We left last time with this constraint on our grammars.

1. Phrase Structure Grammar

A phrase structure grammar consists of a finite set of rules, each of which have the following form:
   a. Each rule rewrites exactly one non-terminal into a finite string of terminals and non-terminals. This is represented by “→.”
   b. Terminals are category labels and non-terminals are phrases.

To bring our rules into conformity with this new definition, we changed our rules to (2).

(2) S → DP VP
    DP → D NP
    NP → N
    NP → AP NP
    AP → A
    CP → C S
    CP → C PP
    P

I decided here to call the thing that a D+N makes a “determiner phrase” (DP). Another popular choice is to call this phrase a noun phrase (NP).

We also saw an important fact about phrases. They have a semantic property which makes them different from other strings of words. Phrases have a meaning that is the result of composing the meanings of the words they contain. That means that (a) they have a different meaning than merely the sum of the meanings of the words in them, and (b) that meaning comes from the meanings of the words inside. Phrases are compositional and if a string is compositional it is a phrase.

The Law of Compositionality

Let \( \alpha \) be a collection of words \( \{\beta_1, \ldots, \beta_n\} \), and let \( \llbracket x \rrbracket \) represent the meaning of \( x \). If \( \llbracket \alpha \rrbracket \) is derivable from \( \llbracket \beta_1 \rrbracket, \ldots, \llbracket \beta_n \rrbracket \), but \( \llbracket \alpha \rrbracket \neq \llbracket \beta_1 \rrbracket, \ldots, \llbracket \beta_n \rrbracket \), then \( \alpha \)'s meaning is compositional. The meaning of a collection of words is compositional if and only if it is a phrase.

This allows for a more general definition of our enterprise, “syntax.”

4. Syntax is the set of laws that determine which strings of words are compositional.

Sentences are just a particular group of strings that are compositional. They are the ones that can stand alone as single utterances. The Law of Compositionality, then, tells us that syntax is the set of laws that determine which strings of words are phrases. We still have to define “words,” and it will turn out, that there is a little bit more to syntax than this – but this is a very good beginning.

We can see how the law of compositionality, and the phrase structure rules we have, work by considering (5).

5. She ate many crackers on every day.

In this sentence, many crackers provides a compositional meaning, but crackers on doesn’t. The rules we have do, in fact, make a phrase out of many crackers but not of crackers on. This will be one of our guiding criterion for choosing phrase structure rules: do they correctly capture just those strings which are compositional.

We saw that sometimes a single string of words can have more than one way of being parsed, and this sometimes results (because of the law of compositionality) in two meanings. One illustration of this that makes use of a new phrase structure rule that I snuck into the assignment is (6).

6. She kissed the squirrel on the tree.

Because of the rule in (7), it is possible for the PP in this sentence to be in the two places indicated in (8).

7. NP → NP PP
If we set aside the rule that rewrites $S$, and makes conjunctions, we can see a generalization: they all have one of the forms in (9).

One generalization is something that our phrase structures captured before we introduced "phrases." That generalization can be described this way:

(10) Wherever an XP is, an X can be.

What we learned last time is that there are positions where an X can be that an XP cannot be. For instance, a V can be the sister to a DP, but a VP cannot be. Or, as we saw last week, a V can be the sister to an AP, but a VP cannot be.

All the rules are "projections," in the sense defined by (11).

(11) A non-terminal $\alpha$ is a projection of $\beta$ if $\alpha$ introduces $\beta$ and:

a. $\beta$ is $\alpha$'s head, or

b. $\alpha$ doesn't introduce a head but $\beta$ could.

A head is the X in the rule $\text{XP} \rightarrow \text{X}$, where the "X"s in this rule are the same symbol.

The head of a VP is a V, then, because there is only one rule of the form $\text{VP} \rightarrow \text{X}$, and in that rule the "X" is V. And the head of a NP is an N, because there is only one rule of the form "NP $\rightarrow$ X," and "X" is "N" in that rule. Phrases that are projections are said to be "Endocentric."

We might speculate that this pattern in the rules isn't an accident. Indeed, this might be one of those things that is giving us a clue as to how the acquisition of syntax by a child is guided. Suppose, for instance, that as a child is putting together what the phrase structure rules for English are, her guesses are constrained so that she only postulates rules that are Endocentric. This would very seriously limit the kinds of rules she would entertain and, as a consequence, her eventual acquisition of the adult-like phrase structure rules might be enhanced. If the acquisition sequence is constrained in this way, we should see that all of the phrase structure rules of English – and indeed, every other language – are Endocentric. We might consider, then, limiting the class of grammars that syntax is limited to even further. They are not just drawn from the stock of context free rules, which operate over the terminal and non-terminal symbols we've seen. They are just those context free rules which are Endocentric. Here is our hypothesis then:

(12) Phrase Structure Grammars

The syntax of a language is a phrase structure grammar. A phrase structure grammar is a finite set of rules, each of which have the following form:

a. Each rule rewrites exactly one non-terminal into a finite string of terminals and non-terminals. This is represented by "$\rightarrow "$.

b. Terminals are category labels and non-terminals are phrases.

c. Each rule is Endocentric.

But, of course, this leaves us with the problem that the rules: "$S \rightarrow \text{NP VP}$," "$\text{DP} \rightarrow \text{D NP}$" and "$\alpha \rightarrow \alpha \text{ disj } \alpha$" aren't Endocentric. The other rules (for NP, VP, AP, CP and PP) are. We're going to ignore the rule for disjunctions and conjunctions – there is no widely accepted solution to this problem. We'll look at the other two problems though. I'll start by tackling the problem posed by the DP rule.

As they stand presently, our rules for building DPs look like (13).

(13) \begin{align*}
\text{DP} & \rightarrow \text{D NP} & \text{NP} & \rightarrow \text{N} \\
\text{NP} & \rightarrow \text{AP NP} & \text{NP} & \rightarrow \text{NP PP}
\end{align*}

One problem is that "head" isn't defined for a DP. That is, there isn't a rule of the form "DP $\rightarrow$ D". This corresponds to the observation that most (all?) of the cases of DPs we've seen have had nouns (and therefore NPs) in them. That is, why DPs are often thought of as being NPs instead. But there are some examples which sug-
suggest that a DP can be just a bare D. If pronouns are determiners, then they furnish examples:

\[(14)\]

\[
S \quad \begin{array}{c}
DP \\
| \\
D \\
| \\
VP \\
| \\
V \\
| \\
she \\
| \\
runs \\
\end{array}
\]

Clearer examples, perhaps, are cases like (15), where an uncontroversial determiner stands alone.

\[(15)\]

\[
S \quad \begin{array}{c}
DP \\
| \\
D \\
| \\
VP \\
| \\
V \\
| \\
many \\
| \\
left \\
| \\
some \\
| \\
ran \\
\end{array}
\]

So let’s allow for the rule that will give DP a head.

\[(16)\] \[DP \rightarrow D\]

This makes DP Endocentric.

One consequence of Endocentricity is that for an XP, there must be, somewhere inside that XP, its head. Once we’ve made DP Endocentric, this consequence now holds for DPs. We should expect every DP to have a head. This is problematic for three kinds of cases, though, and so we should look at those cases and try to understand what’s happening in them.

One of those examples we aren’t equipped with rules to describe yet. We need to add a rule to allow for examples of DPs like those in (17).

\[(17)\]

a. Mary’s big dog barked.
b. The woman’s big dog barked.
c. The loud woman’s big dog barked.
d. The woman from London’s big dog died.

What we see in these examples is that there is a ‘s at the end of a DP that is followed by an NP. This ‘s, sometimes called a “possessive” ‘s, or “genitive” ‘s, is a special kind of suffix. Unlike suffixes you might be familiar with, like the able that is in readable, this suffix attaches to the ends of phrases. It is a suffix on DPs.

Now we need to allow DPs to contain within them these DPs with the genitive suffix. One possibility is (18).

\[(18)\] \[DP \rightarrow DP’s NP\]

Is this rule Endocentric? What is this DP’s head? Consider how this rule would parse the DP in (17b):

\[(19)\]

\[
DP \quad \begin{array}{c}
DP’s \\
| \\
D \\
| \\
NP \\
| \\
N \\
| \\
A \\
| \\
A \\
| \\
N \\
| \\
woman \\
| \\
big \\
| \\
dog \\
\end{array}
\]

This DP is Endocentric if the is its head. It seems clear that the is the head of the possessive DPs, but many syntacticians feel that it isn’t the head of the entire DP. It’s not trivial to be explicit about what underlies that feeling, but let me give an impressionistic sketch.

There a kind of regularity to the meaning that a determiner brings to its DP. One component of that regularity is that determiners express the quantities, or amount, of stuff that the NP they combine with describes. So, for instance, the determiner every indicates in (20a) that all of the dogs we’re talking about are in the room, and the determiner no in (20b) indicates that none are in the room, and many in (20c) indicates that many are.

\[(20)\]

a. Every dog is in the room.
b. No dog is in the room.
c. Many dogs are in the room.

It’s not just that determiners have this relationship to the noun that follows; they have this relationship to the meaning that everything that follows the determiner in the DP it heads. This can be seen by noting that many in (21) determines the quantity of big dogs, dogs in the park, and dogs that Mary likes – whatever it is that follows every in its DP.

\[(21)\]

a. Many big dogs are in the room.
b. Many dogs in the park are in the room.
c. Many dogs that Mary likes are in the room.
If the determiner in a DP’s is the head of the DP that contains that DP’s, then we should perhaps expect the same kind of relationship between that determiner and everything within the larger DP. But that isn’t what we find. (22a), for instance, does not mean that there are many dogs in the park, and (22b) doesn’t mean that there are no dogs in the park.

(22)  a. Many woman’s dogs are in the park.
     b. No woman’s dog is in the park.

We should conclude that *many* is not the head of *many woman’s dogs*, and that *no* is not the head of *no woman’s dog*.

But if DP is not a projection of DP’s, then (18) is not Endocentric. If Endocentricity is a property we would like to preserve for all phrase structure rules, then we should explore alternative ways of describing these cases. One hypothesis that has gained some traction is to entertain the idea that the genitive *s* is, itself, a determiner. This would allow us to convert (18) into the Endocentric (23), which would give (17b) the parse in (24).

\[ \text{DP} \rightarrow \text{DP D NP} \]
\[ \text{DP} \quad \text{s} \quad \text{NP} \]
\[ \text{D} \quad \text{NP} \quad \text{AP} \quad \text{NP} \]
\[ \text{the} \quad \text{N} \quad \text{A} \quad \text{N} \]
\[ \text{woman big dog} \]

We’ll slightly modify this eventually, but it’s close enough to what seems to be the case for us to adopt for awhile.

The second gap to the prediction that all DPs have a determiner in them are cases involving plural nouns. Here, too, we find that determiners are not necessary, though they are possible.

(25)  a. Giraffes entered the room.
     b. The giraffes entered the room.

One thought about this gap hinges on the observation that there is a relationship between the plural/singular distinction of the noun and the choice of determiner. Some determiners can only be combined with singular nouns while others can only be combined with plural nouns. For instance, *every* requires a singular noun, while *all* requires a plural noun.

(26)  a. Every giraffe likes leaves.
     b. * Every giraffes like leaves.

(27)  a. * All giraffe likes leaves.
     b. All giraffes like leaves.

Some determiners are compatible with either plural or singular nouns; the determiner *the* is one such.

(28)  a. The giraffe likes leaves.
     b. The giraffes like leaves.

In these cases, notice, the meaning that the determiner brings to the αP is roughly the same in the singular and plural cases. That is, *every* and *all* mean roughly the same thing; they both say something about all of the individuals referred to by the noun. And the determiner *the* means the same thing in both the singular and plural examples in (28). With this background, consider now the singular and plural DPs in (29).

(29)  a. Unicorns walked into the room.
     b. A unicorn walked into the room.

The meaning that the determiner *a* contributes to the singular DP in (29b) is something along the lines of “there exists some.” That is, when someone says (29b) they are both declaring the existence of a unicorn and telling you something about that unicorn, namely that it walked into the room. The same is true of (29a), notice. The speaker of (29a) is also declaring the existence of some unicorns, and telling you something about them, again, that they walked into the room. If this “existence” part of the meaning is the kind of thing that a determiner brings to a DP, then there is reason to believe that there is a determiner in (29a) that is not pronounced. In fact, we might imagine that there is a version of *a* which is compatible with plural nouns, but like the *a* found in (29b), means something like “there exists some.” Note that *a* itself cannot be found in DPs with a plural noun; (30) is ungrammatical.

(30)  * A unicorns walked into the room.

So there is a sort of gap in the paradigm of determiners: where is the *a* for plurals?

And note too that we wouldn’t want to say that the meaning of *unicorns* itself has this existence bit to it because that would screw up the meaning of DPs like (31), where there is quite clearly no existence claim being made.
(31) No unicorns walked into the room.
So, if we imagine that the plural version of a is, well, silent then we have an account
for some of these facts.
I’ll adopt this speculation from now on, and represent the silent plural version
of a as ∅. So we’ll have parses like (32), for instance.

But then, names are unusual DPs in that they cannot combine with any of the
other things that typically can be found in DPs, as (34) illustrates.

(34) a. * Mary in the room left.
    b. * Happy Sam left.

Once we discover what is responsible for this property of names, then we might be
able to make sense of the absence of determiners in these cases too. The internal
structure of DPs that contain names is going to remain mysterious for us through-
out this course. The truth about these terms requires more time than we’ll have.
So, from now on, let’s adopt the convention of obscuring their internal structure
of DPs with names by use of the “triangles” shown in (35).

(35) a. DP b. DP
    Peter London

If these speculations are on the right track, then we can say that every DP has
a determiner in it, even those, like (25a) which seem not to. We’ll still have to un-
derstand the strange property of names and pronouns to resist having anything
else in the DP they stand in, but we’ll have to save this task for the future.

The last problematic example for the predication that every DP has a deter-
miner in it is proper nouns, or names. They do not have determiners in them, as
we can see from (33).

(33) a. * The Mary left.
    b. * Many Jill left.