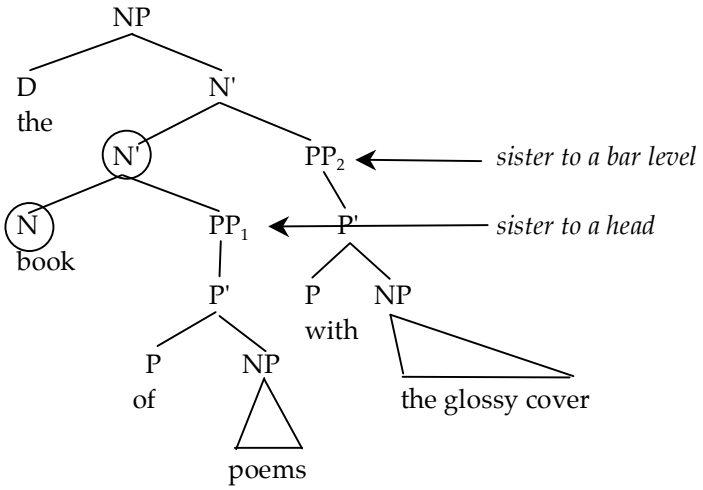
Consider now the two prepositional phrases that are subconstituents of the following NP:

68) the book [$_{PP}$ of poems] [$_{PP}$ with the glossy cover]

Using the X-bar rules,[4] we can generate the following tree for this NP:

[4] Specific instructions on drawing trees using the X-bar rules are found at the end of this chapter.

69)



(I've used triangles in this tree to obscure some of the irrelevant details, but you should not do this when you are drawing trees, until you have a confident grasp of how tree notation works.) You'll note that the two PPs in this tree are at different levels in the tree. The lower PP_1 is a sister to the head N (*book*), whereas the higher PP_2 is a sister to the N' dominating the head N and PP_1. You'll also notice that these two PPs were introduced by different rules. PP_1 is introduced by the rule:

70) $X' \rightarrow X$ (WP)

and PP_2 is introduced by the higher level rule:

71) $X' \rightarrow X'$ (ZP)

An XP that is a sister to a head (N, V, A, or P) is called a ***complement***. PP_1 is a complement. Complements roughly correspond to the notion "object" in traditional grammar. XPs that are sisters to single bar levels (N', V', A', or P') and are daughters of an N' are called ***adjuncts***. PP_2 is an adjunct. Adjuncts often have the feel of adverbial or obliques.

72) *Adjunct:* An XP that is a sister to a single bar level (N', V', A', or P') and a daughter of a single bar level (N', V', A', or P').

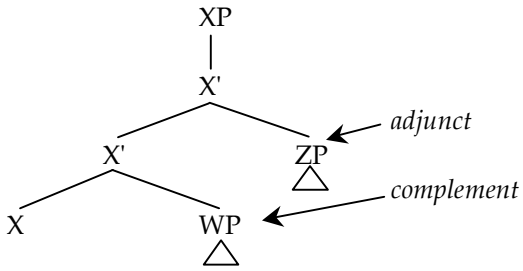
73) *Complement:* An XP that is a sister to a head (N, V, A, P), and a daughter of a single bar level (N', V', A', or P').

The rules that introduce these two kinds of XPs get special names:

74) *Adjunct rule:* $X' \rightarrow X'$ (ZP)
75) *Complement rule:* $X' \rightarrow X$ (WP)

A tree showing the structural difference between these is given below:

76)



If there really are two different kinds of PP within an NP, then we expect that they will exhibit different kinds of behavior. It turns out that this is true: There are significant differences in behavior between adjuncts and complements.

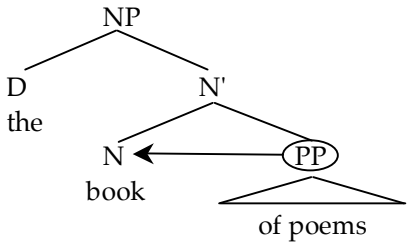
3.1 Complements and Adjuncts in NPs

Take NPs as a prototypical example. Consider the difference in meaning between the two NPs below:

77) the book of poems
78) the book with a red cover

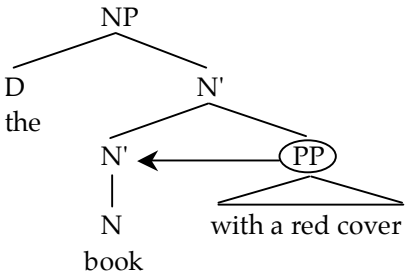
Although both these examples seem to have, on the surface, parallel structures (a determiner, followed by a noun, followed by a prepositional phrase), in reality, they have quite different structures. The PP in (77) is a complement and has the following tree:

79)



You'll note that the circled PP is a sister to N, so it is a complement. By contrast, the structure of (78) is:

80)



Here the PP *with a red cover* is a sister to N', so it is an adjunct. The differences between these two NPs is not one that you can *hear*. The difference between the two is in terms of the amount of structure in the tree. In (80), there is an extra N'. While this difference may at first seem abstract, it has important implications for the behavior of the two PPs. Consider first the meaning of our two NPs. In (77), the PP seems to complete (or complement) the meaning of the noun. It tells us what kind of book is being referred to. In (78), by contrast, the PP seems more optional and more loosely related to the NP. This is a highly subjective piece of evidence, but it corresponds to more syntactic and structural evidence too.

An easy heuristic (guiding principle) for distinguishing complements from adjunct PPs inside NPs, is by looking at what preposition they take. In English, almost always (although there are some exceptions) complement PPs take the preposition *of*. Adjuncts, by contrast, take other prepositions (such as *from*, *at*, *to*, *with*, *under*, *on*, etc.). This test isn't 100 percent reliable, but will allow you to eyeball PPs and tell whether they are complements or adjuncts for the vast majority of cases. With this in mind, let's look at some of the other behavioral distinctions between complements and adjuncts.

Think carefully about the two rules that introduce complements and adjuncts. There are several significant differences between them. These rules are repeated here for your convenience:

81) *Adjunct rule:* X' → X' (ZP)
82) *Complement rule:* X' → X (WP)

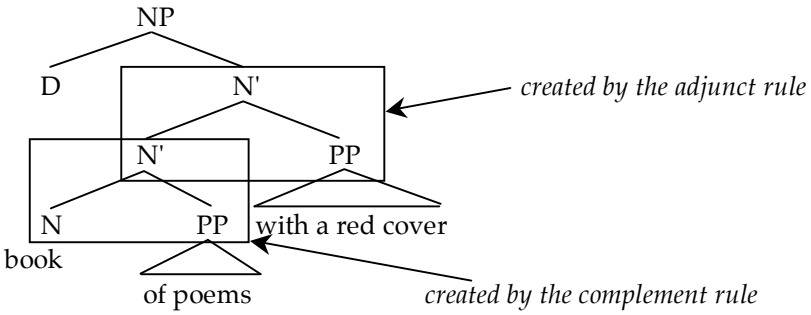
First observe that because the complement rule introduces the head (X), the complement PP will always be adjacent to the head. Or more particularly, it will always be closer to the head than an adjunct PP will be. This is seen in the following data:

83) the book [of poems] [with a red cover]
head *complement* *adjunct*

84) *the book [with a red cover] [of poems]
head *adjunct* *complement*

You can see how this is true if you look at the tree for sentence (83):

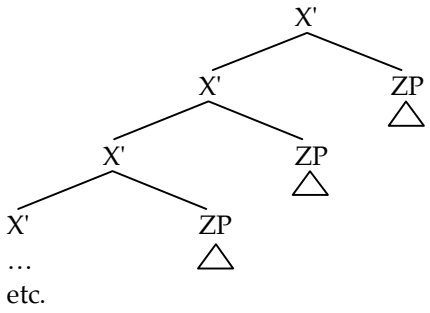
85)



Since the adjunct rule takes an X' level category and generates another X' category, it will always be higher in the tree than the output of the complement rule (which takes an X' and generates an X). Since lines can't cross, this means that complements will always be lower in the tree than adjuncts, and will always be closer to the head than adjuncts.

There is another property of the rules that manifests itself in the difference between adjuncts and complements. The adjunct rule, as passingly observed above, is an iterative rule. That is, within the rule itself, it shows the property of recursion (discussed in chapter 3): On the left-hand side of the rule there is an X' category, and on the right hand side there is another X'. This means that the rule can generate infinite strings of X' nodes, since you can apply the rule over and over again to its own output:

86)



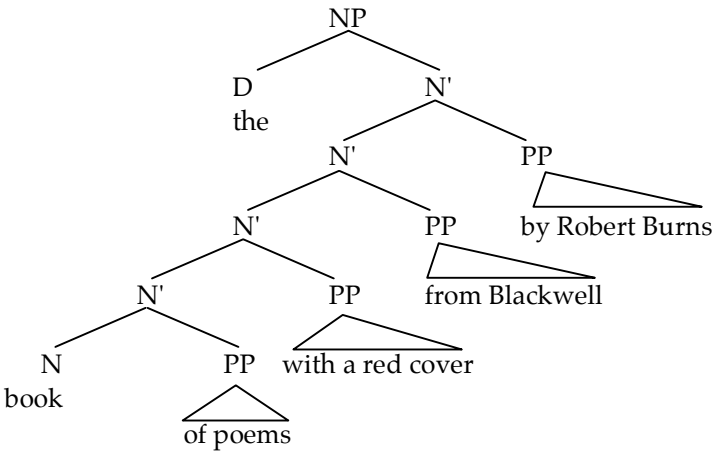
The complement rule does not have this property. On the left side of the rule there is an X', but on the right there is only X. So the rule cannot apply iteratively. That is, it can only apply once within an XP. What this means for complements and adjuncts is that you can have any number of adjuncts (87), but you can only ever have one complement (88):

87) the book [of poems] [with a red cover] [from Blackwell] [by Robert Burns]
head complement adjunct adjunct adjunct

88) *the book [of poems] [of fiction] [with a red cover]
head complement complement adjunct

The tree for (87) is given below; you'll note that since there is only one N, there can only be one complement, but since there are multiple N's, there can be as many adjuncts as desired.

89)



Related to the facts that the number of adjuncts is unlimited, but only one complement is allowed, and complements are always adjacent to the head, observe that you can usually reorder adjuncts with respect to one another, but you can never reorder a complement with the adjuncts:

90) a) the book of poems with a red cover from Blackwell by Robert Burns
b) the book of poems from Blackwell with a red cover by Robert Burns
c) the book of poems from Blackwell by Robert Burns with a red cover
d) the book of poems by Robert Burns from Blackwell with a red cover
e) the book of poems by Robert Burns with a red cover from Blackwell
f) the book of poems with a red cover by Robert Burns from Blackwell
g) *the book with a red cover of poems from Blackwell by Robert Burns
h) *the book with a red cover from Blackwell of poems by Robert Burns
i) *the book with a red cover from Blackwell by Robert Burns of poems
(etc.)

Note that adjuncts and complements are constituents of different types. The definition of adjuncthood holds that adjuncts are sisters to X'. Since conjunction (see under ***additional rules*** at the end of this chapter) requires that you conjoin elements of the same bar level, you could not, for example, con-

join an adjunct with a complement. This would result in a contradiction: Something can't be both a sister to X' and X at the same time. Adjuncts can conjoin with other adjuncts (other sisters to X'), and complements can conjoin with other complements (other sisters to X), but complements cannot conjoin with adjuncts:

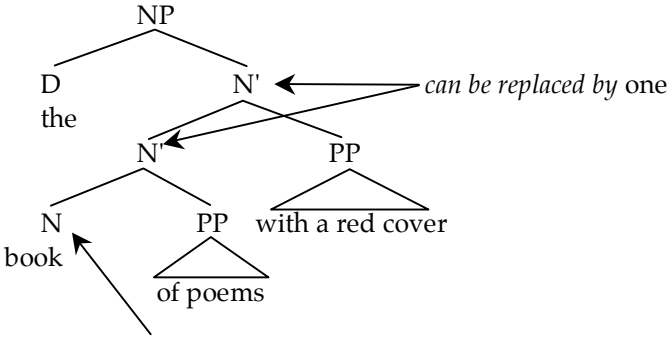
91) a) the book of poems with a red cover and with a blue spine[5]
b) the book of poems and of fiction from Blackwell
c) *the book of poems and from Blackwell

There is one final difference between adjuncts and complements that we will examine here. Recall the test of *one*-replacement:

92) One-*replacement:* Replace an N' node with *one.*

This operation replaces an N' node with the word *one*. Look at the tree in (93):

93)



If you look closely at this tree you'll see that two possibilities for *one*-replacement exist. We can either target the highest N', and get:

94) the one

or we can target the lower N' and get:

95) the one with a red cover

But we cannot target the N head; it is not an N'. This means that *one* followed by a complement is ill-formed:

96) *the one of poems with a red cover[6]

---

[5] If this NP sounds odd to you, try putting emphasis on the *and*.

[6] Not everyone finds this NP ill-formed. There is at least one major US dialect that allows sentence (96). One possible explanation for this is that different dialects have

Since complements are sisters to X and not X', they cannot stand next to the word *one*. Adjuncts, by definition, can.

So far in this chapter, we've covered a huge range of facts, so a quick summary is probably in order. In section 1, we saw that constituency tests pointed towards a more articulated structure for our trees than the one we developed in chapter 3. In section 2, we introduced the X' notation to account for this more complicated structure. In X-bar structure, there are three levels of categories. There are XPs, X's, and Xs. In this section – focusing exclusively on NPs – we introduced special terms for elements that are sisters to X' and X: *adjuncts* and *complements*. These two different kinds of modifier have different properties. Adjuncts but not complements can be iterated and reordered and can stand next to *one*. Complements, by contrast, must be located next to the head and can't be reordered. We also saw that we could conjoin complements with complements and adjuncts with adjuncts, but that we couldn't mix the two. All of these data provide support for the extra structure proposed in X-bar theory. In the next subsection, we'll briefly consider evidence that the complement/adjunct distinction holds for categories other than NP as well.

You can now try General Problem Sets 1, 2 & 3 and Challenge Problem Set 2. You may want to read section 6 (on tree drawing) before attempting General Problem Set 3.

3.2 Complements and Adjuncts in VPs, AdjPs, AdvPs and PPs

The distinction between complements and adjuncts is not limited to NPs; we find it holds in all the major syntactic categories. The best example is seen in VPs. The direct object of a verb is a complement of the verb. Prepositional and adverbial modifiers of verbs are adjuncts:

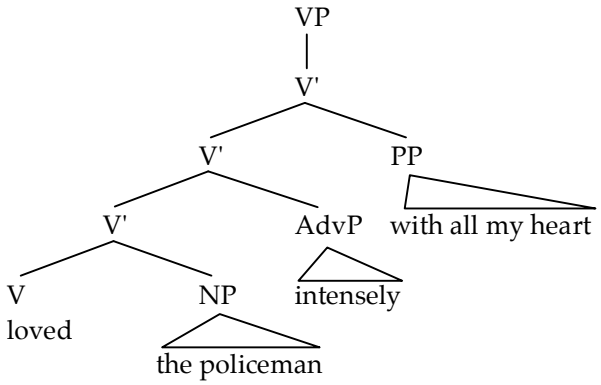
97) I loved [the policeman] [intensely] [with all my heart].

V	direct object	adverbial	PP phrase
	complement	*adjunct*	*adjunct*

---

different *one*-replacement rules. The dialect that finds this NP well-formed allows either N or N' to be replaced. The dialect that finds this ill-formed (or at least odd), only allows N' to be replaced.

98)



Direct objects must be adjacent to the verb, and there can only be one of them.

99) a) *I loved intensely the policeman with all my heart.
b) *I loved the policeman the baker intensely with all my heart.

Did-so (*did-too*) replacement targets V'. Like one-replacement, this means that it can only apply before an adjunct and not before a complement:

100) Mika loved the policemen intensely and
a) Susan did so half-heartedly.
b) *Susan did so the baker.

This is classic adjunct/complement distinction. In general, complements of all categories (N, V, A, P, etc.) are the semantic objects of the head. Consider for example all the complements below:

101) a) John fears dogs. *(verb)*
b) John is afraid of dogs. *(adjective)*
c) John has a fear of dogs. *(noun)*

In all these sentences, *(of) dogs* is a complement.

You now have enough information to try General Problem Set 4

The evidence for the adjunct/complement distinction in adjective phrases and prepositional phrases is considerably weaker than that of nouns and verbs. Adverbs that modify adjectives have an adjunct flair – they can be stacked and reordered. Other than this, however, the evidence for the distinction in PPs and AdjPs, comes mainly as a parallel to the NPs and VPs. This may be less than satisfying, but is balanced by the formal simplicity of having the same system apply to all categories.

3.3 The Notion Specifier

In the section 3.1 above, we introduced two structural notions: adjuncts and complements. These correspond to two of the three X-bar rules:

102) a) *Adjunct rule:* X' → X' (ZP) *or* X' → (ZP) X'
b) *Complement rule:* X' → X (WP)

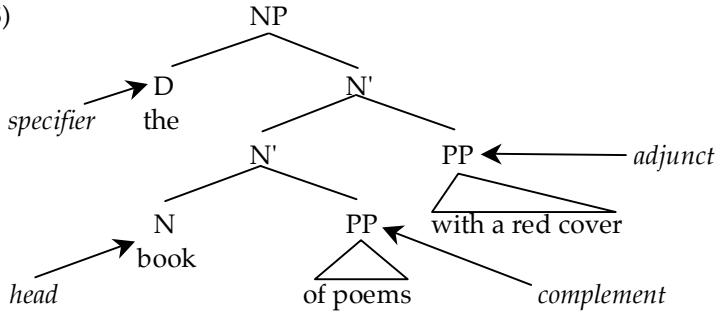
The third rule also introduces a structural position: the ***specifier***.

103) *Specifier rule:* XP → (YP) X'

We have only seen one specifier so far – the determiner in NPs:

104) [the] [book] [of poems] [with a red cover]
specifier head complement adjunct

105)



The specifier is defined as the daughter of XP and sister to X':

106) *Specifier:* An XP[7] that is a sister to an X' level, and a daughter of an XP.

We can show that specifiers are different from adjuncts and complements. Since the specifier rule is not recursive, you can only have one specifier:[8]

107) *the these red books

The specifier rule has to apply at the top of the structure, this means that the specifier will always be the left-most element (in English anyway):

---

[7] If you are being observant you'll notice that the single example we have of a specifier is not a phrase, but a word (*the*), so it may seem odd to say XP here. We return to this issue in later chapters.

[8] One possible exception to this is the quantifier *all*, as in *all the books*. In the next chapter, we discuss the idea that determiners head their own phrase (called a DP), which might provide a partial explanation for this exception.

108) *boring the book

The above example also shows that specifiers can't be reordered with respect to other adjuncts or complements. As the final difference between specifiers and other types of modifier, specifiers can only be conjoined with other specifiers:

109) a) two or three books
b) *two or boring books

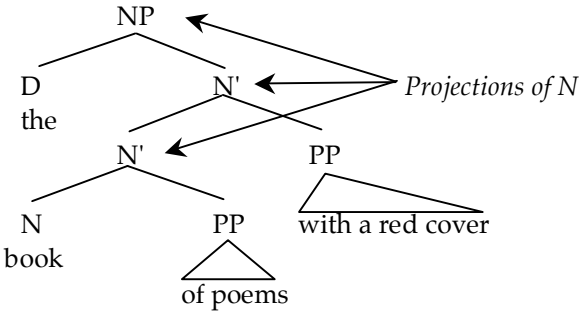
On the surface, the usefulness of this position may seem obscure, since only determiners appear in it. But in later chapters we will have important use for specifiers. (In particular, we will claim that they are the position where subjects are generated in a variety of categories.)

4. Some Definitional Housekeeping

With the refinements to the grammar we've made by adding X-bar theory to our system, we need to make some minor modifications to the rules and definitions that we introduced in previous chapters.

First, we need some terminology to describe the new parts of the phrase that we have added. We can refer to all the elements in an NP, for example, that are introduced (i.e. appear on the left side of the rule) by the three phrase structure rules as ***projections*** of the head. In the following tree, all the N's and the NP said to be projections of the head N.

110)



The NP is called the ***maximal projection***; the N's are called ***intermediate projections***.

Recall our definition of the principle of modification from chapter 3; a modifier must be a sister to the head it modifies:

111) ***Principle of Modification*** (old)
If a YP (that is, a phrase with some category Y) modifies some head X, then YP must be a sister to X.

This definition no longer works for us. If you look at the tree in (110) you'll see that only the complement is actually a sister to the head. Modifiers that are adjuncts and specifiers aren't. To fix this we need to again revise the principle of modification:

111') ***Principle of Modification*** (revised)
If a YP modifies some head X, then YP must be a sister to X or a projection of X (i.e., X', XP).

By adding extra layers of structure we also need to revise our definitions of object and indirect object. In chapter 4, these relations are defined in terms of being immediately dominated by VP. But with the new X-bar structures these NPs aren't immediately dominated by VP anymore, so we need to change them so they are defined in terms of intermediate structure. This is easy to do for the direct object of transitive verbs:

112) ***Direct Object*** *(partly revised):*
With verbs of type $V_{[NP\_\_NP]}$, and $V_{[NP\_\_CP]}$, the NP or CP sister to the V.

The definitions of indirect and direct objects in other types (e.g., ditransitives) are much harder. This is because our rules as stated only allow binary branching; only one complement is allowed. Yet for ditransitives we would ideally like to have two complements. This is a problem for X-bar theory. We will return to ditransitives and indirect objects in chapter 13.

5. Parameters of Word Order

In this chapter, and thus far in this book, we've been concentrating primarily on English. The reason for this is that, since you are reading this book, it is the language most accessible to you. However, syntacticians aren't interested only in English. One of the most interesting parts of syntax is comparing the sentence structure of different languages. The X-bar rules we've developed so far for English do an acceptable job of accounting for the order of constituents and hierarchical structure of English:

113) a) *Specifier rule:* $XP \rightarrow (YP)\ X'$
b) *Adjunct rule:* $X' \rightarrow X'\ (ZP)$ *or* $X' \rightarrow (ZP)\ X'$
c) *Complement rule:* $X' \rightarrow X\ (WP)$

They don't, however, account well for other languages. Consider the position of direct objects (complements) in Turkish. In Turkish, the complement precedes the head:

114) Hasan kitab-i oku-du.
Hasan-SUBJ book-OBJ read-PAST
"Hasan read the book."

If you look carefully at sentence (114) you notice that the word *kitabi* "book" precedes the word *okudu* "read."

Not all languages put the complement on the right-hand side like English. Not all languages put the specifier before the head either. Our rules, while adequate for English, don't really get at the syntactic structure of languages in general. Remember, syntax is the study of the mental representation of sentence structure, and since we all have the same basic gray matter in our brains, it would be nice if our theory accounted for both the similarities and the differences among languages.

X-bar theory provides us with an avenue for exploring the differences and similarities among languages. Let's start by generalizing our rules a little bit. Let's allow specifiers and adjuncts to appear on either side of the head:

115) a) *Specifier rule:* XP → (YP) X' *or* XP → X' (YP)
b) *Adjunct rule:* X' → X' (ZP) *or* X' → (ZP) X'
c) *Complement rule:* X' → X (WP) *or* X' → (WP) X

Each of these rules has two options, the specifier/complement/adjunct can all appear on either side of their head. Obviously, these rules are now too general to account for English. If these rules, as stated, were adopted straight out, they would predict the grammaticality of sentences like:

116) *[$_{NP}$ Policeman the] [$_{VP}$ Mary kissed].
(meaning *The policeman kissed Mary.*)

It would be a bad thing to do this. At the same time, constituent orders like those of Turkish, in fact, exist, so this clearly is an option. Our theory must capture both facts: The fact that the object-verb (OV) order is an option that languages use, and that it isn't the option used by English.

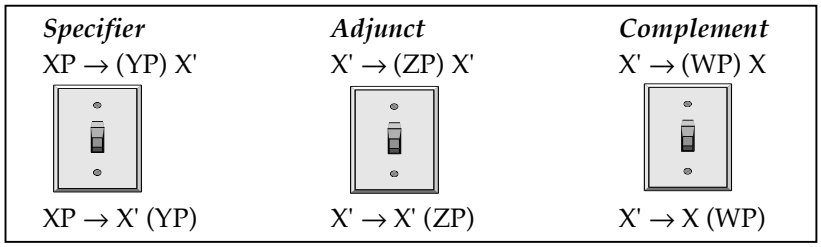
The way that generative syntacticians accomplish this is by claiming that the rules in (115) are the possibilities universally available to human beings. When you acquire a particular language you select *one* of the options in the rule, based upon the input you hear from your parents. Take, for example, the complement rule. In English, complements of verbs follow the verbal head. In Turkish, they precede the head. There are two options in the rule:

117) a) X'→ X (WP)
b) X' → (WP) X

The child learning English will adopt option (a), the child learning Turkish will adopt option (b). These options are called ***parameters***. The proposal that word order is parameterized finds its origins in Travis (1984).

Here is an analogy that might help you understand this concept. Imagine that in your head you have a box of switches, just like the box of master breaker switches which controls the electricity in your house. These switches can be set *on* or *off*. The options in the X-bar rules are like these switches, they can be set in one direction or the other (and in some situations – such as adjuncts in English – allow both settings).

118) X-bar parameters switch box



When you are a child acquiring your language, you subconsciously set these switches, to tell you which version of the rules to use.

Notice that this gives us a very simple system for acquiring the word order of our languages. There are a finite set of possibilities, represented by the different settings of the parameters. English sets its complement parameter so that the complement follows the head. Turkish sets it the other way. The child only has to hear a small amount of data (perhaps even as little as one sentence) to know what side of the head complements go in their language. Once children have set the parameter, they can apply the right version of the rule and generate an unlimited number of sentences. In the problem sets at the end of this chapter, you have the opportunity of looking at some data from a variety of languages and determining how their X-bar parameters are set. For your reference, the English settings are given below:

119) a) *Specifier* specifier on left, head on right (XP → (YP) X')
e.g., *The* book

b) *Adjunct* Both options allowed (X'→ (ZP) X' and X' → X' (ZP))
e.g., *Yellow* roses
Books *from Poland*

c) *Complement* head on left, complement on right (X' → X (WP))
e.g., Books *of Poems*
John kissed *his mother*.

You now have enough information to try General Problem Sets 5 & 6 (although you may want to read section 6 (on tree drawing) before attempting Problem Set 4). You also have enough information to answer Challenge Problem sets 3 & 4

---

6. DRAWING TREES IN X-BAR NOTATION

6.1 Important Considerations in Tree Drawing

In this section, we'll run through the steps for drawing trees in X-bar notation. The basics of tree drawing that you learned in chapter 3 hold here too. However, some special principles apply to X-bar tree drawing:

i) When identifying what modifies what, it is also important to know whether it is a complement, adjunct, or specifier. This is important because you have to know whether to make it a sister to the head, to an X', etc.

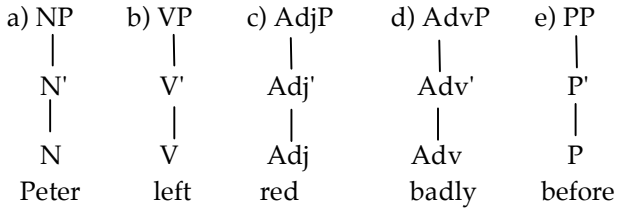
ii) When linking material up, start with the modifiers closest to the head. Because X-bar structure is formulated the way it is, material closest to the head will be the most deeply embedded material – so it will have to attach to the head *first*.

a) Identify the head.
b) Attach the complement (must be a phrase!).
c) Attach any adjuncts (which must be phrases themselves) working progressively away from the head, each adjunct gets its own X' mother. (see points (iv) and (v) below for dealing with cases when you have either no adjuncts or have an adjunct on either side of the head.
d) When there are no more adjuncts, attach the specifier, if there is one. This gets an XP on top.
e) Even if there is no specifier, put an XP on top of the projections. This indicates that there are no more modifiers of the head X.

iii) Keep in mind that none of the X-bar rules are optional. That is, they must all apply. This results in a fair amount of vacuous or non-branching

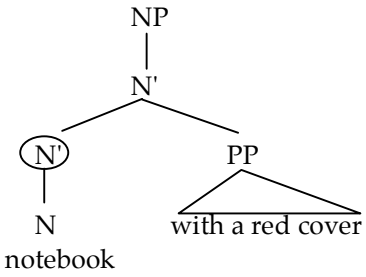
structure. Even if the phrase has only a single word in it you will have *at least* the following structures:

120)



iv) Perhaps one of the most common errors of new syntacticians is in drawing trees for phrases with an adjunct but no complement. Consider the NP [notebook with a red cover]. *With a red cover* is an adjunct – that means that it has to be a sister to N' and a daughter to N' (by definition). This is seen in the following tree:

121)



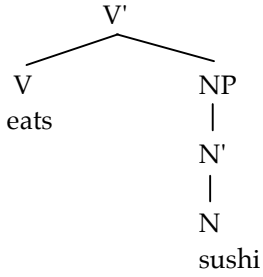
The circled N' here must be present in order to make the PP an adjunct. Be very careful to draw in these vacuous nodes that distinguish adjuncts from complements.

v) Another common issue that arises for new syntacticians is how to tree a sentence when there is an adjunct on either side of the head. Consider the sentence in (123):

122) Andy [$_{VP}$ frequently eats sushi with his boss].
adjunct *head* *complement* *adjunct*

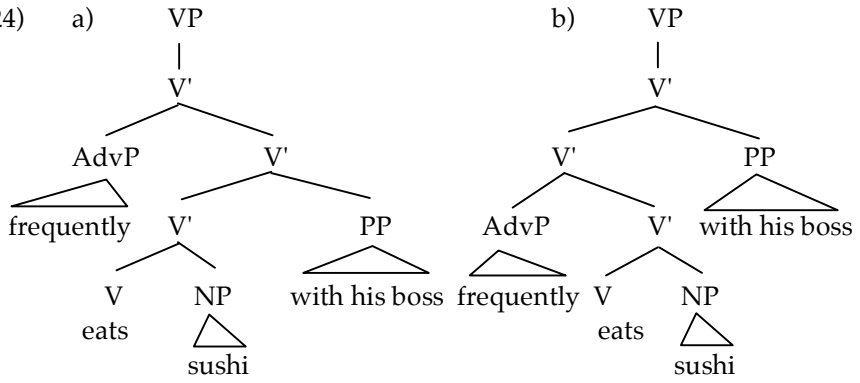
We start by attaching the complement to the head:

123)



Our next step should be to attach an adjunct. But there are two adjuncts. Which one comes first? Interestingly, the answer is *either*. Two possible trees can come out of this VP:

124) a)



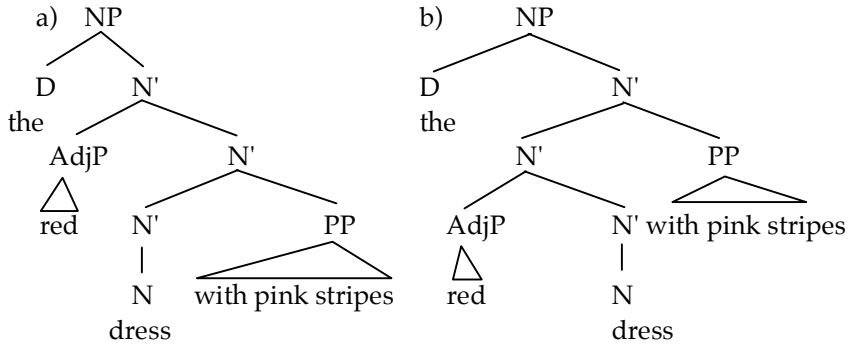
b)

In (124a), the AdvP *frequently* is attached higher than the PP *with his boss*. In (124b), the PP is attached higher than the AdvP. Both of these trees are acceptable, because the adjunct rule iterates. This means that either version of it can appear in either order. Since we have two structures for this sentence you might wonder if there is any semantic ambiguity in this phrase. The distinction is subtle, but it is there. For (124a), we can identify a set of events of sushi-eating with the boss, and then we identify those events as occurring frequently. The meaning of (124b) is very subtly different, there is a set of frequent events of sushi eating, and we are identifying those as occurring with his boss. This distinction is a little easier to see in NPs:

125) The red dress with the pink stripes

This can be treed two different ways:

126) a) b)



The first tree corresponds to a meaning where we are picking a red member out of the set of dresses with pink stripes. (126b) corresponds to the situation where we are picking a dress with pink stripes out of the set of red dresses. These two trees may pick out the same individuals in the world, but they do so in different contexts (one where we are trying to distinguish among red dresses; and the other where we are distinguishing among pink-striped dresses).

With these additional X-bar theoretic considerations in mind we can now draw a sample tree:

6.2 A Sample Tree

The sentence we'll draw is:

127) The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Our first step, as always, is to identify the parts of speech:

128) D Adj N P N V N P N P D N
The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Next, and most importantly, we have to identify what modifies or relates to what, and whether that modification is as an adjunct, complement, or specifier. This is perhaps the most difficult and tedious step, but it is also the most important. You will get better at this with practice. You can use the tests we developed above (stacking, coordination, etc.) to determine whether the modifier is a complement, adjunct, or specifier.

129) [The$_1$] modifies [man] as a specifier.
[ugly] modifies [man] as an adjunct.
[Brazil] modifies [from] as a complement.
[from Brazil] modifies [man] as an adjunct.
[Poems] modifies [of] as a complement.

[of Poems] modifies [books] as a complement.
[books of poems] modifies [found] as a complement.
[the$_2$] modifies [puddle] as a specifier.
[the puddle] modifies [in] as a complement.
[in the puddle] modifies [found] as an adjunct.

Keeping in mind the (revised) principle of modification, and the strict X-bar structure, we next start to build the trees. I suggest you generally start with AdjPs and AdvPs. We have one Adj here. Note that nothing modifies this Adj. As such, it has the minimal structure given above in (120c).

130)

The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Next we do NPs and PPs. Again, we'll also start on the right hand side of the sentence. The first NP is *the puddle*, be sure to apply all three of the NP rules here. Don't forget the N' node in the middle. The determiner is the specifier of the NP, so it must be the sister to N' and daughter of NP.

131)

The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

There are two nouns in this sentence that aren't modified by anything (*Brazil* and *poems*). Let's do these next. Even though they aren't modified by anything they get the full X-bar structure, with NP, N' and N: This is because the rules are *not* optional.

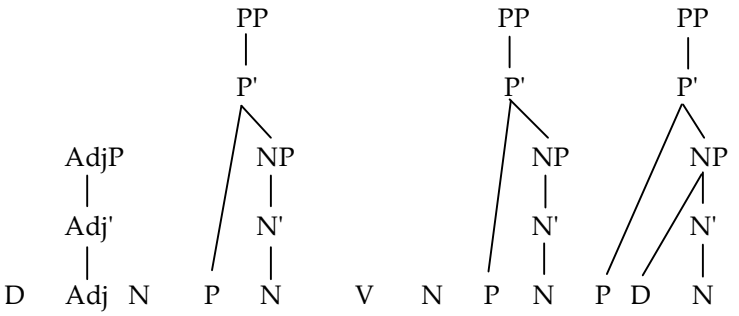
132)

The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

There are two more nouns in this sentence (*man* and *books*), but if you look carefully at our list of modifications (129), you'll see that they are both modified by PPs. So in order to do them, we have to first build our PPs. There are

three Ps in this sentence (and hence three PPs), each of them takes one of the NPs we've built as a complement. The objects of prepositions are always complements. That means that they are sisters to P, and daughters of P':

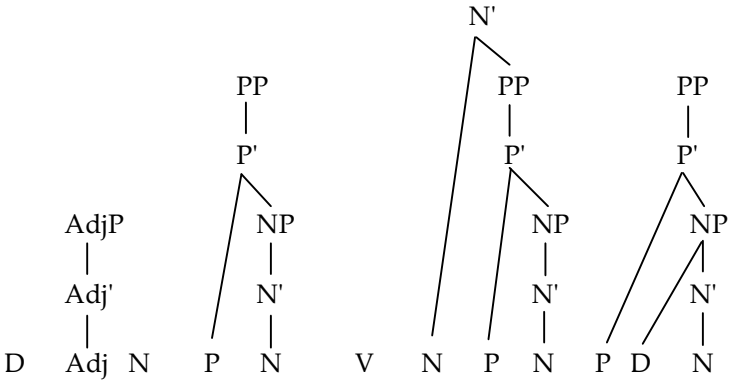
133)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Now that we've generated our PPs, we'll go back to the two remaining NPs. Let's first observe that the PP *in the puddle* does <u>*not*</u> modify an N (it modifies the V *found*), so it is <u>*not*</u> attached at this stage. Now, turn to the N *books*. We start with the complement. *Of poems* is the complement meaning that the PP will be the sister to the N head, and the daughter of N'.

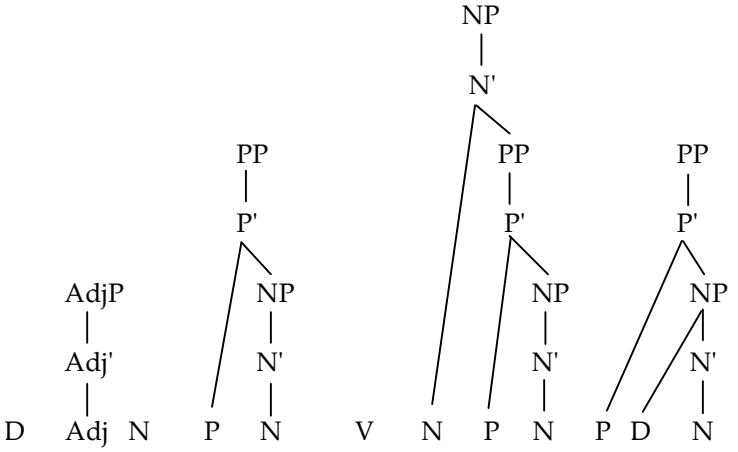
134)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Nothing else modifies books. When there are no more modifiers we close off the projection with the phrase level:

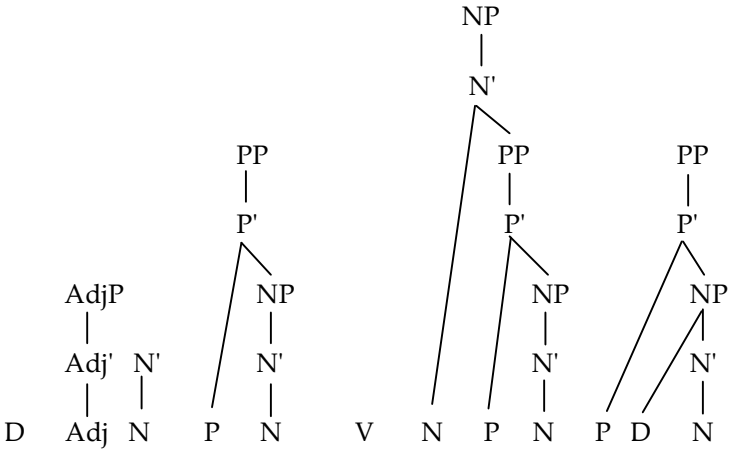
135)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Finally, we have the NP *the ugly man from Brazil.* There is no complement here, so we project to N' without any branching. Were there a complement in the NP we would attach it first.

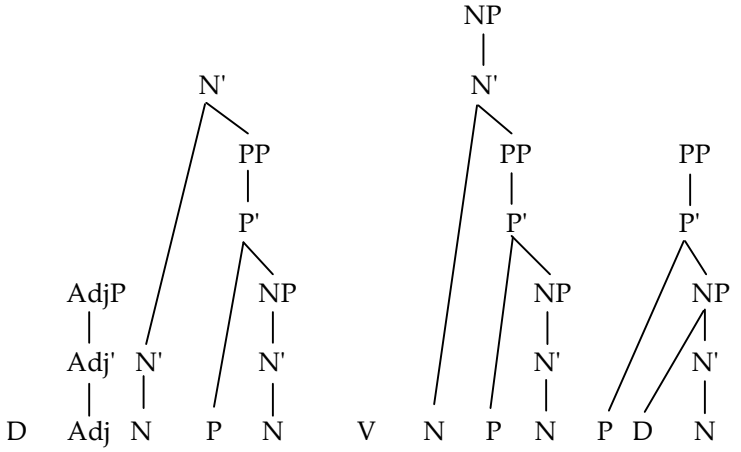
136)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

There are two adjuncts in this NP: *from Brazil* and *ugly*. As per point (v) (and see the trees in (126), this can be treed two different ways. We can attach either adjunct first. I'll arbitrarily pick to attach the PP first here. Because it is an adjunct, it has to be a sister to N' and a daughter of N'. (Note the difference between this NP and *books of poems*.)

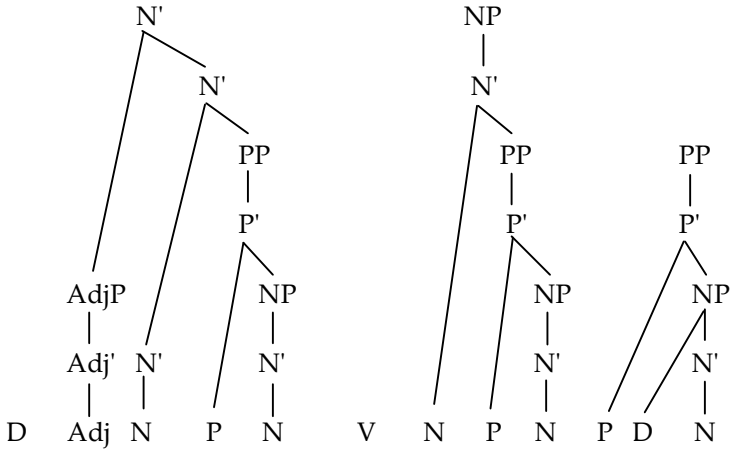
137)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Next we attach the AdjP. Note that because it is an adjunct, it has to be sister to an N' and daughter of an N'. The N' it is a sister to is already in the tree (having been added in the previous step).

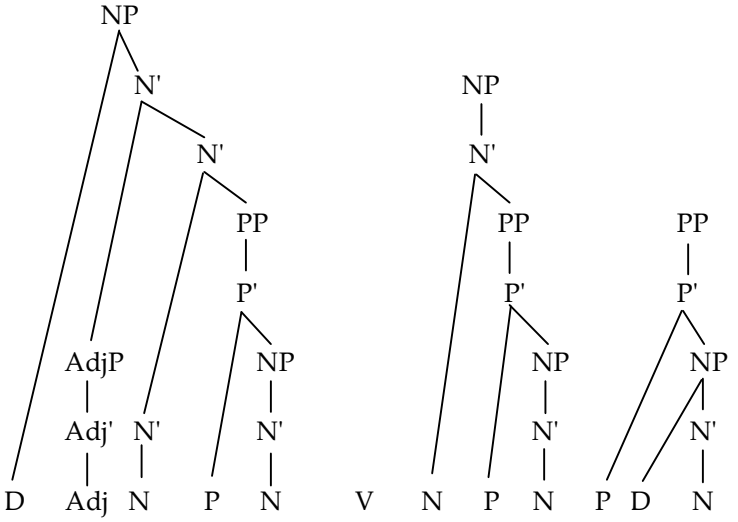
138)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

We're nearly finished with this NP. The determiner is a specifier, which is a daughter of NP and a sister to N'.

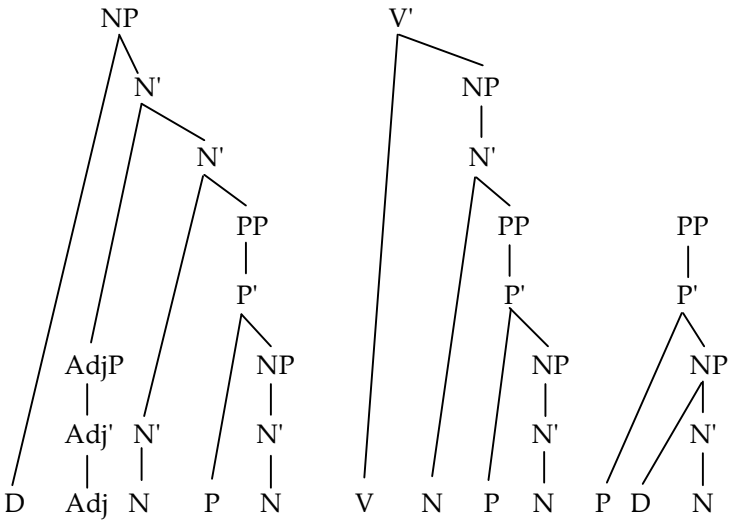
139)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Now we turn to the VP. The verb *found* has two modifiers. *Books of poems* is a complement, and *in the puddle* is an adjunct. You should always start with the complement, and then follow with the adjuncts, because complements are closer to the head. Remember, complements are sisters to V, and adjuncts are sisters to V'. Notice that the complement NP, which is closer to the head, is attached lower than the adjunct PP, it is the sister to V and daughter of V'.

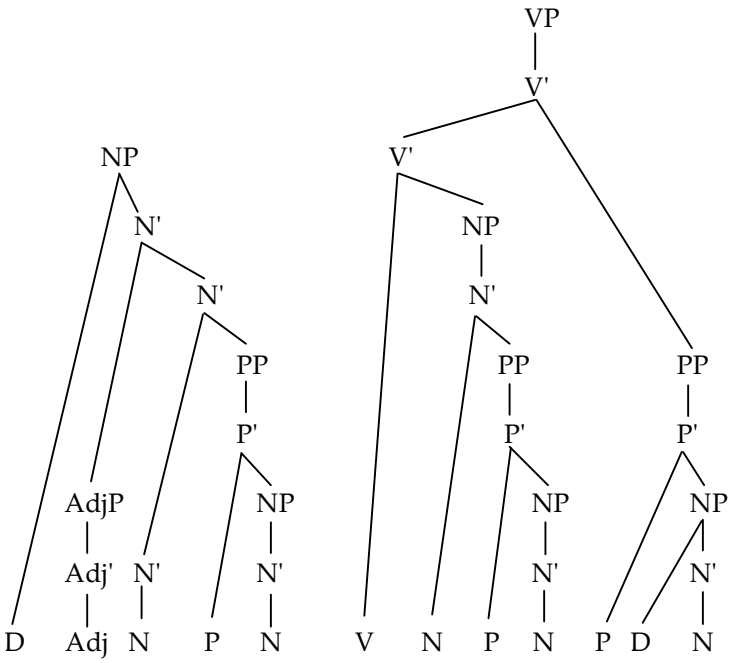
140)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Now we attach the adjunct PP, it has to be a sister to V' (the one just created by the previous step) and daughter of a V' (which we will add here). Since there are no other modifiers of the V, we will also complete this phrase with the VP:

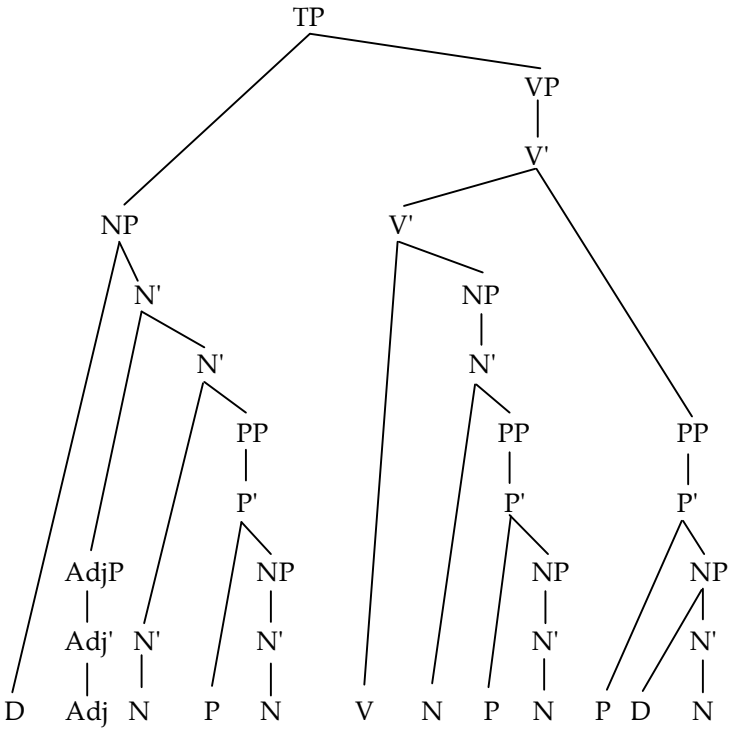
141)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Last, but not least, we apply the TP rule, and then check the tree against the X-bar rules. Making sure that everything is attached; there are no crossing lines; adjuncts are sisters to a bar level, complements are sisters to a head; and finally every head has at least an X, X', and XP on top of it.

142)



The$_1$ ugly man from Brazil found books of poems in the$_2$ puddle.

Each tree will be different, of course, but with practice and patience you will develop the skill quite easily.

You now have enough information to try General Problem Set 7

7. X-BAR THEORY: A SUMMARY

Let's summarize the rather lengthy discussion we've had so far in this chapter. We started off with the observation that there seemed to be more structure to our trees than that given by the basic phrase structure rules we developed in chapter 3. In particular, we introduced the intermediate levels of structure called N', V', A', and P'. The evidence for these comes from standard constituency tests like conjunction, and from processes like *one*-replacement, and *do-so*-replacement. We also saw that material on different levels of structure behaved differently. Complements exhibit one set of behaviors and adjuncts a different set. Next we observed that our rules were failing to capture several generalizations about the data. First was the endocentricity generalization: all NPs, have an N head, all APs an A head, etc.

There is no rule like NP → V A. Next, there was the observation that all trees have three levels of structure. They all have specifiers (weak evidence here), adjuncts and complements. In response to this, we proposed the following general X-bar theoretic rules:

143) a) *Specifier rule:* XP → (YP) X' *or* XP → X' (YP)
b) *Adjunct rule:* X' → X' (ZP) *or* X' → (ZP) X'
c) *Complement rule:* X' → X (WP) *or* X' → (WP) X

These rules use variables to capture cross-categorial generalizations. In order to limit the power of these rules, and in order to capture differences between languages, we proposed that the options within these rules were parameterized. Speakers of languages select the appropriate option for their language.

This is, you'll note, a very simple system. There are, of course, some loose ends, and in the next couple of chapters we'll try to tidy these up. First of all we have the problem of specifiers, we only have one specifier (the determiner). In the next chapter we'll suggest that in fact determiners aren't specifiers at all, instead they are their own heads. Then we'll reserve specifier positions for something else: subjects. We'll also try to integrate our TP and CP rules into the system.

IDEAS, RULES, AND CONSTRAINTS INTRODUCED IN THIS CHAPTER

i) ***Specifier***: Sister to X', daughter of XP.

ii) ***Adjunct***: Sister to X', daughter of X'.

iii) ***Complement***: Sister to X, daughter of X'.

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

v) ***Projection***: The string of elements associated with a head that bear the same category as the head (N, N', N', N', NP etc).

vi) ***Maximal Projection***: The topmost projection in a phrase (XP).

vii) ***Intermediate Projection***: Any projection that is neither the head nor the phrase (i.e. all the X' levels).

viii) **One-*replacement***: Replace an N' node with *one.*

ix) **Do-so-*replacement***: Replace a V' with *do so.*

x) ***Specifier Rule***: XP → (YP) X' or XP →X' (YP)

xi) ***Adjunct Rule***: X' → X' (ZP) or X' → (ZP) X'

xii) ***Complement Rule***: X' → X (WP) or X' → (WP) X

xiii) ***Additional Rules***:
CP → (C) TP
TP → NP VP
XP → XP Conj XP
X' → X' Conj X'
X → X Conj X

xiv) ***Parameterization***: The idea that there is a fixed set of possibilities in terms of structure (such as the options in the X-bar framework), and people acquiring a language choose from among those possibilities.

xv) ***Principle of Modification*** (revised): If a YP modifies some head X, then YP must be a sister to X or a projection of X (i.e., X', XP).

FURTHER READING

Baltin, Mark and Anthony Kroch (1989) *Alternative Conceptions of Phrase Structure*. Chicago: University of Chicago Press.

Borsley, Robert (1996) *Modern Phrase Structure Grammar*. Oxford: Blackwell.

Carnie, Andrew (1995) Head Movement and Non-Verbal Predication. Ph.D. Dissertation, MIT.

Chametzky, Robert (1996) *A Theory of Phrase Markers and the Extended Base*. Albany: SUNY Press.

Chomsky, Noam (1970) Remarks on nominalization. In Roderick Jacobs and Peter Rosenbaum (eds.), *Readings in English Transformational Grammar*. Waltham: Ginn. pp. 184–221.

Jackendoff, Ray (1977) *X-bar Syntax: A Theory of Phrase Structure*. Cambridge: MIT Press.

Kayne, Richard (1994) *The Antisymmetry of Syntax*. Cambridge: MIT Press.

Lightfoot, David (1991) *How to Set Parameters: Evidence from Language Change*. Cambridge: MIT Press.

Speas, Margaret (1990) *Phrase Structure in Natural Language*. Dordrecht: Kluwer Academic Publishers.

Stowell, Tim (1981) Origins of Phrase Structure. Ph.D. dissertation, MIT.

Travis, Lisa de Mena (1984) Parameters and Effects of Word Order Derivation. Ph.D. dissertation, MIT.

GENERAL PROBLEM SETS

1. COMPLEMENTS VS. ADJUNCTS in NPs

[Application of Skills; Basic]

Using the tests you have been given (reordering, adjacency, conjunction of likes, *one*-replacement) determine whether the PPs in the following NPs are complements or adjuncts; give the examples that you used in constructing your tests. Some of the NPs have multiple PPs, be sure to answer the question for every PP in the NP.

a) A container [of flour]
b) A container [with a glass lid]
c) The collection [of figurines] [in the window]
d) The statue [of Napoleon] [on the corner]
e) Every window [in the building] [with a broken pane]

2. ADJECTIVES

[Critical Thinking; Intermediate]

Are adjectives complements or adjuncts to the N? Use the tests you have been given to determine if adjectives are complements or adjuncts. Do NOT use the reordering test – it will not work because adjectives in English are strictly ordered by other principles. Also confine yourself to the adjectives listed below. (Other adjectives, such as *leather* in *leather shoes* or *Chemistry* in *Chemistry Professor*, behave differently. However, you can use these adjectives as interveners if you need to check adjacency to the head.)

hot, big, red, tiny, ugly

3. GERMAN NOUN PHRASES

[Data Analysis; Intermediate/Advanced]

Consider sentence (a) from German:[9]

a) Die schlanke Frau aus Frankreich isst Kuchen mit Sahne.
the thin woman from France eats cake with cream
"The thin woman from France eats cake with cream."

The following sentences are grammatical if they refer to the same woman described in (a):

[9] Thanks to Simin Karimi for providing the data for this question, and to Susi Wurmbrand for clarifying the facts.

b) Die Schlanke aus Frankreich isst Kuchen mit Sahne.
"The thin one from France eats cake with cream."

c) Die aus Frankreich isst Kuchen mit Sahne.
"The one from France eats cake with cream."

d) Die Schlanke isst Kuchen mit Sahne.
"The thin one eats cake with cream."

e) Die isst Kuchen mit Sahne.
"She eats cake with cream."

Now consider sentences (f–i):

f) Die junge Koenigin von England liebte die Prinzessin.
The young queen of England loved the princess
"The young queen of England loved the princess."

g) Die Junge liebte die Prinzessin.
"The young one loved the princess."

h) Die liebte die Prinzessin.
"She loved the princess."

i) *Die von England liebte die Prinzessin.
"*The one of England loved the princess."

(*Native speakers of German should assume the judgments given even if they don't agree with them.*)

Assume the following things:

i) *Der/Die* are always determiners, they are never nouns or pronouns.

ii) *Schlanke* and *junge* are always adjectives, even in sentences (d) and (g) – ***assume they never become nouns***. (Ignore the rules of German capitalization.)

The questions:

1) Describe and explain the process seen in (a–e) and (f–i), be sure to make explicit reference to X-bar theory. What English phenomenon (discussed in this chapter) is this similar to? Make sure you analyze the <u>*German*</u> sentences not the English translations.

2) Draw the trees for sentences (a) and (f). Sentence (a) requires <u>*two*</u> different trees (important hint: the relevant ambiguity in (a) is inside the subject NP, <u>*not*</u> in the position of the PP *mit sahne*).

3) Explain the ungrammaticality of (i) in terms of X-bar theory. In particular explain the difference between it and sentence (c). Draw trees to explicate your answer.

4. COMPLEMENTS AND ADJUNCTS IN VPS

[Application of Skills; Basic]

Using the tests you have been given (reordering, adjacency, conjunction of likes, *do-so*-replacement) determine whether the marked NPs, PPs and AdvPs in the following VPs are complements or adjuncts; give the examples that you used in constructing your tests. Some of the VPs have multiple PPs and AdvPs, be sure to answer the question for every PP, NP, and AdvP in the VP.

a) Erin [$_{VP}$ [$_{AdvP}$ never] keeps [$_{NP}$ her pencils] [$_{PP}$ in the correct drawer]].
b) Dan [$_{VP}$ walked [$_{PP}$ to New Mexico] [$_{PP}$ in the rain] [$_{AdvP}$ last year]].

5. JAPANESE

[Data Analysis; Basic]

Consider the following data from Japanese:

a)	Masa-ga kita.	"Masa came."
b)	Toru-ga shinda.	"Toru died."
c)	Kumiko-ga yonda.	"Kumiko read."
d)	Kumiko-ga hon-o yonda.	"Kumiko read the book."
e)	Toru-ga Kumiko-o mita.	"Toru saw Kumiko."
f)	Kumiko-ga Toru-o mita.	"Kumiko saw Toru."
g)	Hon-ga akai desu.	"The book is red."
h)	Toru-ga sensei desu.	"Toru is a teacher."
i)	Masa-ga ookii desu.	"Masa is big."
j)	Sono hon-ga ookii desu.	"That book is big."
k)	Toru-ga sono akai hon-o mita.	"Toru saw that red book."

1) What is the function of the suffixes *-o* and *-ga*?
2) What is the word order of Japanese?
3) Does the complement precede or follow the head in Japanese?
4) Do adjuncts precede or follow the head in Japanese?
5) Do specifiers precede or follow the X' node in Japanese?
6) Draw the tree for sentence (k) using X-bar theory. Keep in mind your answers to questions (1–5).

6. PARAMETERS

[Data Analysis; Basic to Intermediate]

Go back to the foreign language problems from chapters 3 and 4, (Hiaki, Irish, Bambara, Hixkaryana, Swedish, Dutch, Tzotzil) and see if you can determine the parameter settings for these languages. You may not be able to determine all the settings for each language. (Suggestion: put your answer in a table like the one below. English is done for you as an example.) Assume the following: Determiners are typical examples of specifiers, Adjectives and many PPs (although not all) are adjuncts. "of" PPs and direct objects are complements. Be sure to check the complement/adjunct relation in all categories (N, Adj, Adv, V, P etc.) if you can.

	Specifier	**Adjunct**	**Complement**
English	(YP) X'	Both	X (ZP)

7. TREES

[Application of Skills; Basic to Advanced]

Draw the X-bar theoretic trees for the following sentences. Treat possessive NPs like *Héloïse's* as specifiers. Several of the sentences are ambiguous; draw only one tree, but indicate using a paraphrase (or paraphrases) which meaning you intend by your tree.

a) Abelard wrote a volume of poems in Latin for Héloïse.
b) Armadillos from New York often destroy old pillowcases with their snouts. (NB: assume "their" is a determiner)
c) People with boxes of old clothes lined up behind the door of the building with the leaky roof.
d) That automobile factories abound in Michigan worries me greatly.
e) No-one understands that phrase structure rules explain the little understood phenomenon of the infinite length of sentences.
f) My Favorite language is a language with simple morphology and complicated syntax.
g) Ivan got a noogie on Wednesday from the disgruntled students of phonology from Michigan.
h) The collection of syntax articles with the red cover bores students of syntax in Tucson
i) The red volume of obscene verse from Italy shocked the puritan soul of the minister with the beard quite thoroughly yesterday.
j) The biggest man in the room said that John danced an Irish jig from County Kerry to County Tipperary on Thursday.

k) A burlap sack of potatoes with mealy skins fell on the professor of linguistics with the terrible taste in T-shirts from the twelfth story of the Douglass Building last Friday.
l) The bright green filing cabinet was filled to the brim with the most boring articles from a prestigious journal of linguistics with a moderately large readership

CHALLENGE PROBLEM SETS

CHALLENGE PROBLEM SET 1: INTERMEDIATE STRUCTURE

[Application of Knowledge, Critical Thinking; Advanced-Challenge]

The following verb phrase is ambiguous in its structure

Adam [$_{VP}$ frequently buys paintings from Natasha].

The ambiguity has to do with where [$_{AdvP}$ frequently] and [$_{PP}$ from Natasha] are attached in the string of V' categories. Note that the V' rule can be either V' $\rightarrow$ V' (PP) or V' $\rightarrow$V' (AdvP) and these rules can apply in either order. Using the *do-so/did-so/did-too* replacement test, provide some sentences that show that there is an ambiguity in structure here.

CHALLENGE PROBLEM SET 2: COMPLEMENT ADJPS?

[Data Analysis and Critical Thinking; Challenge]

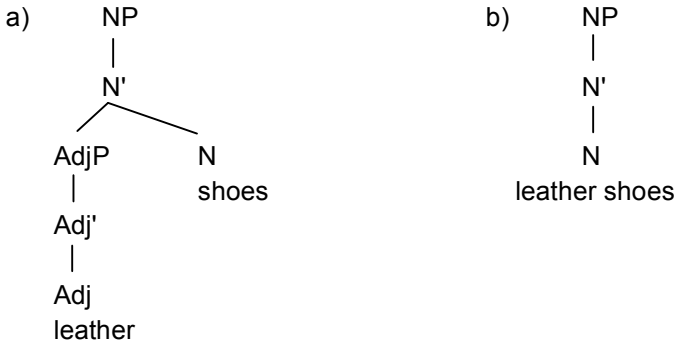
You should do general problem set 2 above before attempting this problem.

Part 1: Consider the following adjectives:

leather (as in *leather shoe*), *Chemistry* (as in *Chemistry Student*)

Using your tests for complements and adjuncthood in NPs (adjacency, *one*-replacement, coordination of likes, only one complement – the test of reordering doesn't work since adjectives in English are ordered by other principles), decide whether these adjectives are functioning more like complements or adjuncts. Contrast them explicitly to adverbs such as *red* and *big*. Provide the relevant examples to support your claim.

Part 2: Two analyses of these adjectives have been proposed. One is that they are complements (a); the other, more common, analysis is that these aren't adjectives at all, but are noun-noun compounds (notice that both *leather* and *Chemistry* can function as nouns in their own right) as in (b).



Which of these proposals is right? Try to come up with some arguments to distinguish between them. The following data may be helpful to you. But you should look for arguments beyond this data (i.e., come up with data of your own)

c) Plastic and leather shoes
d) ?very leather shoes
e) *very Chemistry professor

CHALLENGE PROBLEM SET 3: AMBIGUOUS ADJPS?
[Data Analysis and Critical thinking; Challenge]
Before trying this problem set you should try Challenge Problem Set 2 above.

Part 1: No matter what your answer to challenge problem set 2 was above, assume for the moment that some AdjPs can function as adjuncts and others can function as complements. This requires that we modify our parameter settings for English. Propose a revised set of parameters for English to allow for the possibility that *Chemistry* in *Chemistry Professor* is a complement. Note: your proposal must explain why in English object NP complements cannot appear before verbs but AdjP complements can appear before nouns (i.e., your proposal must account for why complement-head order is allowed in NPs but not in VPs).

Part 2: Consider the following ambiguous NP:

a) the German teacher

It can mean either a teacher (say of math) who is German, or it can mean someone (of any nationality) who teaches the German language. Using the complement/adjunct distinction and the following data, explain this ambiguity in meaning. Pay attention to the meaning of *German* (whether it refers to the

nationality or the subject) in each of the following sentences. Draw trees to explain your answer.

b) the French German teacher
c) the math and German teacher
d) … not the American teacher but the German one

CHALLENGE PROBLEM SET 4: COMPLEMENTS TO ADJ HEADS[10]

[Critical Thinking and Application of Skills; Challenge]

Part 1: Consider the word *sick*. This word seems to have two or more meanings. One meaning corresponds to the meaning "ill," as in *I feel sick*. The other meaning is something like "I've had enough," as in the expression *I am sick of it.* This second meaning seems to take a complement PP. The evidence for this is twofold: (1) To get this meaning of *sick* the complement must be present in the sentence. Otherwise we understand the physical meaning of *sick*. (2) The preposition that we find, *of*, is the most common preposition used with complement PP of adjectives and nouns. Judging from their meanings and other properties, do any of the adjectives below regularly occur with complements?

delightful, familiar, sensitive, adjacent, full

Part 2: Draw the trees for the following two sentences according to the principles of X-bar Theory. Think about the reasons you would use for considering a PP either a complement or an adjunct of an adjective. This is what you need to think about to get each PP attached in the right place.

a) The director is as aware of the problems as the committee members.
b) Everyone was curious about it to the *n*th degree.

[10] Thanks to Leslie Saxon for contributing this problem set.