October 5, 2022

1 The problem with subject agreement

Up until the previous class, we had a kind of explanation for how we get subjects to agree with their verbs. Specifically, we ruled out subjects and verbs that do not agree by supposing that this leads to a feature clash.

Here is a quick review of the story.

1.1 Part 1: *give* selects for a PP headed by *to*

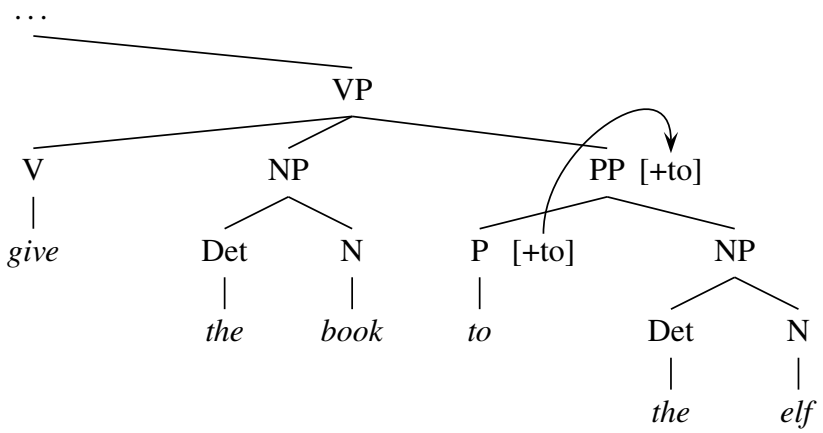
For a verb like *give*, it seems to have a requirement that it occur in a frame that has an NP (the thing being given) and a PP (indicating the destination of the giving). But the PP that it occurs with is constrained pretty tightly. Specifically, it has to be a PP headed by the preposition *to*. We can express this requirement by putting a feature specification the PP in the subcategorization frame that we assign to *give*, like so:

⋮	
to,	P, [+to]
give,	V, [+ __ NP $PP_{[+to]}$]
⋮	

However, this is not quite enough because, even if the P *to* has the feature [+to], the subcategorization frame on *give* requires that the PP (that *to* heads) have the feature [+to]. So we need to suppose that the features of the head P become the features of the PP as well. In fact, we'll assume this more generally, by positing a principle of feature passing:

Principle F: Features pass from a head to phrase it projects.

So the feature [+to] moves up from P to the PP, and now the sister of *give* is a PP with the [+to] feature, as required by the subcategorization from on *give*.



1.2 Part 2: Subjects and verbs agree

The form the verb takes depends on properties of the subject. So: a singular subject (like *Lisa*) must go with a singular form of the verb (*likes* and not *like*). And a plural subject (like *they*) must go with a plural form of the verb (*like* and not *likes*).

(1) a. They like Bart
b. * Lisa like Bart
c. Lisa likes Bart
d. * They likes Bart

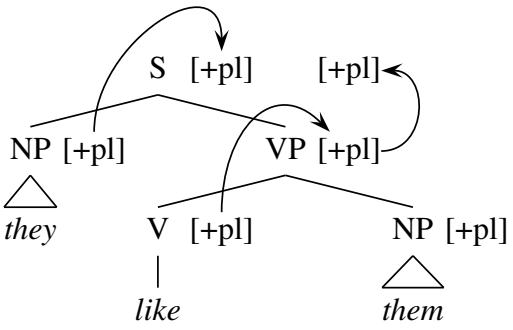
Principle F as hypothesized above had nothing to say about this situation, because the subject NP and the predicate VP are both daughters of S, but neither serves as the head of S. So, we took advantage of this and added a new hypothesis for this situation. Here I will call it "Principle G" though it was not given a name before. It says that if there is no head, then the features of all the daughters become the features of the mother.

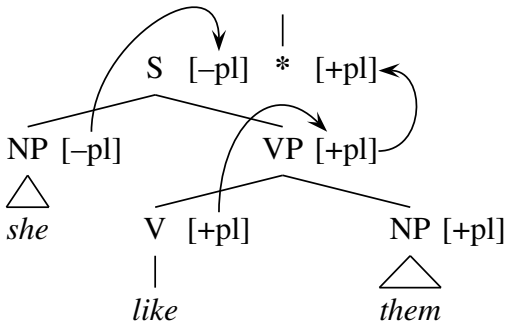
Principle G: Features pass from all daughters to their mother node if none are its head.

This gets the result we want. If the subject NP and VP have values of, say, [+pl] and [–pl] that conflict, then the resulting S node has both [+pl] and [–pl], which we additionally suppose is an impossible representation.

Coherence assumption: A node cannot have both + and – values for an individual feature type.

That is enough to predict the facts in (1).





1.3 An aside about pronouns

Before continuing on with the story, a note about the pronouns in the tree above. The pronouns in English include *they*, *them*, *I*, *we*, *us*, *him*, *her*, *you*, *me*, *he*, *she*, *it*. We believe that they are NPs because they go where NPs can go (that is, they can be subjects or objects). Some forms are specifically for subjects (*I*, *they*, *he*, *she*, *we*), others are not (*me*, *them*, *him*, *her*, *us*). We will worry about that part later. But one part we might consider now is: If *we* is an NP, then is it also an N, and what determiner goes with it? That is, if we assume that all NPs need a Det and an N, what is the Det if *we* is the N?

It will turn out in fact that *we* kind of seems more like a Det than it seems like an N. You can't modify *we* with an adjective (**fabulous we left*), and you can't use a regular determiner with it (**the we left*). In fact, there are cases where *we* seems to go in the same place a determiner like *the* goes: *we happy linguists will (all) leave.*

So, really, it's going to best to consider *we* the Det. And then if we assume it is within an NP, we must assume that it is constrained to (usually) occur with a silent N. (Note that we have silent Ns in some other cases, like in *the poor*, where *poor* there is an adjective describing an unspoken N meaning 'people.')

Another possibility, that we will explore shortly is that there isn't even an N in pronouns like *we* at all (not that it's there but silent), but this will lead to a small cascade of connected changes, so I will put that off just a little bit longer.

However: to postpone worrying about the internal structure (or lack thereof) of pronouns like *we*, I have instead opted to just draw them as NPs with triangles. The triangle means "whatever internal structure there may be here is not important for present purposes." Until we work on this more explicitly, you can/should do the same.

1.4 An aside about ϕ-features

Above the example of agreement was with [+pl] and [–pl]. But in fact agreement in English is also conditioned by person (first, second, third). It is only the third person singular that appears with an *-s* (*She writes*) First person singular and second person singulra do not (*I write*, *You write*).

In languages with gender (masculine, feminine, or neuter), there is also agreement in gender.

Generally, person, number, and gender go together in the languages of the world. Agreement is usually responsive to these as a group (if a language makes those distinctions). We adopt the term "ϕ-features" a description of all of these agreeing features together. Historically, the choice of ϕ there is really just due to the fact that ϕ corresponds to "f" in Greek, and these are features. But "ϕ-feature" does specifically refer to the collection of person, number, and gender features that an NP might have or that a verb might agree with.

1.5 Selection for clause type leads to C

Then, in the previous class, we looked at the fact that (a) sentences come in different types (such as declarative and interrogative), and (b) certain verbs can be selective about which type of sentences can serve as an object.

The sentences that can serve as objects of a verb of this sort are (usually) introduced by a pronounced **complementizer** like *that*, or *whether*. The complementizer (C) determines the clause type of the sentence. So we need to suppose we can form CP out of a C and a sentence, and then the feature projection principle (Principle F) will pass the clause-type features up from C to the CP.

(2) CP $\rightarrow$ C S [C is the head]

(3) *whether*, C, [+Q]

(4) *if*, C, [+Q]

(5) *that*, C, [+D]

(6) $\emptyset$, C, [+D]

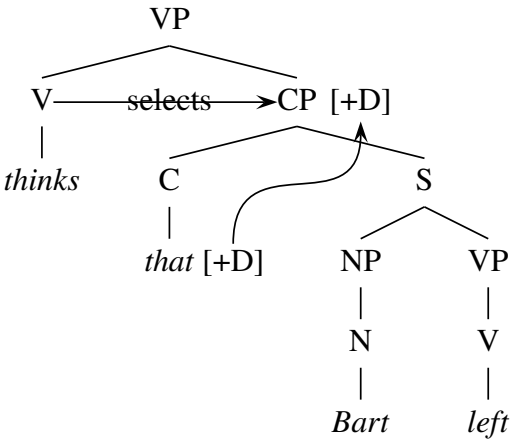
So, *ask* requires a CP object that is interrogative. And *believe* requires a CP object that is declarative. And *know* can take either kind. So we can encode this selectivity, like we did for *give* and its PP, in the subcateogrization frames of the selecting verbs.

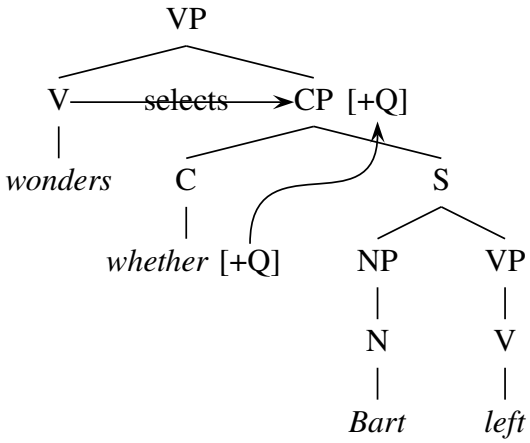
And finally we can specify the lexical entries for our example embedding verbs:

(7) *ask*, V, [+ __ $\text{CP}_{[+\text{Q}]}$]

(8) *believe*, V, [+ __ $CP_{[+D]}$]

(9) *know*, V, [+ __ CP]





So the conclusion of this discussion (from previously) is that the clause type originates in C and takes the form a feature like [+D] (declarative) or [+Q] (interrogative/question). The CP inherits the feature from its head. And then a verb that has CP as its object can additionally require a particular type of clause by specifying it in its subcategorization frame.

1.6 Selection for finiteness leads to T

The conversation continued using much the same argumentation to lead us to conclude that C can select for specific types of sentences as well. So, sentences can be non-finite (with a *to* form of the verb), or finite (with a tensed/agreeing form of the verb), and different Cs go with each.

So *for* is a C that goes with a non-finite (infinitive) S, as in *They want for you to leave*. And *that* goes with finite (tensed) S, as in *They said that you left*.

We can use the same argument to suppose that S has a head, and that head is where the tense information is (finite or nonfinite). It makes sense to call that head T (for tense), and then that just means that if the head of S is T, we may as well call S "TP." So we will.

And this solves the selection problem for *for* and *that* perfectly well.

But it opens up a new problem, which is that we lose access to the explanation we had before about how subject-verb agreement is enforced. That relied on S not having a head and so getting features from both the subject NP and the predicate VP that could then clash. But if S ("TP") has a head now, the features of TP should be the features of its head (T).

This means that "Principle G" is probably no longer useful for anything, if we take this even one step further and suppose that there aren't any phrases that lack a head. S was the only one we'd had, and we have reanalyzed that as being a TP headed by T.

And so now we come back to the issue that launched the discussion: we would like to be able to explain why subjects and verbs agree, and our old explanation is now no longer available.

2 Types of explanation

There are basically two kinds of explanation for this agreement that we can consider. One is that agreement is enforced because if you have a subject and verb that don't agree, you wind up with a feature clash

somewhere. This is the *kind* of explanation that we had before. And we could try to work out how features move through the tree to recreate that explanation.

The second kind of explanation is that agreement is enforced by virtue of it being assigned. On this kind of view, the NP has the ϕ-features, kind of intrinsically (it has person, number, gender), and those values are copied over to the verb. The verb starts off by lacking agreement features, and then gets them from the subject NP somehow. This then enforces agreement not by virtue of penalizing mismatch but by preventing mismatch from arising in the first place.

Either way could be right. We talked about some reasons why the assignment kind of explanation might be better and fit in better with the sort of view of morphology that separates pronunciation a bit from syntax. The examples of this were like the comparative (*taller* vs. *more intelligent*), where the semantics and probably even syntax of these comparative adjectives should be the same, even if the comparative is realized as *-er* on the short adjectives and as *more* ont he longer ones. Similarly, the French examples where *à* 'to' and *le* 'the(masculine)' are realized as *au* 'to+the(masculine)' even though the semantics and syntax should still reflect the endpoint of a path at a definite noun.

3 Specifiers

What we're going to try to do is say that subject shares its features with the T head, which allows the ϕ-features to reach T and ultimately V. We don't currently have a way to do that. We have already hypothesized that a head (X) shares its features with the phrase (XP), but the subject is an NP that is a daughter of TP. We need to add something that allows the features from the NP daughter of TP to get to T. We're going to try something that will turn out to work pretty well, and designate that position, where the subject is, as a special position that can communicate with the head. We're going to call that the "specifier," and we now need to work out how to define it.

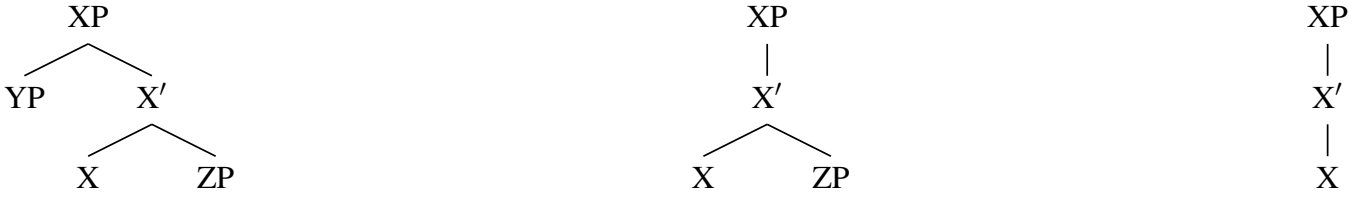
Most of you will have encountered specifiers in previous courses, like Intro to Linguistics. But basically, they are a specific position in the "X-bar" structure, which I also kind of rapidly introduced in class and will run though very quickly here as well.

3.1 X-bar structure

The "X-bar" syntax is basically a generalization over a wider set of phrase structure rules, taking the observation that most of the phrase structure rules we have seen are such that there is a head, and then a spot to the left of the head, a spot to the right of the head, and an ability to iterate in the middle. The idea is essentially that we can *derive* the phrase structure rules from a more general schema. The basic schema (ignoring adjuncts for now) looks like this:

(10) $\text{XP} \rightarrow (\text{YP})\ \text{X}'$

(11) $\text{X}' \rightarrow \text{X}\ (\text{ZP})$



The "X" (and "W", "Y", and "Z") here stands for any category, so from this schema we derive phrase structure rules like

(12) $\text{VP} \rightarrow \text{V}'$

(13) $\text{V}' \rightarrow \text{V NP}$

The main example of a spot to the left of the head that we've seen is the subject of a sentence. These can be full phrases, so they are a whole NP. Another example that we'll get to later is a possessor, which also seems to be a full phrase, and is arguably in this spot to the left of the N *dog*. (This is an approximation, but it's close enough.)

(14) [The person from the pet store] appeared in my driveway.

(15) [The person from the pet store]'s dog

There are plenty of examples of the phrasal spot to the right of a head. The object of a verb, the object of a preposition, a TP to the right of C. That position, to the right of the head in English (and maybe more accurately, a sister to the head) is called the "complement." So YP in those diagrams above is a specifier, ZP is a complement.

Structurally, even apart from the word order, a specifier is distinguishable from a complement because one is a sister to the head, and one is the either the sister to X′ or alternatively it is a daughter of XP. So we can refer to the complement and the specifier independently. There might be some constituency tests that might be able to identify the X′ level, although that is not clear, it's kind of mostly based on a need to be able to distinguish them.

There is a lot of complexity and nuance here, and the full exposition of X′ theory and concerns about it will take some time to work through. However, the main thing I want to point out here is that there is a single position called a "specifier" that is a YP (that is, a phrase of some type) that is sister to X′ and daughter to XP.

4 Motivating specifier-head feature sharing

The goal here is to work out a way to ensure subjects agree with verbs in ϕ-features. The strategy is going to be that we want to get the features of the subject to T. The mechanism is going to be that the features of a specifier are shared with the head. Let me take a side trip to show another place where that arguably happens, to make the case that positing this principle will provide some other coverage.

We will talk later about *wh*-questions in some detail. But the basic facts seem to be like this.

(16) Pat has eaten lunch.

(17) what has Pat eaten?

When we introduced CP, the idea was that the C (head of CP) is the place where the information about whether a sentence is a declarative or an interrogative is stored. Let's further assume that *wh*-questions have a [+whq] feature and a yes-no question has a [–whq] feature. So the C in (16) is [+D] (declarative) and the one in (17) is [+Q, +whq] (interrogative, *wh*-question).

If you look at (17), you see that *has* is to the left of the subject *Pat*. Since we know where the subject is (the specifier of TP), that means that *has* is further up. The only thing further up is C. So *has* is a pronunciation of C. And *what* is to the left of *has*. So we suppose that the *wh*-word is in the specifier of CP.

While it's still kind of a leap at this point, we can understand the ungrammaticality of (18) as being due to the fact that English requires a *wh*-question to have a *wh*-word in that specifier of CP position. So it's kind of matching requirement: if C is [+Q, +whq], then there needs to be a *wh*-word in the specifier of CP.

(18) * Has Pat eaten what?

That *wh*-word needs to be differentiated from other words that aren't *wh*-words, so we might suppose that it has a [+wh] feature. So the way that we can think of the requirement that there be a *wh*-word in the specifier of a [+Q, +whq] C is that the [+whq] feature of C needs to match with a [+wh] feature of a *wh*-word. There are various ways we could formalize this, but if we suppose that putting a *wh*-word in the specifier of CP shares its features with C (which satisfies the need that a [+whq] feature has for a paired [+wh] feature), then we can kind of understand why that position is a good one for *wh*-words. And it's another example of a specifier sharing features with the head, besides the one that is giving us subject agreement.

This is only a sketch, but the point is just that there are two situations so far where it seems like there's some usefulness to thinking that features of a head and specifier are shared.

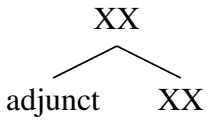
So, in conclusion, this sharing of the features between a specifier and a head is another type of feature sharing (meaning we have the feature percolation ("Principle F") that shares features between X and XP, and now this Spec-Head Agreement that shares features between X and its specifier).

Spec-Head Agreement: Features pass from the specifier of a phrase to its head.

5 Adjuncts in X′ structrures

Now, let's return to adjuncts. There is a question here about what level we should assume adjuncts attach.

Here's what we know: Adjuncts are optional and iterative. Which tells us that they are recursive rules that result in structures like this:



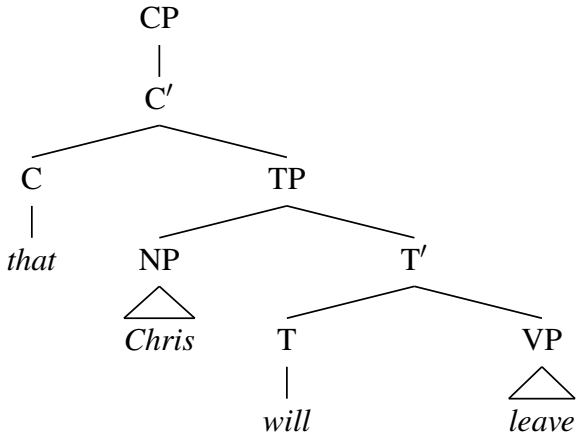
That is, an adjunct has the same label as its mother and its sister. This is what predicts the optionality and iterativity.

When we were identifying adjuncts vs. complements before, it was stipulated that adjuncts attach to XP level nodes. That was stipulated without rationale, but why might we want to allow that?

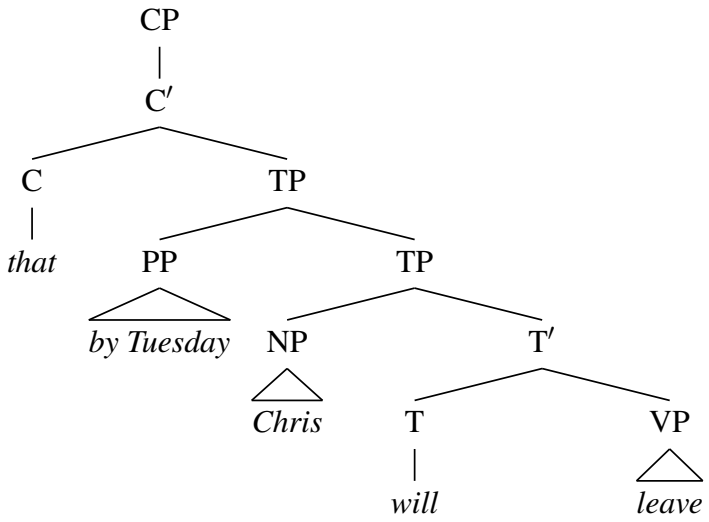
One example that seems to require adjunction to an XP would be the following:

(19) Pat said that Chris will leave.

(20) Pat said [that [Chris will leave]].



(21) Pat said that by Tuesday Chris will leave.



So there is at least some rationale for what was stipulated before. There's no place that *by Tuesday* could be there except adjoined to TP, since we have *Chris* in the specifier of TP and *that* in C.

That means we should probably add the following rules to the X′ schema for adjunction:

(22) XP → (YP) X′

(23) X′ → X (ZP)

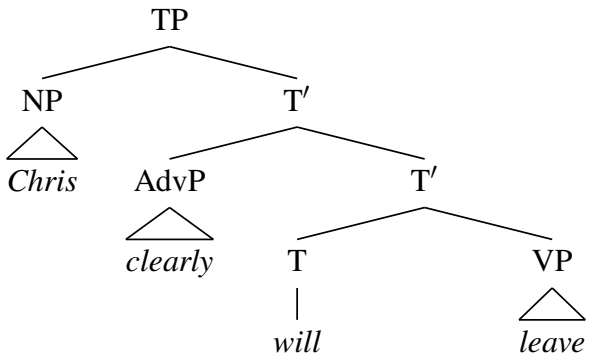
(24) XP → XP WP ⟵ new

(25) XP → WP XP ⟵ new

But you may have seen the X′ written out with adjunction to the X′ level instead, if you've seen this before. Do we need that? In most cases, there is no difference in terms of what word orders the grammar predicts. Above we saw evidence for adjoining to XP, is there a case that would force adjoining to X′?

I think one possible case that argues for this is if we can put something in between the subject (in the specifier of TP) and T. If an adjunct can fit in there, then it must be adjoined to T′, given our other assumptions. And I think it is possible.

(26) Chris clearly will leave.



So it looks like we need to allow *both* adjuncts to XP and to X′. Note: this is not an irrefutable argument. We could make additional/different assumptions that might allow us to restrict adjunctions just to XP or just to X′—simplifying the system in one place, even if arguably making it more complex in another place. But for the moment it seems the simplest route to assume that both types of adjunction are allowed.

(27) $XP \rightarrow (YP)\ X'$

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

(29) $XP \rightarrow XP\ WP$ $\boxed{\leftarrow \text{new}}$

(30) $XP \rightarrow WP\ XP$ $\boxed{\leftarrow \text{new}}$

(31) $X' \rightarrow X'\ WP$ $\boxed{\leftarrow \text{even newer}}$

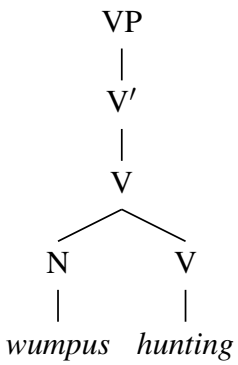
(32) $X' \rightarrow WP\ X'$ $\boxed{\leftarrow \text{even newer}}$

You might wonder if, now that we've allowed adjunction to XP and to X′ if really the more general approach is to assume that we just allow adjunction to *anything*. What that means in this case is also allowing adjunctions to heads. Notice the form of this too: we see a pattern and a way that we might be able to state it more simply, but generalizing like that makes a prediction, that we'd expect you could adjoin something to a head as well.

It's conceivable that something like this might be a kind of evidence that this is possible:

(33) Pat is hunting wumpus.

(34) Pat is wumpus-hunting.



(35) XP → (YP) X′

(36) X′ → X (ZP)

(37) XP → XP WP ⟵ new

(38) XP → WP XP ⟵ new

(39) X′ → X′ WP ⟵ even newer

(40) X′ → WP X′ ⟵ even newer

(41) X → X W ⟵ newer still

(42) X → W X ⟵ newer still

Ideally, we'd be able to compress all those "new" rules into something more general, but we kind of lack the ability to generalize over "bar levels" in our notation. Though we can state those last six rules as saying essentially that you can adjoin something to anything, but with the stipulation (not defended here) that what you adjoin is a phrase (XP) except if you are adjoining to a head (X) (in which case what you adjoin is a head (X)). But we'll leave it there for now.

Conceptually, the schema above kind of lives "outside the rules" at the moment. It tells us what rules are possible, they have to take one of those forms. Later we might try to eliminate some/all of the explictly stated rules by instead supposing that *any* rule that matches the X′ schema above is one of the rules. But for now I will continue to write out the rules. And in particular, I will omit some of the rules that would be possible but seem to predict ungrammatical sentences. This is a problem for later, perhaps beyond the end of this semester, but something to maybe file away in the back of your mind.

6 Summary of the new assumptions about structure

Given that we are now going to want to have specifiers and heads and at least some version of X′ structures implemented, let me take a second to re-outline the current state of the phrase structure rules that build up our trees. We are essentially following the X′ schema now, although the X′ schema itself is not part of the rules. I am also cutting a corner or two, based on the things we need to do. (So I'm not including all of the possible X′ schema expansions in the rules here.)

The additions/changes here from last time this was outlined are:

- What we used to call S, we now call TP.
- TP has a head, which we call T.
- The subject of TP is going to be its specifier, and the VP will be daughter to T′.
- CP has a head and an optional specifier.
- TP, CP, and VP will always have bar-level nodes now. (So if there is a CP, there is also a C′.)
- For the moment I am limiting the category of what is in the specifier of CP or TP to be NPs. Later we will need to allow other things.
- I am using parentheses to indicate options below, but keep in mind this is just shorthand. "(NP) C′" is a short way to write "C′" and "NP C′" in a single line.
- I have disallowed specifiers and adjuncts to PP for now, but that means we might not predict "right over the fence."

- I have made a kind of policy decision at this point that adjuncts will be usually assumed to be at XP and only at X′ where have evidence that we need them.
- NPs are kind of clunky at the moment. They require a Det in their specifiers, and it is not clear where adjectives go.
- I have left Adj and Det and Adv as heads for now, though we may wonder about that, later we might consider them full phrases as well.

CP →	(NP) C′
C′ →	C TP
TP →	NP T′
T′ →	T VP
VP →	V′
V′ →	V (NP)
V′ →	V NP PP
V′ →	V NP NP
V′ →	V CP
NP →	Det N′
PP →	P′
P′ →	P NP

TP →	Adv TP
TP →	PP TP
T′ →	Adv T′
VP →	VP Adv
VP →	Adv VP
VP →	VP PP
N′ →	Adj N′
N′ →	N′ PP
Adj →	Adv Adj
Adv →	Adv Adv

Other notes: Conceptually if a sentence is a statement, and that semantic information is assumed to be in C, then there must be a C in any statement. The topmost C in English (and more generally) seems to have to be silent. We don't have an explanation for why, we just stipulate that. There is a C in a main clause declarative, and its content is the silent counterpart to *that*.

7 Getting subject agreement

Since by now this handout is getting long and the hour is growing late, let me bring this back around to showing how we might derive subject agreement this way.

Here is what we are trying to do: We want the features of the subject to go to T, which happens because the subject is in the specifier to T (so the features move to T due to Spec-head agreement).

We still need to connect the features of T to the features of V, and we have not provided a way to do that. To get this to work, let us suppose that there is something special about T and V: The tense features need to be assigned to a verb.

I am partly thinking ahead to *do*-support here, where it will turn out that the tense needs to have its features realized (to the extent that we will insert *do* in order to allow them to be realized). I'm also trying to think ahead to how we might want to explain French verb movement to T. But the idea is essentially that tense wants to pass its features on to a verb, which it does by passing them on to its sister, the VP.

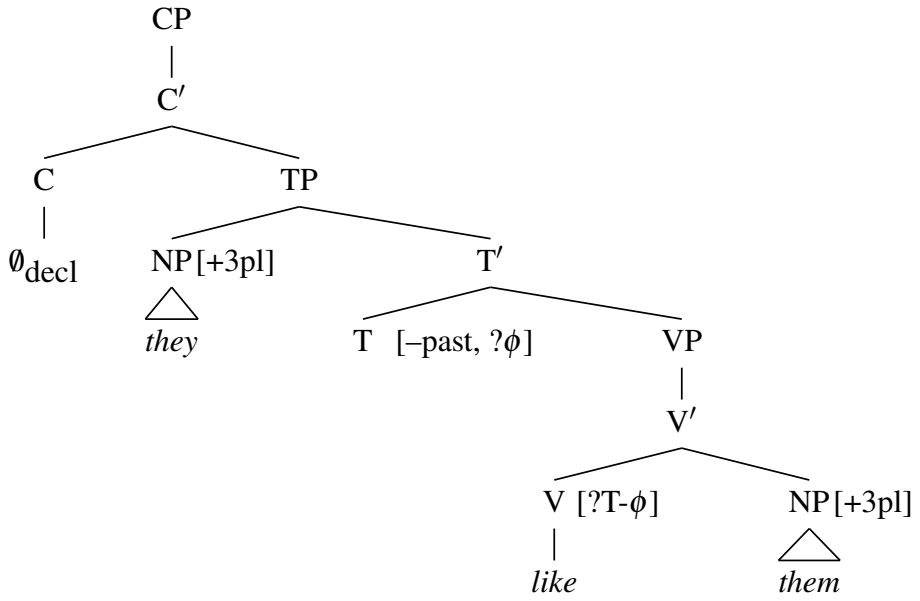
Suppose we then generalize Principle F so that instead of saying that features move from the head to the phrase, we say that the features are simply shared between a phrase and its head. This means that if T assigns a feature to VP, then that feature is effectively also assigned to the head.

Lastly, we have in the lexicon the information that the verb *like* is pronounced as *like* if it is [+pl] and *likes* if it [–pl].

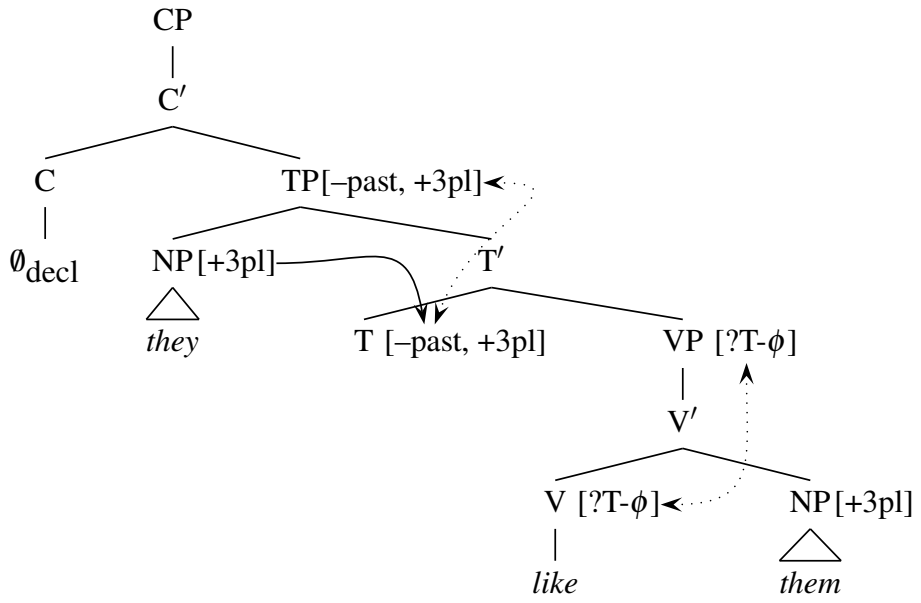
So, let me line up succinctly the things we need, and then I will demonstrate it. The derivation will occur in a couple of steps.

- V starts out with empty (unfilled) agreement. I'll call this feature [?T-ϕ], meaning that it is a space that *can* hold tense and ϕ-features, but currently does not.
- NP (e.g., the subject NP) starts out with defined agreement features (ϕ-features), like [+3pl] (3rd person plural).
- T starts out with a tense feature (like [+past]), as well as an empty (unfilled) ϕ-feature space ([?ϕ]).
- **Spec-head agreement**: (Certain) features (including at least ϕ-features) are shared between the head and its specifier.
- **Feature percolation**: (Certain) features (including at least tense and ϕ-features) are shared between a phrase and its head. (This was called "Priciple F" before.)
- **VP inflection**: T passes on (certain) features (including at least tense and ϕ-features) to a sister of category V.

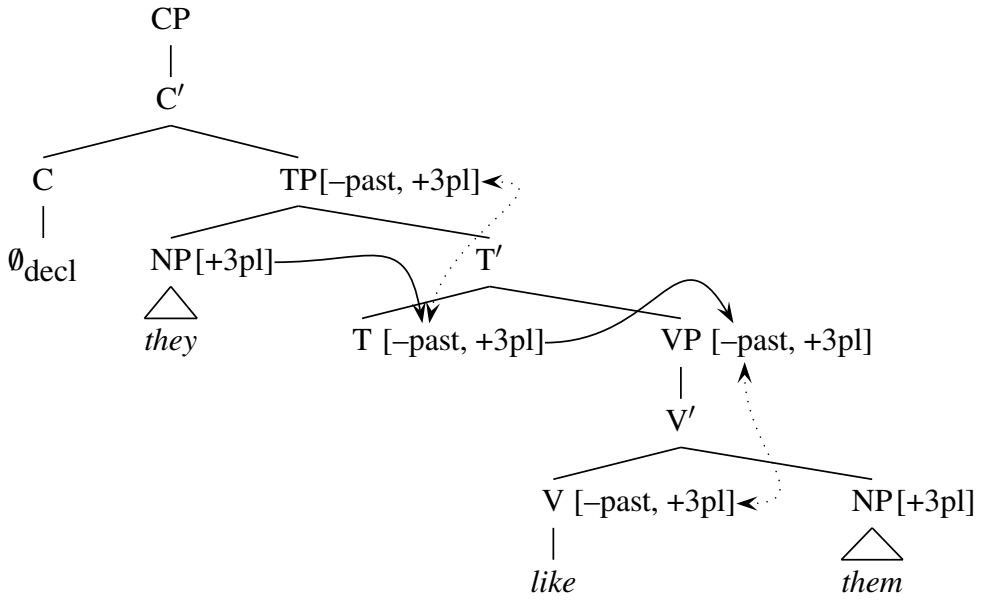
This should be clearer with a demonstration. Let me demonstrate with a diagram of *They like them*. In the first step, let's just see where the features are before they get shared around.



Step two: the features of the subject are shared with T (which goes from being [?ϕ] to having the [+3pl] from the subject; this is Spec-Head Agreement). The features of the T are automatically the features of the TP as well (Feature Percolation). Same for V and VP.



Step three: the features of T are assigned to VP (VP inflection). The features of the VP are automatically the features of the V as well (Feature Percolation).



Step four: when the verb is pronounced, it is the form of *like* for the non-past, 3rd person plural context, which is *like*.