

Some Notes and Practice Problems on Syntactic Tree Structures

1. Some Notes on Drawing Syntactic Trees

In any 'Introduction to Linguistics' course, there comes a time when you are asked to use Phrase Structure (PS) rules to draw syntactic trees for various sentences of English. In this class, our PS rules for English currently look as follows:

(1) Our Current PS Rules for English

$S \rightarrow \{ NP, CP \} VP$

$NP \rightarrow (D) (A^*) N (CP) (PP^*)$

$VP \rightarrow V (NP) \{ (NP), (CP) \} (PP^*)$

$PP \rightarrow P (NP)$

$CP \rightarrow C S$

But how, exactly, do we use these PS rules to draw syntactic trees for sentences of English? Now, the bad news is that finding the right tree-structure for a sentence always requires a modicum of insight and ingenuity. However, there *is* a way of proceeding through the problem that makes the answer easier to see.

To see this, let's work step-by-step through a particular complex example:

(2) Illustrative Sentence The good boy in the class built Tom a new wooden table.

So, how do we figure out the tree structure for this sentence? We start off as follows:

(3) First Step: Label the Words in the Sentence

Above each word in the sentence, write the category label for that word and attach it with a line.

Applying this first step to our illustrative sentence, we get the following:

(4) Applying the First Step to Sentence (2)

D	A	N	P	D	N	V	N	D	A	A	N
The	good	boy	in	the	class	built	Tom	a	new	wooden	table.

Now, having drawn the category label for each word, the name of the game is to find rules from the list of PS rules that can combine those category labels into larger phrases. The way to proceed here is completely open-ended, but one strategy I find useful is to start off by trying to form the NPs in the sentence.

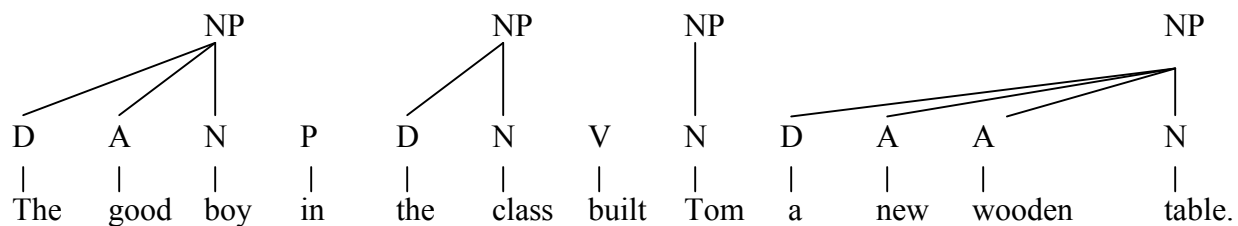
(5) **Second Step: Try to Form NPs**

From the list of category labels created in Step 1, group Ns together with other categories to create NPs (following the PS rule for NPs that we have).

- Look to each N in the sentence.
- Draw an NP label above the N, and connect it to the N with a line.
- If the N is directly preceded by a D, connect it to the NP label
- If the N is directly preceded by a sequence of As, connect each A to the NP label
 - If there is also a D before the As, connect that to the NP label as well.

Applying Step 2 to the structure we made in (4) will result in the following:

(6) **Applying the Second Step to Sentence (2)**



Next, I personally find it easy to form the PPs in the sentence. To do so, we follow the procedure laid out in (7).

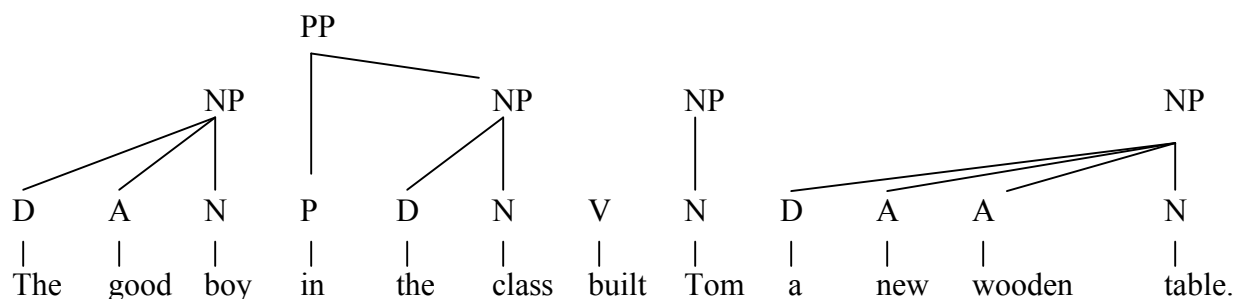
(7) **Third Step: Try to Form PPs**

If there are any Ps, group the Ps together with any following NPs into a PP.

- Look to each P in the sentence.
- Draw a PP label above the P, and connect it to the P with a line.
- If the P is followed by an NP (created in Step 2), connect that NP to the PP label.

Applying Step 3 to the structure we made in (6) will result in the following:

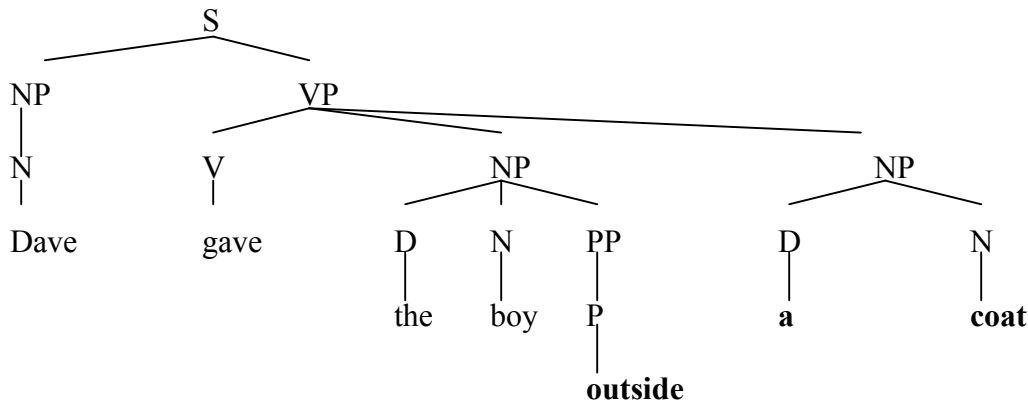
(8) **Applying the Third Step to Sentence (2)**



Now, I should note here that this third step in (7) is not 'foolproof'. It may sometimes be that a P is followed by NP but the NP is not really part of a PP. For example, we see this in sentences like the one in (9) below.

(9) **A Sentence Where Step Three Will Lead You Astray**

In the sentence below, the NP *a coat* follows the P *outside*, but is not part of a PP.



In cases like this, if you see that applying Step 3 will give the wrong result, you have to choose not to apply it. I wish I could give you a foolproof way of figuring out whether to use Step 3 or not, but it's really not possible. This is something that you'll have to work out through good old-fashioned trial-and-error.

After forming the PPs, I myself find it natural to try to form the VPs in the sentence. To do so, we follow the procedure laid out in (10).

(10) **Fourth Step: Try to Form VPs**

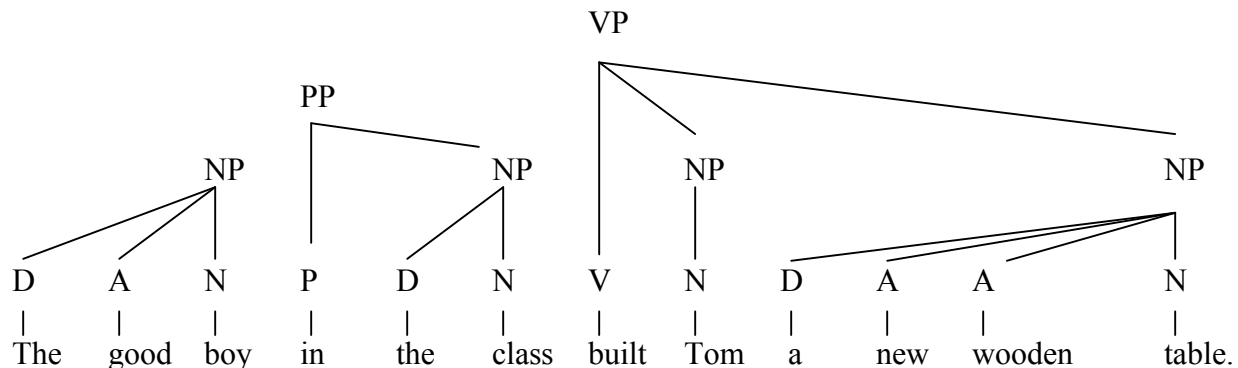
Group the Vs together with material following them into a VP.

- Look to each V in the sentence.
- Draw a VP label above the V, and connect to the V with a line.
- If there are phrases following the V that can be part of the VP (according to the rule in (1)) connect them to the VP label with a line.

Applying Step 4 to the structure we made in (8) will result in the following:

(11) **Applying the Fourth Step to Sentence (2)**

According to the rules in (1), a VP can be formed from a V followed by two NPs:

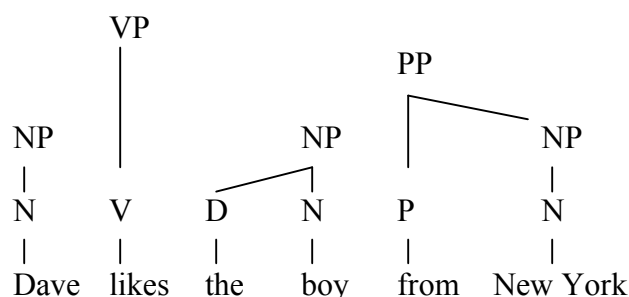


I should note that Step 4 in (10) is also not foolproof; it may sometimes lead you to the wrong result. For example, applying Steps 1-3 to the sentence in (12a) below will produce the partial structure in (12b). If we then apply Step 4, we will be lead to create the structure in (12c), since the rules in (1) allow PPs to be part of the VP.

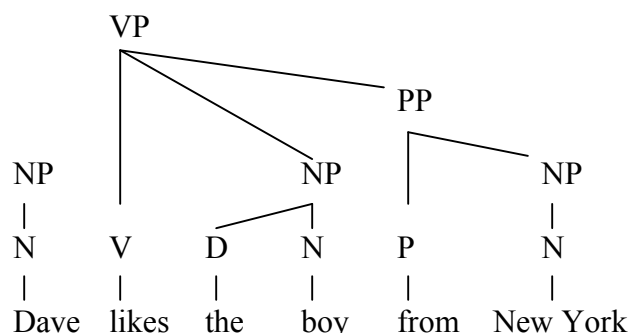
(12) **A Sentence Where Step 4 Will Lead You Astray**

a. Sentence:
Dave likes the boy from New York.

b. Result of Applying Steps 1-3:



c. Result of Applying Step 4 to (12b):



However, in this tree structure, the PP ‘*from New York*’ is part of the VP, and so would be taken as describing the *liking*. Intuitively, though, in sentence (12a) the PP ‘*from New York*’ describes *the boy that Dave likes*, and so therefore should be part of the NP formed from ‘*the boy*’. Again, in cases like this, you’ll just have to use your own best judgment as to whether to include the PP within the VP or not.

Next, having made the VP, its time to go back and attach our PPs to larger phrases. Now, in Step 4, you may have attached some PPs to the VP label. If so (and this move was correct), great! However, you might also still have some other PPs laying around. If so, examine the tree-structure to see if there is a suitable label that the PP might be attached to (following the rules in (1)). This is summarized in (13) below:

(13) **Fifth Step: Attach PPs to Larger Structures**

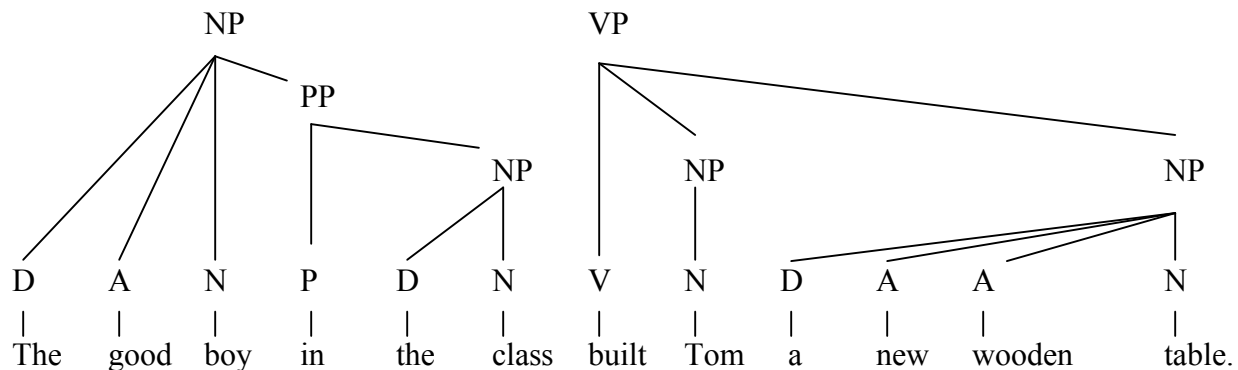
If you have a PP label that is not attached to a VP or an NP, see if there's an NP or a VP that the PP could be attached to, in a way that's consistent with the PS rules in (1).

- For example, if the PP directly follows an NP (that you made in Step 2), or a VP (that you made in Step 4), you could consider attaching the PP to it.

The result of applying Step 5 to our structure in (11) would be the following:

(14) **Applying the Fifth Step to Sentence (2)**

According to the rules in (1), an NP can be formed from an N followed by a PP:



In applying Step 5, you should use your own intuitions regarding the meaning of the sentence to help you decide where the PP should go. Remember, as stated in class, the tip to keep in mind is the one in (15):

(15) **A Tip Regarding the Attachment of PPs**

- If the PP is understood to describe the *action* described by the V, attach the PP to the VP label above that V.
- If the PP is understood to describe the *thing* described by the N, attach the PP to the NP label above that N.

So, for example, in sentence (2), the PP “*in the class*” intuitively describes **the boy** (who built Tom a new wooden table). Therefore, the PP “*in the class*” should be attached to the NP label above the N *boy* in the sentence, as we have done in (14).

Continuing on in this fashion, you will eventually get to a point where you have drawn a VP and something that can combine with it to form a sentence (either an NP or a CP). When you get to this point, you cap everything off by attaching both the VP and the other thing (in this case, an NP) to an S label.

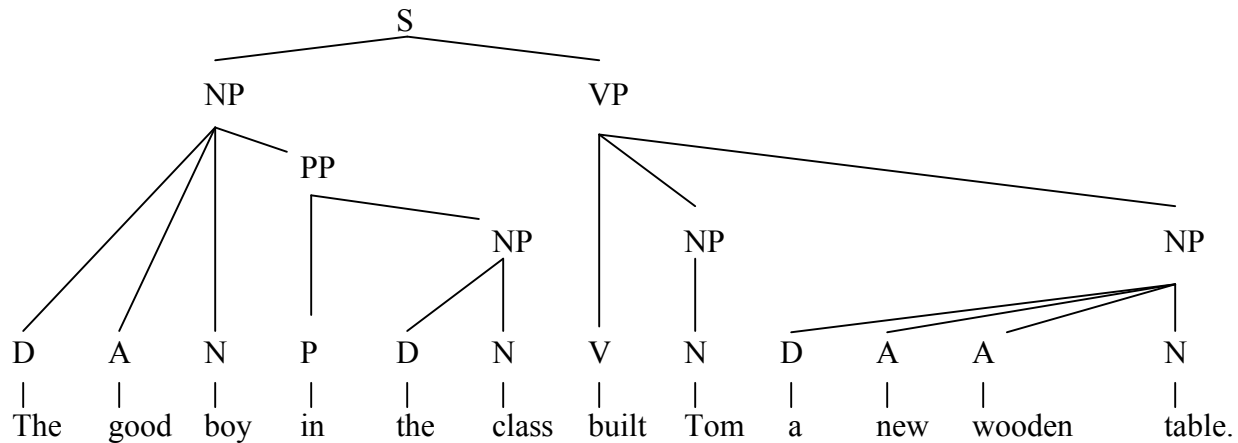
(16) **Step 6: Combine the VP and the Other Phrase (NP or CP) into a S**

Draw an S label above the VP, and connect the VP to that S label. Then, connect the other phrase (either an NP or a CP) to that S label as well.

The result of applying this sixth step to the structure in (14) appears below.

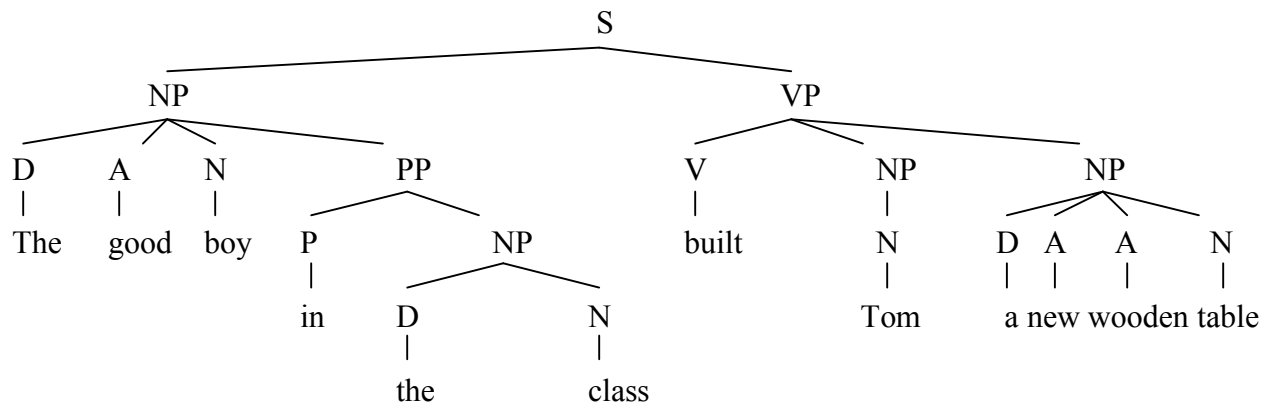
(17) **Applying Step 6 to Sentence (2)**

According to the rules in (1), an S can be formed from an NP and a VP:



Now that you have the tree structure, you can make some ‘cosmetic’ changes to it, so that everything looks nice and centered.

(18) **A Cosmetic Readjustment of the Tree in (17)**



Let’s do another example together, one that’s a bit more complicated. The following sentence contains some CPs, and so it will require us to use our PS rule for CPs.

(19) **Illustrative Sentence** That Dave likes Jennifer proves that he has no taste.

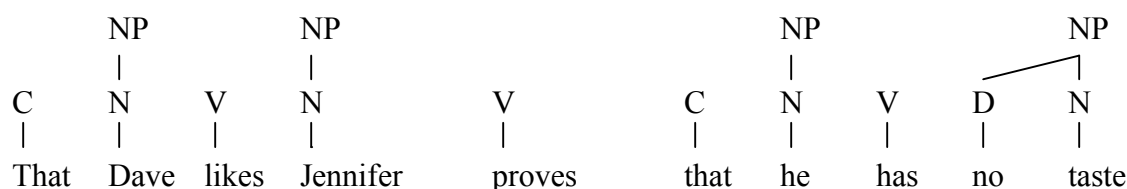
The result of applying Step 1 appears in (20) below:

(20) **The Result of Applying Step 1 to Sentence (19)**



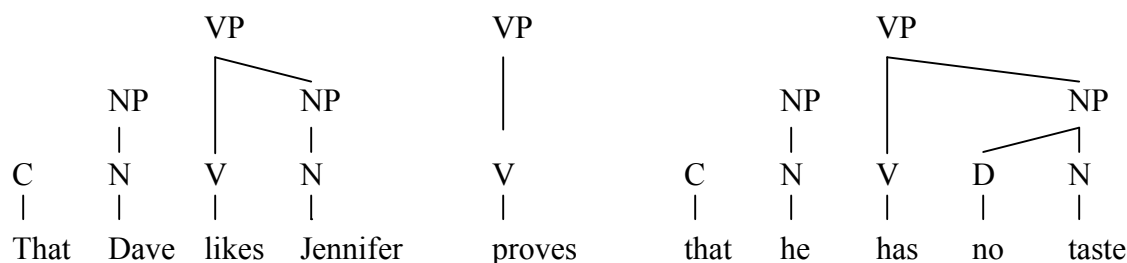
The result of applying Step 2 – the creation of NPs – appears in (21) below:

(21) The Result of Applying Step 2 to Sentence (19)



Since there are no Ps in this sentence, we can skip Step 3. We move right on to Step 4 – the creation of VPs – the result of which is shown in (22) below.

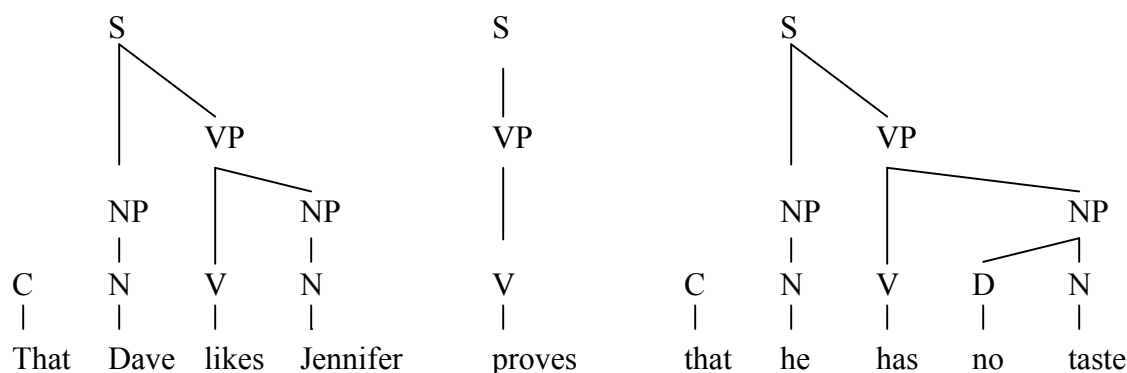
(22) The Result of Applying Step 4 to Sentence (19)



Notice that we can't attach anything to the VP above 'proves' yet. If we tried to attach the NP above 'he' to that VP, we wouldn't have anywhere to attach the complementizer 'that'.

Now that we've created some VPs, and those VPs are preceded by NPs, we can place those VPs into larger sentences. That is, we can now apply Step 6 in (16) to get the structure below:

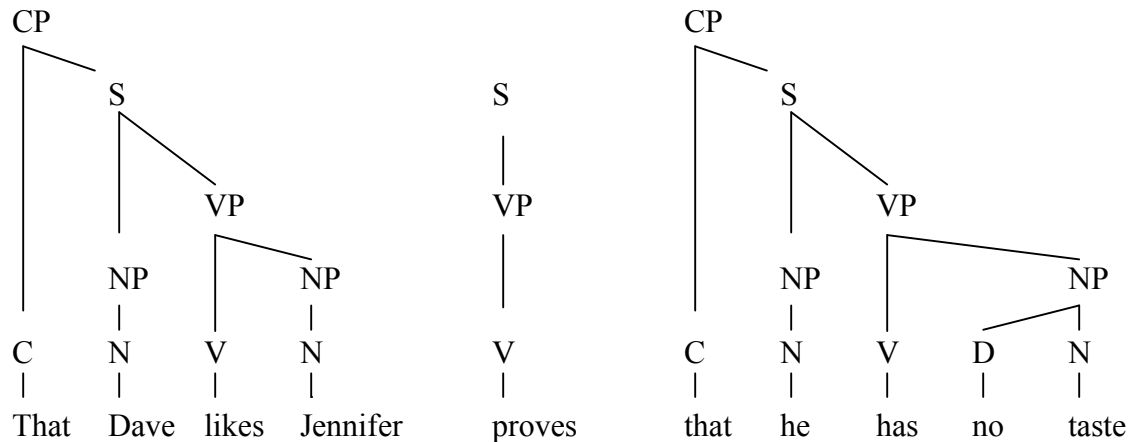
(23) The Result of Applying Step 6 to Sentence (19)



Notice that we can't yet attach anything to the S label above 'proves', since there is nothing that precedes the VP above 'proves' that can combine with the VP to make an S.

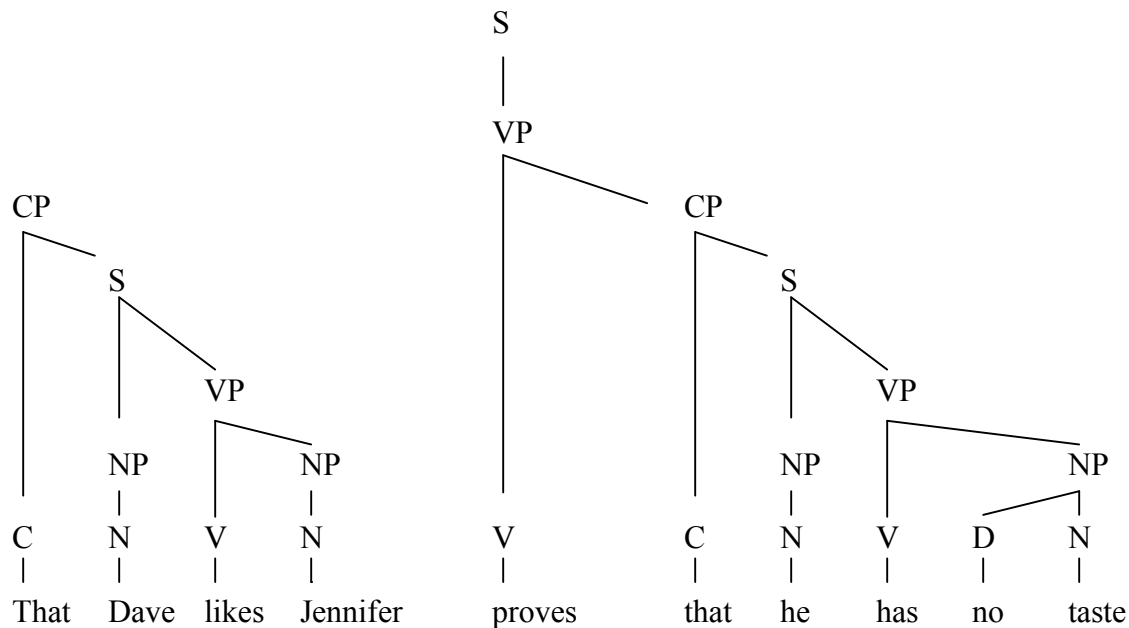
Now we're almost done. According to our PS rules in (1), a C always comes together with a following S to make a CP. We can apply that PS rules to the structure in (23) to form the following structure.

(24) **The Result of Applying the 'CP' Phrase Structure Rule to (23)**



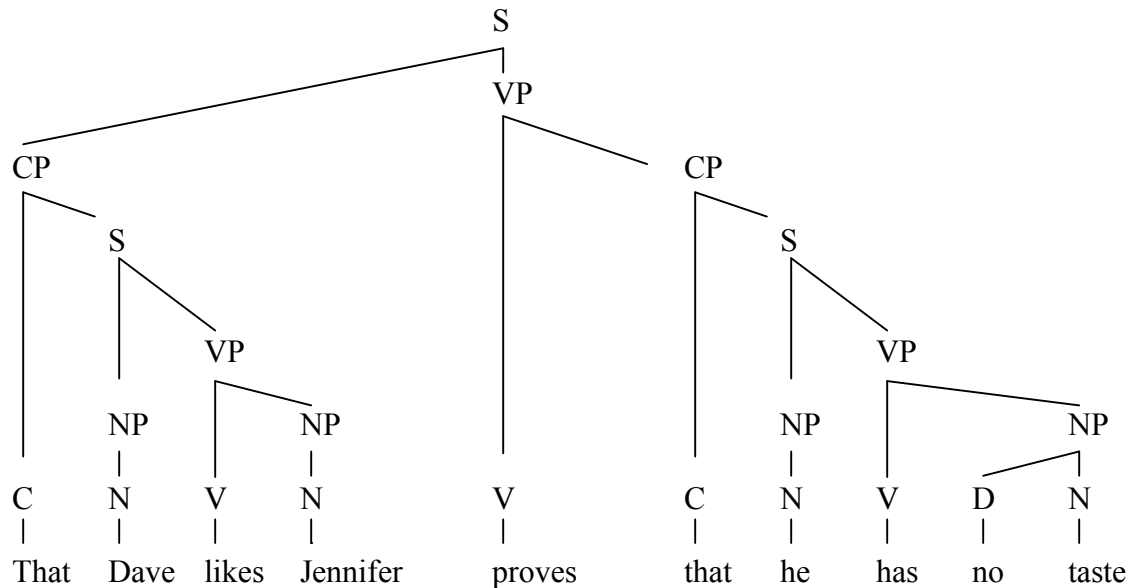
Now we need to find some place to attach the CPs we've just made. Since our rule for VPs in (1) allows VPs to contain CPs, we can attach the CP 'that he has no taste' to the VP above 'proves'.

(25) **The Result of Attaching the Second CP to the VP above 'Proves'**



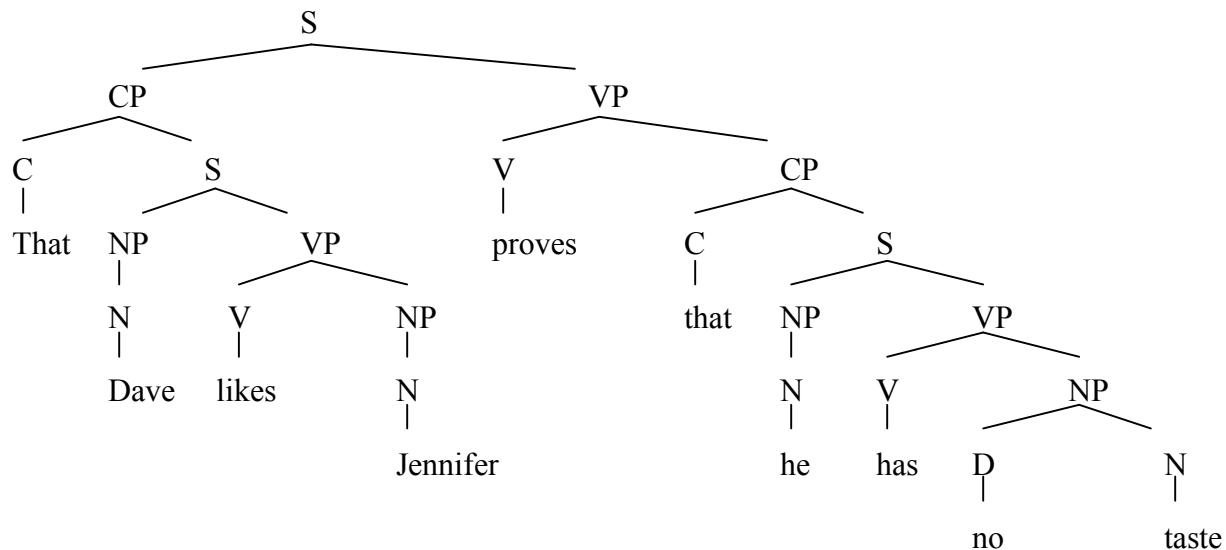
Finally, our phrase structure rule for forming sentences in (1) states that an S can be formed from a CP followed by a VP. Therefore, we can attach the first CP 'that Dave likes Jennifer' to the S label above the VP 'proves that he has no taste'. This is done in (26) below.

(26) The Result of Applying Step 6 to the Structure in (25)



Now that we have the tree structure, we can again do some slight ‘cosmetic’ adjustments to it, just so that it looks nice and balanced.

(27) Cosmetic Adjustment to the Tree-Structure in (26)



Again, I should note that the steps that I’ve laid out for you here are not a *guaranteed* path to the correct tree structures for other sentences. As I mentioned, you will always need to apply a certain amount of our own personal ingenuity and insight in order to find a way of getting the words of the sentence to come together in a way that fits our PS rules. However, if you follow the general contours of the procedure laid out here, it should be a bit easier for you all to hit upon the right answer in the end.

2. Some Notes on Finding Structures for Ambiguous Sentences

One of the homework problems you've been assigned requires you to find tree structures that correspond to certain interpretations of an ambiguous sentence. In these notes, I give you a few pointers on how this is to be done.

Let's start off with the sentence in (28), which can be given a variety of interpretations.

(28) **Illustrative Sentence** Dave drove a car from a city near a lake.

One interpretation the sentence can have is that paraphrased in (29) below.

(29) **One Interpretation of Sentence (28)**

Dave drove a car *which was from a city*, and he drove it near a lake.

Now, let's try to figure out the tree structure for (28) that corresponds to the interpretation in (29). As mentioned in Section 1, the rule-of-thumb to follow here is the one in (30):

(30) **Rule-of-Thumb Regarding the Attachment of PPs**

- If the PP is understood to describe the *action* described by the V, attach the PP to the VP label above that V.
- If the PP is understood to describe the *thing* described by the N, attach the PP to the NP label above that N.

Now, under the interpretation in (29), PPs in (28) are used in the way outlined in (31).

(31) **How the PPs Under Interpretation (29) are Used**

Under the interpretation in (29)

- The PP '*from a city*' describes **the car**
- The PP '*near a lake*' describes **the driving**

Therefore, following the rule-of-thumb in (30), we come to the conclusion in (32):

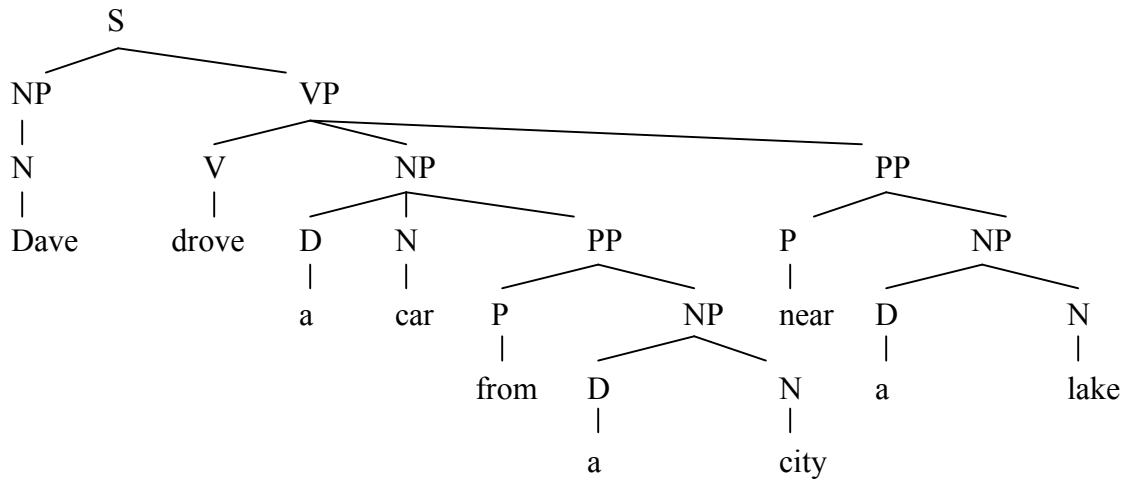
(32) **How the PPs are Attached, Under Interpretation (29)**

In the tree-structure corresponding to interpretation (29):

- The PP '*from a city*' is attached to the NP above '*car*'
- The PP '*near a lake*' is attached to the VP above '*drove*'

Finally, given the conclusions in (32), we know how to draw the tree-structure for (28) under the interpretation in (29). That tree-structure is the one given in (32) below:

(32) **The Tree-Structure for (28) Under Interpretation (20)**



Let's also do another one together. Sentence (28) can also be understood as having the meaning paraphrased in (33).

(33) **Another Interpretation of Sentence (28)**

Dave drove a car *which was from a city*, and *the city was near a lake*.

Under this interpretation, the PPs '*from a city*' and '*near a lake*' are used in the way stated below

(34) **How the PPs Under Interpretation (33) are Used**

Under the interpretation in (29)

- The PP '*from a city*' describes **the car**
- The PP '*near a lake*' describes **the city**

Therefore, following the rule-of-thumb in (30), we come to the conclusion in (35):

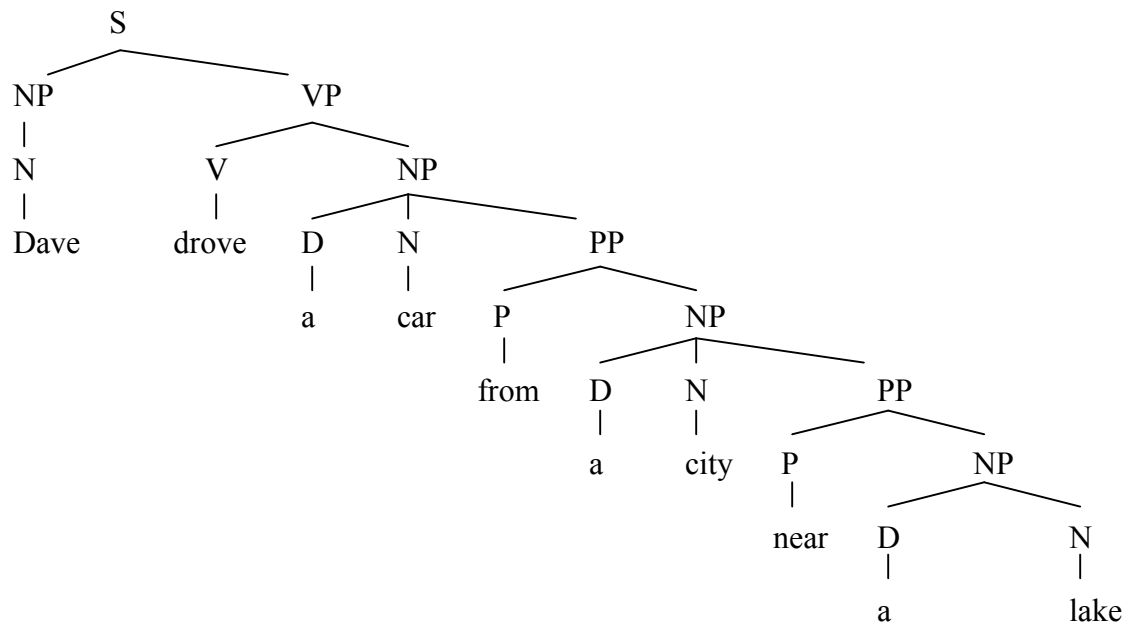
(35) **How the PPs are Attached, Under Interpretation (33)**

In the tree-structure corresponding to interpretation (33):

- The PP '*from a city*' is attached to the NP above '*car*'
- The PP '*near a lake*' is attached to the NP above '*city*'

Finally, given the conclusions in (35), we know how to draw the tree-structure for (28) under the interpretation in (33). That tree-structure is the one given in (36) below:

(36) The Tree-Structure for (28) Under Interpretation (33)



3. Some Practice Problems on Drawing Tree Structure

Please draw tree structures for the following sentences. Answers can be found on pages 13-15.

- (37) Dave likes Tom.
- (38) Cool kids think that nachos rule.
- (39) A nice old man with a limp sold firearms to many deranged clowns.
- (40) The teacher told the students an unbelievable story about angry bears.
- (41) The ridiculous idea that students deserve corporal punishment died out by the early 70s.
- (42) Dave knows whether tigers eat paint.
- (43) That Dave smells like anchovies worries the people around him.

The sentence in (28) can also be given meanings that may be paraphrased as in (44) and (45) below. Please provide the tree-structures for (28) that correspond to these meanings. The answers can be found on page 15.

- (44) Dave drove a car, and his *driving* was from a city, and his *driving* was near a lake.
- (45) Dave drove a car, and his *driving* was from a city, and the *city* was near a lake.

4. Answers to the Practice Problems

