Back to the trees: X-bar Theory

- Consider our current NP rule:
  - NP: (D) (AdjP+) N (PP+)
- This yields a “flat structure” where all of the components of DP c-command each other.

X-bar Theory: NP

- I bought this big book of poems with the blue cover.
- You bought this small one.

X-bar Theory: NP

- We can substitute one for book of poems with the blue cover, which should mean book of poems with the blue cover is a constituent, but it isn’t in our structure.

X-bar Theory: NP

- I bought this small one with the red cover.
- We can also substitute one in for book of poems alone, which should thus also be a constituent.

X-bar Theory: NP

- This suggests a more deeply embedded structure:
X-bar Theory: NP

- These “intermediate” nodes of NP: N[N-bar].
- Notice that you can also say I bought this one.

X-bar Theory: NP

- So, our final NP looks like this:

X-bar Theory: NP

- We need to break up our NP rule; instead of
  - NP: (D) (AdjP+) N (PP+)
- We have:
  - NP: (D) N
  - N[AdjP N]
  - N[Adj PP]
  - N[Adj (PP)]
- These yield the same results on the surface (note the recursion and the optionality) but produce different structures (in terms of constituency).
- Notice also that under these rules, any node of NP has no more than two daughters (binary branching).

X-bar Theory: VP

- The same kind of thing holds for VP as well as NP. Instead of using one (which stands for N[ which we can try doing replacements using do so, and we’ll get a very similar result.
- Our old rule generated a flat structure for VP as well (all PPs, NPs, CPs, etc. in a VP c-command each other).
- VP: (AdvP+) V (NP/CP) (PP+) (AdvP+)

X-bar Theory: VP

- Again, it looks like we need to break our rule into parts using V[ for which do so can substitute.
- VP: (AdvP+) V (NP/CP) (PP+) (AdvP+)
- To:
  - VP: V[VP
  - VP[AdjP V[PP
  - VP[AdjP VP
  - VP V[NP/CP)
- Again, this is (almost) the same on the surface, but yields a different structure. And again, binary.
X-bar Theory: VP

Our new rules do not quite make the same predictions about the surface strings of VPs, however. The old rules had (PP+) before (AdvP+), the new rules allow them to intermingle.

But that’s actually better:
- John grabbed the book quickly from the table triumphantly.
- John grabbed the book off the table quickly with a devilish grin.

X-bar Theory: AdjP

We should now be growing suspicious of our other rules, now that we have had to split up NP and VP and introduce N and V nodes.

- The governor was [AdjP very concerned about housing costs ]; the tenants were [AdjP even more so ].
- The studio was [AdjP unusually pleased with its actors and confident of success ].
- The first statement was true; the second was less so.

This gives us evidence of:
- AdjP: (AdvP) Adj
- Adj: Adj (PP)

X-bar Theory: PP

The frisbee landed on the roof.
- It landed right on the edge.
- John knocked it right off the roof and into the trashcan.
- Mark was at odds with his supervisor.
- Mark was in love and at odds with his supervisor.

So, this gives us (assuming right is an AdjP):
- PP: (AdjP) PP
- P (PP) P
- P DP

X-bar Theory: X-bar theory

The main idea behind X-bar theory is to explain the similarity between the rules for each category. It is an attempt to generalize over the rules we have.

- PP: (AdjP) PP
- P (PP) P
- P DP

- NP: (D) N

- VP: V

AdjP: (AdvP) Adj
Adj: Adj (PP)

The X in X-bar theory is a variable over categories. When we talk of XP, we mean to be describing any kind of phrase (VP, NP, AdjP, AdvP, PP, TP, CP, …).

- PP: (AdjP) PP
- P (PP) P
- P DP

- NP: (D) N

- VP: V

AdjP: (AdvP) Adj
Adj: Adj (PP)
X-bar theory

- X-bar theory elevates this to a principle of phrase structure; it hypothesizes that all phrases in a syntactic tree conform to this template.
- \( \text{XP} : (\text{ZP}) \text{X} \)
  - A phrase (XP) consists of optionally another phrase and a bar-level projection (X).
- \( \text{X} \text{YP} \text{X} \text{YP} \text{X} \text{YP} \)
  - A bar-level projection (X) can consist of another X and another phrase (recursive).
- \( \text{X} \text{YP} \text{X} \text{YP} \text{X} \text{YP} \)
  - A bar-level projection (X) consists of a head of the same category (X) and optionally another phrase.

X-bar theory

- Structurally, this looks like this (of course, there can be any number of X nodes, here we see three).
- Different parts of this structure are given different names (and they act different from one another, as we'll see).

X-bar theory

- The phrase which is immediately dominated by XP (designated ZP here) is the specifier.
- A phrase dominated by X and the sister of X is an adjunct.
- The phrase which is sister to X is the complement.

X-bar Theory: NP

- The head of this NP is book.

X-bar Theory: NP

- The head of this NP is book.
- The complement is of poems.
X-bar Theory: NP

- The head of this NP is book.
- The complement is of poems.
- With the blue cover and big are adjuncts.
- The is in specifier position.

Note: D here is not a phrase; it does not conform to X-bar theory. We will fix this soon.

X-bar theory: NP

- An adjunct, on the other hand, feels more “optional”
  - A book on the table
  - X-bar theory allows for any number of adjuncts (not just one, like with complements).
    - The book with the blue cover on the third shelf about C++
    - Adjuncts can generally be re-ordered freely.
      - The book with the blue cover about C++ on the third shelf
      - The book about C++ with the blue cover on the third shelf
      - The book about C++ on the third shelf with the blue cover
      - The book on the third shelf with the blue cover about C++
      - The book on the third shelf about C++ with the blue cover

X-bar theory: NP

- Other tests differentiate adjuncts and complements too.
  - Conjoining two elements of a given category yields an element of the same category; if conjunction is possible the two conjuncts are of the same category.
  - You cannot conjoin a complement and an adjunct PP (where could it go in the structure?), although you can conjoin complements and you can conjoin adjuncts:
    - The book of poems and of essays
    - The book with the blue cover and with the red spine
    - *The book of poems and with the red spine
Finally, recall our one-replacement test. *One* can stand in for an N but not for an N.

This predicts that you should not ever be able to get *one* followed by a complement PP; *One* should only be able to be followed by adjunct PPs.

And this prediction is met:
- The book of poems on the third shelf
- The one on the fourth shelf
- *The one of essays on the third shelf

So, X-bar structures seem to accurately characterize the structure of the NP.

Adjuncts do not have to be on the right, as all of the PP’s that we’ve looked at so far have been.

*Left-handed* adjuncts to NP include AdjP, like:
- The very big book of poems
- The big red boring book of poems
- The big boring red book of poems

In fact, it appears that complements do not always have to be on the right. A complement is the phrase which is sister to the head, but either of these structures has a complement XP. Nevertheless, there can be only one complement.

An example of a left-sided complement is *linguistics* in *linguistics book*.

Is it really a complement? What kind of tests can you think of to see if it is really a complement?

There can be only one complement
- The *linguistics* book
- The book *of essays*
- *The *linguistics* book of essays
- The boring book *of essays*
- The boring *linguistics* book.
X-bar theory: NP

- The complement has to be closest to the head.
- Adjuncts can be re-ordered.
  - The boring linguistics book
  - "The linguistics boring book
  - The boring old linguistics book
  - The old boring linguistics book
- Note: English adjectives tend to have a preferred order, but putting them out of order sounds a lot better than having a complement separated from the head N.
  - The big red linguistics book
  - ?The red big linguistics book
  - "The big linguistics red book

X-bar theory: NP

- Complements cannot be conjoined with adjuncts; likes can only be conjoined with likes.
  - The long and boring linguistics book
  - The linguistics and literature book
  - "The boring and literature book
  - "The long and linguistics book

X-bar theory: NP

- One-replacement can’t strand the complement.
  - The big linguistics book
  - The big one
  - "The linguistics one

X-bar theory: NP

- An interesting ambiguity:
  - The French teacher
  - What can this mean?
    - The teacher of French
    - The teacher from France
  - In the first case, we paraphrased with a complement PP, in the second, we paraphrased with an adjunct PP.

X-bar theory: NP

- French can be either a complement or an adjunct, but the two structures yield the same surface word order:

  \[
  \begin{array}{c}
  \text{NP} \\
  \text{N} \\
  \text{French teacher}
  \end{array}
  \quad \quad \quad
  \begin{array}{c}
  \text{NP} \\
  \text{N} \\
  \text{AdjP} \\
  \text{French teacher}
  \end{array}
  \]

X-bar theory: NP

- But, now we have a bag of tricks that we can use to disambiguate this in one sense or another.
  - Complements have to be closest to the head.
    - The French German teacher
    - The German French teacher
  - One cannot strand the complement
    - The French one
  - Conjunctions must be of the same category
    - The French and Math teacher
    - The tall and German teacher
Side comment

- A quick pause to remind us of what we’re doing...
- We are characterizing what native speakers know about language (in this instance, NPs).
- Chances are, those of you who are native speakers of English, didn’t know about the distinction between complements and adjuncts and the rules governing their use.
- Yet, if you agree with my assignment of grammaticality and ungrammaticality, you nevertheless knew the distinction and the structures.
- That is, there really is a system here hiding beneath our consciousness. There really is something to this stuff.

X-bar theory: VP

- X-bar theory hypothesizes that phrases of all categories have the same basic structure.
- In particular, VP has the same properties as NP:
  - Only one complement
  - Adjuncts which can be of any number and are re-orderable
- So, let’s see how this plays out in phrases other than NP.

X-bar theory: VP

- In the VP, the direct object is the complement.
  - The students ate the sandwiches.
- Other things (AdvPs, PPs) are adjuncts.
  - The students left at 7 o’clock.
  - The students left swiftly.

X-bar theory: VP

- Do so can’t strand the complement.
  - “John ate the pizza and Mary did so the sandwiches.
  - John ate the pizza in short order but Mary did so in record time.
- Likes conjoin only with likes.
  - John ate the pizza quickly and with gusto.
  - ?Mary ate the pizza and with gusto.
- Note: The reason this does not sound so bad is that it is possible to interpret this as Mary ate the pizza and (she did so) with gusto, leaving she did so unpronounced. It is hard to get around this problem, so this test is not very reliable for VP.

X-bar theory: PP, AdjP, AdvP

- It turns out to be more difficult to show parallels in PPs, AdjPs, and AdvPs, but we will still assume that they follow the same structural rules as VPs and NPs.
- Nevertheless, here are a couple of suggestive data points…
X-bar theory: AdjP, PP

- So-replacement can’t strand the complement (AdjP).
  - John was afraid of tigers; Mary was less so (*of lions).
- There can be only one complement (AdjP).
  - *John was afraid of tigers of lions.
- There can be only one complement (PP).
  - *John fell off the roof the house.

X-bar theory: Specifiers

- One position we haven’t addressed yet is the specifier position (ZP here), the daughter of XP and sister of X.
  - In our rules so far, we have had almost nothing which occupies that position, but we will see more shortly.
- X-bar theory allows for only one specifier (like with the complement).

X-bar theory: Specifiers

- The main example of a specifier we have seen so far is the D in the NP (the in the books or this in this book).
- But as you’ve probably heard by now, this is problematic for X-bar theory because D is a head, and specifiers are supposed to be phrases.

X-bar theory: DP

- So what’s the deal with this D, anyway?
- If we want to believe in X-bar theory, our structure for NP that has D in its specifier cannot really be the structure. Specifiers should have phrases (XPs), yet D is a head.
  - Where do we start?

X-bar theory: DP

- Well, if D is really a head, we have an immediate conclusion we can draw based on X-bar theory:
  - D heads a DP. There must be a structure like this:
  - So is it actually DP which is in the specifier of NP?

X-bar theory: DP

- Actually, no. In fact, the DP is not inside the NP at all.
  - Rather, the NP is inside the DP. The NP is the complement to D.
This structure is in accord with X-bar theory, but what other evidence can we come up with that it is actually right?

Consider the genitive (possessive) 's in English:
- John’s hat
- The student’s sandwich
- The man from Australia’s book
- The man on the hill by the tree’s binoculars

Notice that the ‘s attaches to the whole possessor phrase—in the last two examples, it isn’t even attached to the head noun (it’s the man’s book and binoculars, not Australia’s or the tree’s, after all).

This is not a noun suffix. It seems more like a little word that signals possession, standing between the possessor and the possessee.

It is impossible to have both a ‘s and a determiner.
- *The building’s the roof
- *The tiger’s the eye

Determiners like the and the possession marker ‘s seem to be in complementary distribution—if one appears, the other cannot.

This suggests a structure like this for possession phrases:

The possessed NP is the complement of D.

Note that if we took the old view and supposed that D is in the specifier of NP, then we shouldn’t be able to have anything else in the specifier of NP, since we’re only allowed one specifier.

We would have no way to draw the student’s book, since there would be no place to attach the student.
X-bar theory: DP

- Another thing of interest about the possessor phrase is its recursive property.
- The possessor is a DP in the specifier of DP. That means that the DP possessor could have a possessor too...
- The student’s father’s book
- The student’s mother’s brother’s roommate

X-bar theory: Pronouns

- Consider the following:
  - You politicians are all alike.
  - We linguists need to stick together.
  - The media always mocks us academics.
  - These seem to have a pronoun followed by a noun inside the DP; we can make sense of this if the pronoun is a D which can optionally take an NP complement.

- So in the basic case, it looks like we should treat pronouns as being of category D.
X-bar theory: Bare nouns and proper names

- How about something like students (in Students poured out of the auditorium at noon) or John (in John went for a walk)?
- For students, we want to believe that it is an instance of the N category (in order to make sense of the students or we students or John’s students. But if this N is contained in a DP (the complement of a D head), where is the D?
- In order to maintain consistency, we'll suppose that in bare nouns D is present but null (it has no phonological representation; we write this as Ø).

X-bar theory: Proper names

- We can draw John as shown here.
- It’s worth pointing out that there is a lot more to say on the subject of proper names and on the structure of DP in general, but we will return to these questions in Syntax II.
- For something to ponder, consider that in many languages you would say something analogous to “the John” for John, and consider the implications of something like Good old John left early. Nevertheless, we’ll draw proper names as shown.

X-bar theory: Specifiers

- The structure also predicts that the specifier should be the element furthest away from the head, outside of all adjuncts and complements.
- The student’s big red book of poems
- “Big the student’s red book of poems
- “Big red the student’s book of poems

X-bar theory: Specifiers

- Incidentally, if we look back to the rules we had for PP and AdjP, we initially posited things in these specifiers as well.
- It turns out to be hard to get any internal evidence to show whether these are or are not really specifiers; in the book, this is simply glossed over as we skip to the next step. I opted to present them as the simplest structures we had evidence for at the time.

\[
\begin{align*}
PP: \left(\text{AdjP}\right) & \rightarrow \text{Adj} \\
\left(\text{AdjP}\right) & \rightarrow \text{Adj} \left(\text{PP}\right) \\
\text{AdjP} & \rightarrow \text{Adj} \left(\text{PP}\right)
\end{align*}
\]
X-bar theory: Specifiers

- However, for the purpose of a) consistency and b) compatibility down the road, we will assume this was not in fact correct.
- Instead, we will assume that, except for the possessor in DP, we have not met any specifiers yet.
- So, when you go back and look over your notes, consider the proper interpretation to be as follows:

\[
\begin{align*}
\text{PP: } & P P' \\
\text{P'}: & (AdjP) P' \\
\text{P} & : P DP
\end{align*}
\]

X-bar theory: TP

- Now, let’s look a bit more globally. We left off last time with a rule for TP (which we used to call “S”) that looks like this:
  \[
  \text{TP: NP T VP}
  \]
- Since X-bar theory has been working so far, we assume that TP too must have an X-bar-compliant structure, not the flat structure this rule provides.
- And, of course, now that we know the student is a DP and the student is a perfectly fine subject, we need to change the NP in the rule to a DP.

X-bar theory: CP

- The last phrase we need to deal with is the CP phrase headed by complementizers like that. The obvious proposal is that they look like this:
  \[
  \begin{align*}
  \text{CP: } & C C' \\
  \text{C'}: & C TP
  \end{align*}
  \]
- We’ll make use of SpecCP later; for now it remains empty.

Sentencing guidelines

- We now have all of the pieces organized to draw a structure of a basic sentence.
- With X-bar theory, our structures will in general be taller, because they involve only binary branching.
- Every phrase (XP) has a head and at least one X\textsuperscript{c} constituent.
- Every sentence will have a TP and a VP.

A basic sentence

- Here’s the structure for the very simple sentence
  \[
  \begin{align*}
  \text{I left.}
  \end{align*}
  \]
- We see that:
  - There is a TP.
  - There is a VP.
  - The subject is in SpecTP.
  - Every XP has a head and an X\textsuperscript{c}

\[
\begin{align*}
\text{TP: } & DP TVP \\
\text{DP: } & I T ed VP
\end{align*}
\]
More complex...

- Slightly more complex:
  - John’s dog chewed a bone.
- We see that:
  - There is a TP.
  - There is a VP.
  - The subject is in SpecTP.
  - Every XP has a head and an X*
  - The possessor is in SpecDP.
  - The direct object is the complement of V.

Where we are...

- X-bar theory says that all phrases have the structure here.
  - ZP is the specifier,
  - The YPs are adjuncts,
  - The WP is the complement,
  - The X is the head,
  - The XP is the phrase

Where we are...

- X-bar structure constrains the form that structures can take.
  - Specifiers, adjuncts, and complements must themselves be phrases (XP-type trees, not heads)
  - There can be only one complement and only one specifier.
  - There can be indefinitely many adjuncts, iterating at the X* level.

Matrix clauses

- A simple clause (subject, predicate) which “stands on its own” is often called a root clause or a matrix clause or a main clause.
  - Most of the sentences we’ve seen so far are of this type.
  - The students ate the sandwiches.
  - Mary left.

Embedded clauses

- We also know that it is possible to embed a clause inside another clause.
  - John said that the students ate the sandwiches.
  - Sue claimed that Mary left.
- These are called, sensibly enough, embedded clauses or subordinate clauses.

Finiteness

- There are several different kinds of clauses.
- We’re all probably familiar with the infinitive form of verbs: to walk, to sing, …
- In general, the infinitive form of the verb is to plus a bare stem. By “bare stem” we mean the verb without any marking for past tense (eat not ate) or for subject agreement (eat not eats).
**Finiteness**

- We refer to the infinite forms of the verb as *nonfinite*, and forms of the verb without *to* and with tense marking or subject agreement marking as *finite*.
- We’ve already discussed the idea that tense information is something that is represented in the tree in the T node.
- T can be either *finite* (past, present) or *nonfinite* (in which case it often holds to).

**Finiteness**

- Matrix clauses seem never to be nonfinite; all matrix clauses are finite.
- Embedded clauses can be either nonfinite or finite (depending on certain other factors).
  - I want John to leave.
  - I said that John left.
  - I said that Mary should leave.
  - I see that Ben exercises regularly.

**Finiteness: tense and agreement**

- The hallmark of finiteness is the presence of tense and agreement. This is generally reflected on the verb in the form of suffixes.
  - I walk; I walked.
  - You walk; you walked.
  - He walks; he walked.
  - She walks; she walked.

**Finiteness: tense and agreement**

- Although other languages of the world often mark tense and/or agreement more explicitly, in English we find a lot of zero morphology in the tense and agreement system.
  - Remember, all matrix clauses are finite, yet the you (2nd person) form of walk looks just like the bare form in to walk.

**Finiteness: tense and agreement**

- We think of *walked* as having two parts, the verb stem (*walk*) and the past tense suffix (-ed).
- In the present tense, we often see only the verb stem (*I walk*), but it is, after all, present tense—it is finite. The assumption is that the [pronunciation](https://example.com) of the present tense suffix in English is Ø, null, nothing. That is, a finite verb always has a tense suffix, but sometimes it is pronounced as -ed, sometimes as Ø.
- Present tense is a zero morpheme.

**Finiteness: tense and agreement**

- In English, there is also (limited) agreement with the subject of the clause. We can see this most clearly with the verb to be:
  - I am; he is; we/they/you are
- And with most other verbs, there is an -s suffix that appears when the subject is 3rd person singular; in the other cases, we assume a Ø suffix.
  - If you/he/she/it walk; she walks
- Finite verbs are those which have tense and/or agreement marking (even if it is Ø).
Finiteness: tense and agreement

In English, an overt (non-Ø) tense suffix generally "takes priority" over subject agreement. Having a past tense suffix (-ed) for nearly all verbs precludes having an overt subject agreement in 3sg:
- I walk; he walks
- I walked; he walked.
- The only exception is the copula (to be) which shows both tense and subject agreement:
  - I am; he is; you/they/we are
  - I was; you/they/we were
- Nevertheless, the assumption is that they are both there abstractly. Finite verbs agree with the subject and have tense morphology.

Finiteness

Because of all the zero morphology, it isn’t always obvious when a clause is nonfinite. Although to is a good tip-off, it’s not always present in a nonfinite clause:
- I told you to eat broccoli.
- I saw you eat broccoli.
- I know you eat broccoli.
- The first is clearly nonfinite, but so is one of the other ones. Which one?

Finiteness

I saw you eat broccoli.
- I know you eat broccoli.
- Because the you form (2sg; 2pl) does not show overt subject agreement, one thing to try is to change the subject to 3sg:
  - I saw him eat broccoli.
  - I know he eats broccoli.
- Ah-ha! With a 3sg subject, we find agreement in the second sentence; it must be finite. There is no agreement in the first sentence, so it must be nonfinite.

Finiteness and Case

This difference between he and him is a difference in Case—Case, basically, marks the position (or role) of a pronoun in the structure.
- A pronoun in subject position of a finite clause has nominative (subject) case:
  - I left; he left; she left; we left; they left.
- A pronoun in almost any other position (object position; subject of a nonfinite clause) has accusative (object) case:
  - I met me; I met him; I met her; I met us; I met them.
  - I saw me eat broccoli; I saw her eat broccoli.

Finiteness and Case

Although in English, Case is limited to the pronominal system, many languages show Case distinctions on all nouns.
- Korean:
  - Chelswu-ka Sunhi-hui manna-ss-ta
  - Chelswu-nom Sunhi-acc met-past-decl
  - ‘Chelswu met Sunhi.’
- Japanese:
  - Akira ga ringo o tabeta
  - Akira nom apple acc ate
  - ‘Akira ate an apple.’
Finiteness

- Another way to tell whether a clause is finite is to look at the complementizer, if there is one.
- The complementizer that always introduces finite clauses, and the complementizer for always (in contemporary English) introduces nonfinite clauses.
- John’s parents wish for him to succeed.
- John’s parents said that he will succeed.

Some more thoughts on T

- Let’s narrow in just a little bit on T for a moment.
- A clause, finite or nonfinite, must have a T node, must have a TP. In a nonfinite clause the T often is where we see to.
- In a finite clause, T is where we see modals like should, would, might, shall, … Note that these clauses do not show subject agreement, but they are nevertheless finite (and arguably show tense distinctions, e.g., should vs. shall, could vs. can)
- He should leave
- I might leave.

Some more thoughts on T

- T is also where we seem to see auxiliary verbs, namely have and be.
- I am (not) hungry.
- She has (not) eaten.
- Auxiliary verbs are a special kind of verb, but they are verbs after all. They aren’t modals, and it isn’t clear that they really should be classified as being of category T (rather than category V).

Some more thoughts on T

- So why do we see auxiliary verbs in T?
- This is something we will cover in more detail later, but the idea which we will be adopting here (generally, the mainstream view) is that auxiliary verbs are verbs, the head of a VP, and then they move into T.

Auxiliary be

- John is (not) happy.

[Diagram: TP -> VP -> AdjP -> be+[past] -> AdjP -> V -> AdjP]

- The verb be starts out (abstractly) as shown here, the head of the VP.
- The verb then moves (before we pronounce it) up to T.
- But not if a modal is in T
- John might (not) be happy.
- This is sort of similar to (but backwards from) the idea of how [past] -ed “hops” down from T to V to form past tense verbs.

Auxiliary have

- The same can be said of have.

[Diagram: TP -> VP -> AdjP -> V -> AdjP]

- In general have is a “helping verb”, when it is an auxiliary is not the only verb in the sentence. The other verb is in the same VP, in the complement of have’s VP.
- John might (not) have written.
- For the moment, we’ll treat the participle written as if it were a simple verb (not worrying about where the -en came from); we’ll come to that within a couple of weeks.