6

Syntax

Words in a sentence are more than just a string of items—there are patterns and regularities that can be discovered. Syntax studies the organization of words into phrases, and phrases into sentences.

FILE

6.1

Linear Order, Hierarchical Structure, and Ambiguity

While a dictionary of all the words in any human language (at a given time) can be made, it is impossible to compile a dictionary of all the sentences of a language; unlike words, sentences are not finite in number, and therefore sentences, unlike words, are not learned individually. As a simple example, it is possible to repeat the word *very* in sentences like (1):

(1) a. The house is very large.
b. The house is very, very large.
c. The house is very, very, very large.
etc.

Although adding more *very*s would be somewhat pointless, it is clear that no matter how many *very*s you have, you can always add another and the result will still be a sentence of English. As another example, notice that adding *John believes that* to the beginning of a sentence always creates a new English sentences:

(2) a. The house is large.
b. John believes that the house is large.
c. John believes that John believes that the house is large
etc.

These sentences are again not very useful, but they are certainly part of the English language. Further examples of such infinite possibilities can be found in File 6.5.

Despite this infinity of possibilities, native speakers of a language seem to get along amazingly well without such a dictionary for sentences—they can use and understand sentences in their language that they have not previously encountered. Why is it that we cannot always properly use or understand a word in our language that we have not heard before but can spontaneously produce and understand new sentences? If what we learn is not the sentences themselves, what *do* we learn that enables us to produce and understand an infinite number of sentences? This is the question we will be concerned with as we consider syntax, the study of the structure of phrases and sentences.

Though we use sentences all the time, we don't normally think about how they are structured. However, a little consideration reveals that the principles by which words are

organized into sentences are, in fact, quite complex. In this file, we will consider two basic principles of sentence organization: **linear order** and **hierarchical structure**.

Linear Order

The most obvious principle of sentence organization is linear order; the words in a sentence must occur in a particular sequence if the sentence is to convey the desired meaning. Consider, for example, the following sentence of English.

(3) John glanced at Mary.

If we rearrange the words in this sentence, we come up either with nonsense, as in (4) (the * marks an ungrammatical expression):

(4) *Mary John at glanced.

or with a sentence whose meaning is distinctly different from that of (3):

(5) Mary glanced at John.

Clearly, the ordering of the words in sentences determines, in part, whether a sentence is grammatical or not and what the sentence means.

One of the many rules of English requires that the grammatical subject of a sentence normally precedes the main verb, which in turn normally precedes its direct object; thus, *she resembles him* is English (where *she* is the subject and *him* is the object), but **resembles she him* and **she him resembles* are not. However, an important fact about rules of word order is that they are language-specific—that is, languages vary in the ways in which they order words (see File 6.7).

Constituency

Although linear order is an important principle of sentence organization, sentences are more than just ordered sequences of words; they have internal hierarchical structure as well. That is, the individual words in a sentence are organized into natural, semantically coherent groupings, which are themselves organized into larger groupings, the largest grouping of all being the sentence itself (and the smallest of all being individual words). These groupings within a sentence are called **constituents** of that sentence. The relationships between constituents in a sentence form the **constituent structure** of the sentence.

For example, consider the sentence in (6).

(6) Many executives eat at really fancy restaurants.

We can easily distinguish a number of meaningful groups of words in this sentence: *many executives* and *eat at really fancy restaurants,* for instance, clearly have meanings of their own, and each makes a coherent contribution to the meaning of (6) as a whole. For these reasons, they are constituents of this sentence. On the other hand, some groups of words in sentence (6) do not naturally form meaningful units; *executives eat at* and *eat at really,* for example, don't clearly have meanings of their own. Thus, these groups of words are *not* constituents of (6).

Constituent Tests

If a constituent is a semantically coherent group, then sentences are always constituents, as are the individual words within a sentence. In sentence (6), for instance, the largest constituent is the sentence itself; the smallest constituents are the individual words *many, executives, eat, at, really, fancy,* and *restaurants*. Other constituents within a sentence are not always so easy to identify. However, there are a number of useful tests for distinguishing constituents, which are syntactic units, from mere strings of words, which aren't constituents and therefore do not behave as a single unit.

Question-Answer

A constituent can often be replaced by a question expression such as *who, what, where, how, why,* or *do/did what*. The replaced constituent can then stand alone as an answer to the question.

(7) Q: Many executives eat where?
A: At really fancy restaurants.

(8) Q: Many executives do what?
A: Eat at really fancy restaurants.

This isn't true of nonconstituents: there is no question you could form from (6) to which the reply would be **(Well), executives eat at.*

Note that when replacing the subject of a sentence by a question expression, it is sometimes necessary to change the verb form, as in *Who eats at really fancy restaurants?* Here we have had to change the word *eat* in (6) to eats. This is only because the question word *who* always requires singular agreement and does not bear on the constituency of *many executives*.

Substitution by a Pro-form

It is often possible to replace a constituent with a single word having the same meaning as that constituent. For example, if we're already talking about many executives, we can use sentence (9), in which the constituent *many executives* is replaced with the single word *they* (which in this context would mean the same thing as *many executives*). Note that it is a certain category of word which is used for the substitution test, namely, a **pro-word** (or **pro-form**). Pronouns are one type of pro-form (e.g., *he, she, it, they, us, her,* and *that*). There are pro-verbs such as *do, be,* and *have,* pro-adverbs such as *there* and *then,* as well as a pro-adjective, *such*. You may use these pro-forms when attempting to determine constituency.

(9) They eat at really fancy restaurants.

Similarly, if someone asked "Who eats at really fancy restaurants?" we could answer either with (6) or with (10), in which the constituent *eat at really fancy restaurants* is replaced with the single word *do* (which would mean the same thing in this context).

(10) Many executives *do*.

But there is no word that could possibly replace the nonconstituent *eat at really* in (6) and mean the same thing, no matter what question was asked.

Movement to the Beginning

If some part of a sentence can be moved to the beginning of the sentence, it is a constituent. For example, one could say:

(11) At really fancy restaurants, many executives eat.

It may sound a bit stilted, but it sounds grammatical to many English speakers in the right context. Thus, *at really fancy restaurants* must be a constituent because it can be moved to the front of the sentence. Compare this with:

(12) *fancy restaurants many executives eat at really.

This is not grammatical; according to the movement test, *fancy restaurants* is not a constituent in this sentence, since it cannot be moved.

Of course, the words *many executives* in (6) cannot be moved to the beginning, since they are already there. In such cases, the sequence neither passes nor fails the movement test in this sentence; the test simply does not apply.

One thing to keep in mind when you apply these tests is that they are not an absolute indicator of constituency. A group of words in a sentence may pass two tests and fail one and still be a constituent. For example, in the above sentence, the phrase *eat at fancy restaurants* is taken to be a constituent because it passed the Question-Answer test. But, most English speakers do not think that one can say **Eat at fancy restaurants many executives.* Thus, this constituent fails the Movement test. However, it does pass the Substitution by Pro-form test: *Many executives do.* Second, some tests are better indicators of constituency than others—if a group of words passes Substitution by Pro-form and Ability to Stand Alone, you probably will want to consider it a constituent, even if it fails the Movement test. The key here is not to apply the tests blindly but to consider how convincing each test is and to develop some intuitions about English constituents.

Other Issues Concerning Constituents

Two points must be kept in mind regarding constituents. First, given a group of words, we cannot say once and for all whether or not it is a constituent; rather, we can only say whether or not it is a constituent relative to a particular sentence. To illustrate this, consider sentences (13) and (14).

(13) Pat and Leslie raised llamas.
(14) Robin raised Pat and Leslie adopted Chris.

In (13), *Pat and Leslie* is a constituent: it functions as a coherent, meaningful unit within the sentence, in particular, as its subject. In (14), however, the very same sequence of words is *not* a constituent: because *Pat* is the direct object of the first clause and *Leslie* is the subject of the second clause, the sequence *Pat and Leslie* does not make a coherent contribution to the meaning of this sentence. We can apply the constituent tests to verify this claim. For example, although *Pat and Leslie* can be replaced with *they* in (13), this isn't possible in sentence (14). Thus, we can properly say that a string of words is a constituent only with respect to a particular sentence.

The second thing that must be kept in mind is that constituent structure is **hierarchical**—that is, one constituent may be part of another. What this means, in turn, is that sentences are composed of parts that have been grouped together before they are grouped into the sentence. Consider sentence (6) again.

(6) Many executives eat at really fancy restaurants.

Among the constituents in this sentence is the sequence *really fancy*. To see this, note that *really fancy* can be used by itself:

(15) How fancy was it?
Really fancy.

and that it can be replaced with the single word *such:*

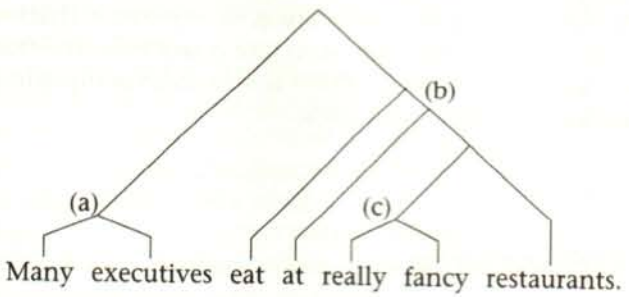
(16) Who eats at really fancy restaurants?
Many executives eat at such restaurants.

But *really fancy* is also part of a larger constituent, namely, *really fancy restaurants;* this in turn is part of a larger constituent, *at really fancy restaurants,* which is itself part of the still larger constituent *eat at really fancy restaurants* and ultimately of the largest constituent in the sentence, namely, the sentence itself. If we underline each of the constituents in (6), the hierarchical nature of its constituent structure is easier to see:

(17) Many executives eat at really fancy restaurants.

Underlining is, as in (17), one way of representing the hierarchical nature of constituent structure. Another way is with tree diagrams: branching structures in which each constituent forms a "branch." For example, the **tree diagram** for sentence (6) is in (18):

(18)



In this diagram, each of the constituents of sentence (6) forms a branch: for example, *many executives* corresponds to the branch labeled (a); *at really fancy restaurants,* to the branch labeled (b); and *really fancy,* to the branch labeled (c). Observe, in addition, that groups of words that are not constituents of sentence (6) do *not* form branches in this tree diagram; *executives eat at* and *eat at really,* for instance, clearly aren't constituents according to the diagram in (18). In principle, underlining is just as good as tree diagrams for representing constituent structure, but because tree diagrams are somewhat easier to read, they are usually preferred.

Ambiguity

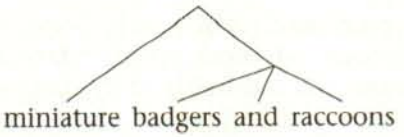
In every human language we can find individual expressions that have two or more distinct meanings. For example, the italicized portions of the following sentences of English can be interpreted in more than one way:

(19) a. Larry raises *miniature badgers and raccoons*.
b. We need *more intelligent leaders*.
c. The *cranes* were transported by boat to Minneapolis.

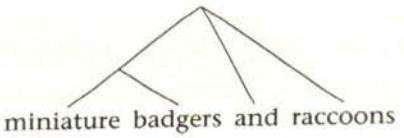
In (19a), *miniature badgers and raccoons* can mean either 'miniature badgers and miniature raccoons' or 'miniature badgers and raccoons (of any size)'; in (19b), *more intelligent leaders* can mean either 'a greater quantity of intelligent leaders' or 'leaders who are more intelligent'. This property of having two or more distinct meanings is called **ambiguity**; an expression with two or more distinct meanings is ambiguous.

Often, an expression is ambiguous because it has more than one possible constituent structure. Consider, for example, the expression *miniature badgers and raccoons* in sentence (19a): it can have either of the following constituent structures.

(20)



(21)



In (20), *badgers and raccoons* forms a constituent; (20) therefore represents the interpretation in which the adjective *miniature* applies to both the badgers and the raccoons. In (21), on the other hand, *miniature badgers* forms a constituent; (21) therefore represents the interpretation in which only the badgers are miniature. An expression that is ambiguous because it has more than one possible constituent structure is said to be **structurally ambiguous**.

The italicized portion of sentence (19b) is also structurally ambiguous: it can have either of the following constituent structures.

(22)

(23)

In (22), *intelligent leaders* is a constituent; for this reason, (22) represents the interpretation 'a greater quantity of intelligent leaders'. In (23), however, *more intelligent* forms a constituent; (23) therefore represents the meaning 'leaders who are more intelligent'.

Although structural ambiguity is a very common kind of ambiguity, it is not the only kind. Individual *words* are sometimes ambiguous; for example, *crane* can refer either to a kind of bird or to a large construction device. Because words like *crane* have no internal constituent structure, sentences containing such words clearly can't be structurally ambiguous. Instead, a sentence containing a word with more than one meaning is said to be **lexically ambiguous**. Thus, both meanings for (19c) are represented with the same constituent structure.

Exercises

0. Apply the constituent tests to determine if the underlined expressions in the following sentence are constituents.
(Answers to all zero exercises can be found in Appendix A.)

   a. Many retired workers spend their time on relaxing hobbies.
   b. Many retired workers spend their time on relaxing hobbies.
   c. Many retired workers spend their time on relaxing hobbies.

1. Which of the underlined expressions in the following sentences are constituents? Which are not? Why? (Use the constituency tests mentioned above to determine which are constituents in each case.)

   a. Chris ate the stale candy.
   b. Chris ate the stale candy.
   c. My little brother snores.
   d. My little brother snores.

2. Apply each of the constituency tests to the underlined expressions and determine whether they are constituents. Remember that a constituent does not necessarily have to pass all the constituency tests.

   a. The clouds rolled across the sky.
   b. My aunt crashed our new car.
   c. Mattingly hit the ball over the fence.
   d. Some students hate computers.
   e. The ancient ruins of the temple were covered by earth.
   f. The women wept.
   g. Too many noisy birds are nesting on campus.
   h. Joggers like to run along the river.
   i. The bride and groom ran out of the church.
   j. The thieves opened the door with a credit card.
   k. The tired teachers had a party.
   l. She paid the woman with a twenty dollar bill.
   m. A rabid dog on the street scared everyone inside.
   n. We drank too much coffee last night.
   o. The children ate their dinner quickly.
   p. Michael suspects his wife had an affair.

3. Find all of the constituents in the following sentence and list them.

   The science books on the table fell suddenly to the floor.

4. Discuss the ambiguity of the following sentences. Which are lexically ambiguous? Which are structurally ambiguous?

   a. John sat on Jumbo's trunk.
   b. The little girl hit the child with the toy.
   c. Chocolate cakes and pies are my favorite desserts.
   d. We used to meet near the bank every afternoon.

FILE

6.2

Lexical Categories

One aspect of our syntactic competence is our understanding of the similarities and differences in the behavior of the words in our language. Though all human languages have numerous words, each word in a given language is not entirely different in its behavior from all the other words in that language. Instead, a large number of words often exhibit the same properties, which suggests that a language's enormous inventory of words can be grouped into a relatively small number of word classes based on their morphological and syntactic properties. We will call these word classes **lexical categories**, because the lexicon is the list of all the words in a language (plus various kinds of information about those words). For example, one of the morphological properties of the word *book* is that it has a plural form, *books*. But this is by no means a unique property of the word *book*. Thousands of other words in English have a plural form—e.g., *box, song, child, rock*. All these words can occur in the following context:

(1) _____ + plural morpheme

That is, *book* and words like it appear in the **morphological frame** given in (1). A morphological frame is the position of a word with respect to the bound morphemes that can attach to it within a word. Thus the word *book* combines with plural /-z/ to form the word *books*. (In English /-z/ is the usual plural morpheme, though there are irregular plural forms such as *children* and *oxen*, which do not contain /-z/.)

Now, is the fact that *book* and certain other words have plural forms a significant one, or is it merely an accidental feature of all these English words? After all, thousands of words could share some feature without there being any interesting reason to group them together. For instance, a large number of English words have the sound [k] in them—*take, chemistry, tacky*, and so on—but this fact does not contribute to our understanding of the syntax of English (nor would similar facts in any language be relevant to the syntax of that language). Is the singular-plural distinction that numerous English words share such an accidental, unrevealing property, or is it a significant criterion for grouping all such words together? It turns out that it is a significant property, since all the words that show this property also behave similarly in other respects, thus indicating that they do act as a group, all having something in common. For instance, the words that occur in the morphological frame in (1) can also occur in the syntactic frames in (2) and (3). A **syntactic frame** is a position in which a word occurs relative to other classes of words in the same phrase. In other

words, it is the syntactic context of a word. Example (2) shows that this group of words can combine with determiners (abbreviated DET: words such as *a, the, some, many, several, few*), and (3) shows that this group of words can occur after DET and adjective (ADJ) combinations; adjectives are words such as *small, unexpected, bright, friendly.*

(2) DET _____

(3) DET ADJ _____

We group all the words that share this cluster of properties into the lexical category of **nouns**. A lexical category is a class of words that all share morphological and syntactic properties—that is, words that may appear in the same morphological and syntactic frames. In this case, *noun* is a lexical category whose members all share the morphological property of having a plural form—they occur in the morphological frame in (1)—and the syntactic properties of combining with determiners (frame 2) or with both determiners and adjectives (frame 3). (We shall soon discuss determiners and adjectives, which are also lexical categories in English.)

Each lexical category has a unique set of morphological frames and syntactic frames, and so the morphological and syntactic frames of a given word can be used as diagnostic tests for deciding which lexical category that word belongs to. That is, the morphological and syntactic frames of a word act as clues to the lexical category of that word. Given below are the patterns of some more lexical categories in English. Even though there are some universal tendencies across languages in the area of lexical categories, and the strategies we lay out here are valid tools in the investigation of other languages, it is important to note that what follows is a description of English lexical categories, and the details are not the same in other languages.

Verbs

Members of the lexical category of **verbs** (V) have the morphological property of having tense distinctions such as *present* and *past* (e.g., *sing – sang; walk – walked; drive – drove; is – was*); this is shown in the morphological frame in (4):

(4) _____ + tense morpheme

(In English /-d/ is in general the past tense marker, even though a large number of English verbs have a past tense form other than /-d/; for example, *sang* and *drove*.)

Another morphological property of English verbs is that they sometimes show a contrast in number and person. Compare *he walks* with *I walk, they walk,* and so on. Thus the suffix /-z/, which denotes third person singular agreement, can be used as a morphological frame for verbs in English. This is given in (5):

(5) _____ + third person singular morpheme

Verbs may also be suffixed with *-ing,* which is attached when the verb is used in the progressive (e.g., *I am walking*). This morphological frame for verbs is shown in (6):

(6) _____ + progressive morpheme

One of the syntactic properties of verbs is that they combine with auxiliary verbs (abbreviated AUX), such as *may, might,* and *will,* to form, for example, *may go, might be, will*

drive. (See section on closed categories for more on AUX.) This syntactic frame is given in (7):

(7) AUX _____

Another syntactic frame for verbs is given in (8), which shows that verbs can occur in the beginning (or optionally after *please*) in orders or requests (e.g., *Please leave!, Shut up!, Listen to me!, Please take a seat*).

(8) (please) _____ . . . !

Adjectives

Adjectives (ADJ) have the property of having comparative and superlative forms (e.g., *tall, taller, tallest; affectionate, more affectionate, most affectionate*). Note that with some adjectives (such as *tall*) this property is reflected as a morphological frame as given in (9); with some others (such as *affectionate*) it is reflected as a syntactic frame, given in (10):

(9) _____ + er/est

(10) more/most _____

Adjectives can also occur in the syntactic frame in (11), which shows that they can occur before a noun (N), which they **modify** (i.e., describe or give more information about), and after a determiner—e.g., *a true story, the unexpected guests*.

(11) DET _____ N

Another syntactic frame for adjectives is given in (12), which shows that if a word can occur after a **linking verb**, such as *is, seems,* or *looks:* e.g., *is sunny, seems angry, looks ready,* then it is an adjective.

(12) LINKING VERB _____

Adjectives can also be modified by adverbs (ADV), such as *very* in *very rude, highly* in *highly qualified,* or *amazingly* in *amazingly perceptive*. Example (13) is this syntactic frame:

(13) ADV _____

Adverbs

It is hard to come up with hard-and-fast tests for identifying adverbs (ADV), since their morphological and syntactic frames (if any) do not always rule out other possibilities. One somewhat useful characteristic is that a large number of adverbs are formed by adding *-ly* to adjectives. So, if a word ends in *-ly,* and if the part without the *-ly* is an adjective, then the word is an adverb—for example, *happily, unexpectedly, skillfully, eagerly.* We can represent this as in (14), but notice that this is not the same kind of "fill-in-the-blank" notation that we've used for other frames. Instead, it's a description of the internal structure of many adverbs.

(14) $[\text{ADJ} + \text{ly}]_{\text{adv}}$

While (14) tells us that all adjective + *-ly* combinations are adverbs, it does not cover *all* adverbs, since there are other adverbs that are not formed from adjectives, including *well, westward, agewise,* and so on. Note also that not all words ending in *-ly* are adverbs; for example, *likely, lovely,* and *friendly* are all adjectives (of course, *like, love,* and *friend* are not adjectives).

Adverbs usually modify adjectives, verbs, and other adverbs; thus you find them in phrases like *unusually nice, quite big, quietly entered the room,* and *moved carefully.* The syntactic frame that illustrates this is given in (15):

(15) _____ ADJ
_____ VERB or VERB PHRASE
_____ ADV

Adverbs may also be difficult to identify using a syntactic frame because they often have the option of occurring in several positions in a sentence, as can be seen in (16):

(16) a. Anxiously, the bride went to her wedding.
b. The bride anxiously went to her wedding.
c. The bride went anxiously to her wedding.
d. The bride went to her wedding anxiously.

Like adjectives, many adverbs can fit in frame (10) as well, for example, *more unexpectedly, more skillfully,* etc., but by no means do all, e.g., **more very.*

Closed Lexical Categories

Closed classes are sometimes known as **function words**. The members of closed classes, unlike the lexical categories discussed above, have little meaning outside of their grammatical purpose and are used to relate phrases of various types to other phrases. These classes are called "closed" because the addition of a new member to a closed category rarely occurs. This contrasts with **open classes**, such as N, V, ADJ, and ADV, to which new members can be added easily. Consider the fairly recent additions to nouns—*geek, fax, yuppie,* and so on. The closed classes include determiners, auxiliary verbs, prepositions, and conjunctions.

(Note that in the discussion that follows, reference is made to **phrases**, for example, verb phrases and noun phrases (abbreviated VP and NP, respectively). These are technical terms and will be explained further in File 6.3.)

Determiners (DET) often signal that a noun or adjective + noun is following, as in *the book, many blue pencils.* This class includes words like *a, the, many, several, few, some, all,* and *which.* It also includes possessive words and phrases, for example, *my, her, your,* and *our.* The syntactic frame for determiners is given in (17). (The parentheses around ADJ indicate that the adjective is optional—it may or may not be there.)

(17) _____ (ADJ) N

Auxiliary verbs (AUX) often indicate tense and aspect. Examples of auxiliaries are *may, might, can, should, will,* and *must,* and forms of *do, have,* and *be* that are used with another verb. They often precede verb phrases (VPs), and in questions they precede noun phrases (NPs); for example, auxiliary verbs occur in the sentences *I might go, I have gone, Did I go?* and *I am going.* AUXs may also be followed by *not,* as in *will not* and *should not.* Note that non-auxiliary verbs do not follow this pattern, **went not, *ate not,* and that *not* doesn't

precede the AUX, **not will, *not did.* The syntactic frames in (18), (19), and (20) illustrate these facts:

(18) NP _____ VP

(19) _____ NP VP ?

(20) _____ not

Prepositions (P) combine with noun phrases (NPs) to form prepositional phrases (PPs), which modify nouns or verbs as in *the man with the beard* or *ran to the store.* One syntactic frame for prepositions is given in (21):

(21) _____ NP

Another syntactic frame for prepositions shows that they may sometimes be preceded by *right,* as in *right into the store, right on campus, right over the bleachers,* etc.

(22) right _____ NP

Conjunctions (CONJ) join words and phrases of the same category. Examples of conjunctions are *and, but, or;* some sample syntactic frames are given in (23):

(23) N _____ N
ADJ _____ ADJ
NP _____ NP
ADJP _____ ADJP
S _____ S (where S = sentence)

Pronouns (PRO) include *he, she, we, they, I,* and *you,* which are used as subjects; *him, her, us, them,* and *me,* which are used as objects; and *it* and *you,* used for both subjects and objects. Note that the so-called possessive pronouns are not pronouns (e.g., *her, my, his, our,* and *their*). They are determiners, since they fit in frame (17), the syntactic frame for DET.

Some Suggestions

1. It is important to keep in mind several factors when determining the lexical category of a word. As you might have noticed, the classification of words into lexical categories is somewhat similar to the traditional notion introduced in primary school as "parts of speech." You are encouraged to compare the two notions if you understand this earlier introduction to parts of speech well, but it has to be stressed that there are important differences. While parts-of-speech classification relies heavily on meaning-based definitions (e.g., "a noun is a person, place, or thing"), classification into lexical categories relies solely on the morphological and syntactic properties of a word; for the purposes of understanding and working with the concepts in the syntax files in this book, you are better off following the criteria given in the above section in identifying the lexical category of words.

2. Sometimes the same word belongs to more than one category, with roughly the same meaning, because of the word-formation process of functional shift (see File 12.7). For

example, words like *walk* and *promise* can be used as nouns or as verbs—e.g., *I took a long walk* vs. *I walked*. It is generally accepted that such words have two separate entries in the lexicon, and, of course, any given instance of such a word in a sentence is a member of only one category.

3. Words with completely different meanings and/or category membership sometimes sound identical; these are **homophones** ("sound-alike" words). For example, there is a verb *rock*, as in *I rocked the baby till it fell asleep*, and a noun *rock*, as in *She threw a rock into the pond*. These two words are not related by any word-formation processes, nor do they have similar meanings; that the words are pronounced alike is simply coincidental.

4. Use *all* the tests for a given lexical category before you decide that a word belongs to that category. For example, if you use the syntactic frame given in (11) alone, you might decide that *army* is an adjective since you sometimes seem to find the word in that syntactic frame (*the army uniform, an army officer*), but the word does not meet the other criteria for being an adjective: for example, there is no **armier, *armiest* or **more army, *most army,* or **very army.* (In the examples *army uniform* and *army officer, army* is the first member of a compound noun, not an adjective.)

5. In some cases, the information about the subcategories within a lexical category (File 6.4) will be useful in addition to the criteria already discussed in this section.

Exercises

1. Identify the lexical category of the underlined word in each of the following sentences.

   a. I collect antique glassware.
   b. There was a large piano wedged in the doorway.
   c. You must be there on time.
   d. Susan bought a new car last week.
   e. The squirrel scrambled up the tree.
   f. Chris plays volleyball and swims.
   g. The river is very full now.
   h. Every good boy deserves favor.
   i. Give me something unusual.
   j. Would you hand me that wrench?

2. In each of the following pairs of sentences, the underlined word in the (i) sentence belongs to a different lexical category than the underlined word in the (ii) sentence. Identify the lexical category of the underlined word in each of the sentences.

   a. i. It was a cold and dreary day.
      ii. I can't seem to get rid of my cold.
   b. i. You must dry cilantro leaves before storing.
      ii. The dry heat of the desert proved to be deadly.
   c. i. There has been some improvement in the past week.
      ii. In the past, there has not been much improvement.
   d. i. That's a promise.
      ii. I promise to take you to the zoo tomorrow.

3. Examine the following sentences and answer the questions that follow.

   i. Leslie is working, and so is Nancy.
   ii. Philip went bankrupt, and so did Max.
   iii. Lucy had seen the dog, and so had her mother and her neighbors.
   iv. Robin will avoid the construction, and so will Pat.

   a. Think up several more sentences that have the *and so* construction.

   b. Now consider the syntactic frame:

      and so _____ NP

      What kind of lexical category fills this pattern?

4. Explain how the differences in the category and meaning of the homophonous words *fly* and *fly,* and *like* and *like,* are exploited in the following saying:

   Time flies like an arrow;
   Fruit flies like a banana.

   Do the same for the following sentence by identifying the lexical category of each occurrence of *can:*

   Can he can me for kicking the can?

FILE

6.3

Phrasal Categories

Phrasal Categories

So far we have discussed only lexical categories, that is, classes to which individual words belong. However, there is another kind of syntactic category, namely, the **phrasal category**. Recall that we determine a word's category by finding characteristics it shares with other words. That is, we find words that behave the same, or have the same distribution, as other words, and these sets of words we group into a category and give it a name, such as *noun* or *verb*. Then recall that words can combine with other words to form semantically coherent groupings, or constituents. A phrasal category is a set of constituents that behave the same, or share the same functions and distribution.

For instance, consider the following sentence:

(1) The joggers ran through the park.

One constituent of this sentence consists of the words *the joggers,* as can be demonstrated by applying the constituent tests discussed in File 6.1. Upon examining the lexical categories involved, we see that this constituent is formed by the combination of a determiner and a noun. Now consider each of the words or groups of words below. Note that each of them could be substituted for the phrase *the joggers* in sentence (1), and a grammatical sentence would result:

(2) a. Susan
b. students
c. you
d. most dogs
e. some children
f. a huge, lovable bear
g. my friend from Brazil
h. the people that we interviewed

Each of the examples in (2) could likewise be shown to be a constituent in this sentence if it occurred in place of *the joggers*. Note, however, that some have different structures than the DET + N constituent in *the joggers*. Examples (a) and (b) are single Ns, (f) is

composed of DET + ADJ+ ADJ + N, (g) is composed of DET + N + PREP + N, and (h) is different from all of these. Note that other sets of words that are constituents cannot be substituted for *the joggers,* for example, *in the tree* or *made a cake.* What we have discovered is that constituents with different structures can have the same functions because they can be used in the same position in a sentence. This means that they belong to the same *category,* and since some constituents may involve combinations of more than one word, these categories are called *phrasal* categories. In the category discussed above, a noun alone or a noun plus other words forms a **noun phrase** (NP). Sometimes, a single word can count as an NP all by itself, but not always. For example, the word *dog* cannot be substituted for the NP slot in (3):

(3) _____ ran through the park.

Thus, in the sentence *The dog ran through the park, dog* is an N, but not an NP (whereas *dogs,* and other nouns in the plural, would count as both if placed alone in the slot). So we observe from (2) and (3) that proper nouns, pronouns, and plural nouns can be used individually as NPs, but some types of singular Ns cannot be.

An NP can be used as the subject of a sentence, as in (4); as the direct object, as in (5); as the indirect object, as in (6); and in many other ways as well. These are descriptions of the *functions* that NPs can perform.

(4) *Some children* like ice cream.

(5) Harold likes *some children.*

(6) The teacher gave *some children* a scolding this morning.

Now consider the sentence in (7):

(7) The mothers visited their children.

Constituency tests demonstrate that *visited their children* is a constituent. It is composed of V + NP. Note that this particular structure does not share the same properties as the structures grouped into the category of NP because we could not insert *visited their children* in the slot in (3). Other structures could be substituted for *visited their children.* For example:

(8) a. snored
b. love music
c. walked the dog through the park
d. believe that dogs are smart
e. wanted to leave
f. will sleep soundly
g. can lift 100 pounds
h. are wearing sunglasses
i. go home and have a beauty rest

All of these structures behave the same and thus can be grouped into another phrasal category, namely, that of **verb phrase** (VP). Note that VPs can consist of a single V or a V plus other words; for example, (f) is V + ADV and (c) is V + NP + PP.

A VP can be used as the predicate of a sentence—i.e., it combines with a subject NP to form a whole S, as shown in (9):

(9) a. Pat *loves music.*
b. Henry *wanted to leave.*

Another phrasal category is that of **adjective phrases** (ADJPs), such as those in (10):

(10) a. smart
b. very expensive
c. as tall as his father
d. smarter than the average bear
e. certain to win

Note that each of the words or phrases in (10) could be inserted into the syntactic frame in (11):

(11) John is _____

ADJPs are often used to modify nouns and thus often appear as elements of noun phrases; for instance, *a very expensive watch; anyone as tall as his father.*

Adverbial phrases (ADVPs), such as those in (12), are often used to modify verbs and adjectives and adverbs, and thus appear as constituents of VPs and ADJPs, as in (13).

(12) a. soundly
b. fiercely
c. as fluently as a native
d. almost certainly

(13) a. speak Russian as fluently as a native (VP)
b. fiercely loyal (ADJP)
c. sleep soundly (VP)

Another phrasal syntactic category is that of **prepositional phrases** (PPs). PPs always consist of a preposition plus an NP:

(14) a. from Uganda
b. with Howard and his dog
c. for nothing
d. to the head honcho

A PP can be a constituent of a wide range of phrases:

(15) a. go to the movies (VP)
b. my friend from Uganda (NP)
c. angry with Howard and his dog (ADJP)
d. separately from the others (ADVP)

Sentences (Ss) also form a phrasal syntactic category. Sentences are, of course, often used by themselves:

(16) a. It is raining.
b. Robin likes apples.

But a sentence may also appear as a element of another expression; for example, each of the following expressions contains a sentence.

(17) a. the fact that *it is raining* (NP)
b. a student *who met Leslie last Thursday* (NP)
c. discover that *it is raining* (VP)
d. glad that *it is raining* (ADJP)

Note that any expression resulting from the combination of two or more smaller expressions by a conjunction belongs to the same category that the smaller ones do. Thus, both *Howard* and *his dog* are each separate NPs, and in (14b) and (15c) *Howard and his dog* is also an NP. Likewise, *faster than a speeding bullet and more powerful than a locomotive* is a larger ADJP containing two conjoined ADJPs; and similarly the sentence *It is raining, but it may sleet* contains two conjoined Ss.

Tree Diagrams

Tree diagrams are one way of graphically representing the structure of a sentence. In File 6.1 we saw that tree diagrams could represent which words grouped together to form constituents, and which, in turn, formed larger constituents. Now we see that each constituent in a sentence belongs either to some lexical or to some phrasal category. This can also be represented in the tree diagram by labeling each of the **nodes**, or points that indicate a constituent, with the name of the syntactic category to which the lexical or phrasal constituent belongs. For example, consider the sentence in (18):

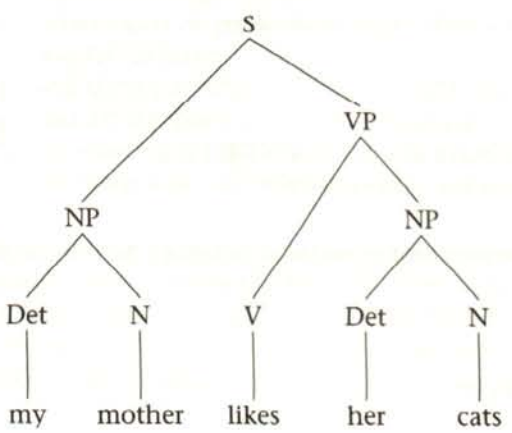
(18) My mother likes her cats.

We can determine (with constituent tests) that the phrasal constituents of this sentence are the following:

(a) my mother (NP)
(b) likes her cats (VP)
(c) her cats (NP)
(d) my mother likes her cats (S)

We know that each word is a constituent as well, and we can determine each lexical category. A tree diagram representing the structure of this sentence looks like:

(19)



Note that the tree diagram represents many aspects of the structure of a sentence. First of all, the linear order is represented because the words appear in some specific order (in the above case, they are in the proper order). Second, the categories to which words and phrases belong are indicated; for example, the noun *mother* is labeled as being an N, and the phrase *my mother* is labeled as an NP. Furthermore, the hierarchical structure is represented by the lines, which indicate which words group to form constituents, and, in turn, which constituents join to form larger constituents. For example, the line from the DET above *her* and the line from the N above *cats* join at a node to indicate that the DET + N form a constituent. This constituent joins with the V above *likes* to form another constituent, as indicated by the lines above NP and V, which join at a node labeled VP.

Exercises

0. Draw a tree for the following sentence.
(Answers to all zero exercises can be found in Appendix A.)

Many retired workers spend their time on relaxing hobbies.

1. Identify the phrasal category of the underlined constituent in the following sentences:

a. We were in Holland at that time.
b. Our loud neighbors will be away this weekend.
c. The guests ate too much at the reception.
d. Me and my friends play basketball every Saturday.
e. Over the holidays I will be traveling to France.
f. She painted a portrait of her niece from Boston.
g. The experienced chefs complained about the excessively sweet sauce on the duck.
h. The newborn babies cried.
i. The building across the street is Oxley Hall.
j. Stars can be seen best during the winter.
k. Which of these contradictory suggestions should the conscientious health nut follow?
l. The twins and their mother got sick from eating the egg salad.
m. Tom's sister is a lawyer.
n. Alex tried all his tricks but nothing worked.
o. The cat on the couch thinks you are crazy.
p. You have an extremely efficient secretary.
q. The fact that you can whistle better doesn't impress me.
r. I strongly refuse to be involved in this.
s. No one except Larry can come up with such strange excuses.
t. Drinking and driving should not be mixed.
u. The lifeguard found my cousin from Alabama's ring in the pool.
v. He joined us silently but unwillingly.

2. Draw tree diagrams for the following sentences.

a. My father is an artist.
b. The relatives of my husband live in Chicago.
c. Robin drove her car into a tree.
d. Chefs from many countries competed in a difficult contest.
e. The teacher threw a book out the window.

f. That dentist charged too much money for the dentures.
g. The walk through the park was very pleasant.
h. The birds sang.
i. Tonika's favorite show is about a rich family from California.
j. Some people like cats and dogs, but many people hate snakes.

FILE
6.4

Subcategories

Subcategories within Lexical Categories

According to our characterization of the lexical category of verbs given in File 6.2, *sleep*, *assume*, and *buy* belong to this category, since they all share the morphological and syntactic frames for verbs given there. However, if we look more closely at the syntactic frames in which these verbs appear, we can see that although they behave enough alike to be grouped together as verbs, they behave differently from one another in other ways. Consider the fact that *sleep*, but not *think* or *buy*, can occur in the syntactic frame in (1) (which gives us examples like *I left, he slept, the children played*); *think*, but not *sleep* or *buy*, can occur in (2) (which gives us examples like *everyone knows the earth is round* and *Lucy thinks it's raining*); *buy*, but not *sleep* or *think*, can occur in (3) (e.g., *we bought a new one, my brother ate two hamburgers*); and *give*, but not *sleep* or *think*, can occur in (4) (e.g., *Sarah gave her daughter a new toy*).

(1) NP____
(2) NP____ S
(3) NP____ NP
(4) NP____ NP NP

Just as not all verbs share exactly the same syntactic frames, so are there differences among adjectives. For example, although *asleep* and *utter* are both adjectives, *asleep* cannot occur in the syntactic frame for adjectives repeated below as (5), and *utter* cannot appear in the syntactic frame repeated below as (6), although *asleep* can fit in (6) (*the baby is asleep*) and *utter* can fit in (5) (*that utter fool*):

(5) DET _____ N but not **an asleep baby*
(6) LINKING VERB _____ but not **that fool is utter*

In other words, many adjectives can fit into both frames (5) and (6), but not all adjectives can. What this suggests is that the classification of words into lexical categories, even though it does capture many generalizations about the behavior of words, is not sufficient when we are dealing with differences *within* a lexical category. We need to make finer distinctions than can be made using the lexical categories we have already discussed. We

will further subdivide lexical categories into groups of words, or **subcategories**, that share common properties within a lexical category. Some of the common subcategories within various lexical categories are discussed below.

Verbs

Intransitive Verbs (V_i): Verbs that can occur in the syntactic frame in (1) above will be called intransitive verbs. Intransitive verbs do not take an object NP, which is why nothing follows the verb slot in (1). Examples of this subcategory of verbs include *run, walk, sleep, sigh,* and *sneeze.*

Transitive Verbs (V_t): Verbs that occur in the syntactic frame in (3) are called transitive verbs because they take an NP object, which follows the verb in (3). Examples of this subcategory of verbs are *buy, meet, kill, throw,* and *see.*

Ditransitive Verbs (V_{dt}): Ditransitive verbs take two NPs as their object, as the syntactic frame in (4) shows. Examples of this subcategory are *give, sell,* and *tell.*

Verbs with Sentence Complements (V_s): These are verbs that take a following whole sentence (S), as (2) shows. Some of them require a **complementizer** (COMP) plus a sentence; the words *that, if,* and *whether* are complementizers. (Complementizers form another closed class of lexical items.) Some verbs requiring sentence complements may *optionally* take the complementizer *that.* The examples below contain verbs of this subcategory.

(7) The ancients *believed* (that) the earth was flat.
(8) The doctor *asked* if she felt any pain.
(9) The witnesses *say* (that) the light was red.

Other examples of this subcategory of verb are *assert, claim, think,* and *deny.*

Linking Verbs (V_l): This small subcategory contains verbs such as *seem, appear, be, look,* and *become.* The characteristic peculiar to this class is the ability to occur with phrases of different kinds following them—ADJPs, NPs, and PPs:

(10) You look marvelous.
My sister became a doctor.
This book is from the library.

Adjectives

As mentioned above, most, but not all, adjectives can occur in both the syntactic frames given in (5) and (6). Adjectives like *long, boring,* and *clean* can occur in both; others, such as *utter* and *total,* can occur only in (5) (between a DET and an N); and still others, such as *ajar* and *asleep,* can occur only in (6) (following a linking verb). We will assign no particular names to these subcategories.

There is also a difference between what are called **stative** and **nonstative** adjectives. Semantically, stative adjectives (including *tall, blue,* and *wooden*) denote more permanent qualities, whereas nonstative ones (including *impatient, kind,* and *naughty*) denote more or less temporary or changeable qualities. There are syntactic differences between these two subcategories of adjectives as well; this can be seen in the following patterns. Stative adjectives cannot occur in (11) (i.e., they cannot occur in the progressive aspect). However, nonstative adjectives can occur in both (11) and (12).

(11) You are being very _____ (e.g., You are being very kind/*You are being very tall)
(12) You are very _____ (e.g., You are very kind/You are very tall)

Nouns

Two important subcategories within the category of nouns are **count** and **mass** nouns. Count nouns, as the name suggests, denote objects that are discrete, countable units (e.g., *table, song, computer*), whereas mass nouns usually refer to things that cannot be counted (*water, wheat, furniture*). Another class of nouns is **abstract** nouns (*honesty, peace*), which generally behave more like mass nouns than count nouns. The difference in the syntactic behavior of these subcategories can be illustrated by the fact that count nouns, but not mass or abstract nouns, can combine with determiners that make reference to numbers. Hence only count nouns occur in the syntactic frame in (13) (cf., for example, *a table* with **a furniture*). In contrast, singular abstract and mass nouns can occur without any determiner at all, as in (14), but singular count nouns cannot (compare *water is a liquid* with **computer is a machine*).

(13) A/two/every/few _____
(14) _____ VP

Notice that count nouns, if they are in the plural form, can occur without a determiner and can fill the slot in (14) (e.g., *Computers are a must, *computer is a must, I sell computers, *I sell computer*).

Further Issues

1. The above discussion on subcategories is not exhaustive; however, it should be an adequate introduction to the idea that words of a lexical category, while sharing enough properties to be classified as members of the same lexical category, might still show enough differences to warrant further subclassifications. You should expect to find more instances of subcategories than have been discussed here.

2. The same word can be used in more than one way and therefore can belong to more than one subcategory of a lexical category (just as a word like *walk* can belong to more than one lexical category). For instance, the verb *eat* can be used either as a transitive verb (i.e., with a noun phrase object) or as an intransitive verb (without an object), as the examples below show:

(15) I ate an apple.
I ate.

FILE

6.5

Phrase Structure Rules

Part of every language user's knowledge of his or her language is the knowledge of how constituents are put together and categorized in that language. This special sort of knowledge can be represented as a set of rules called **phrase structure (PS) rules**. In this file, we consider the nature of such rules and discuss several important properties that make them useful for describing the syntactic competence of language users.

Phrase Structure Grammar

Before we discuss phrase structure rules as tools for studying the syntax of human languages, let us look at the nature of grammatical descriptions that use PS rules. PS rules can be understood as simple instructions for building larger constituents from smaller ones, and they also give information about the order in which the constituents appear, and their categories. Thus, the PS rule in (1a) gives the instructions in (1b) and (1c):

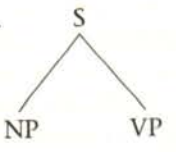
(1) a. S → NP VP

b. To build a constituent of the category S, take a constituent of the category NP and combine it with another constituent of the category VP.

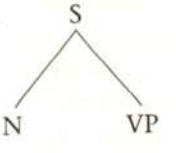
c. In building an S constituent in this manner, put the NP constituent first and the VP constituent after it.

Thus (1a) merely says a sentence is made up of an NP and a VP in that order. As part of the descriptive devices available in a phrase structure syntax, we have tree structures (already discussed in File 6.3). There is a direct connection between PS rules and tree structures. For instance, the rule in (1a) allows you to construct a tree structure as in (2a), but the ones in (2b) and (2c) (among numerous other trees) are not allowed by (1a):

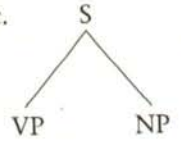
(2) a.



b.



c.



To gain a precise understanding of the instruction-giving aspect of PS rules, let us for a moment take examples of PS rules that do not describe English or any other human language. Let us create what linguists call a "toy grammar" for a "language" whose lexical categories consist of *a, b, c,* and *d*. Its phrasal categories are X and Y, in addition to S (for *sentence*), which is also a phrasal category. The instructions (i.e., PS rules) for building sentences in this language are given in (3):

(3) a. S → X Y
b. X → ab
c. X → a
d. Y → bcd
e. Y → cd Y
f. Y → cd

Now what "sentences" are acceptable (i.e., grammatical, able to be produced with this set of rules) and what sentences are ungrammatical (i.e., cannot be produced using this system of rules)? The shortest sentence produced by this system is *acd,* the derivation of which is given in (4) using tree structures:

(4) Step 1: S — allowed by (3a)

Step 2: X Y — allowed by (3c) and (3f)

a c d

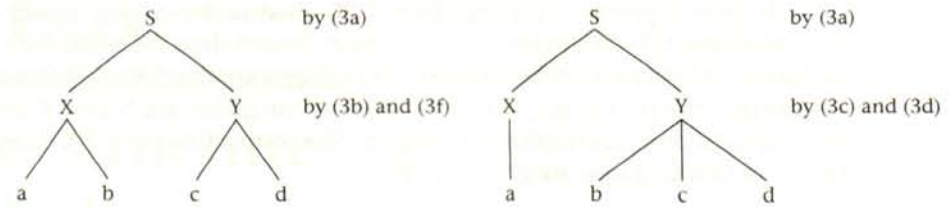
At this point, no further instructions can be carried out, and the sequence *acd* has been successfully derived in accordance with the rules. On the other hand, the sequences **abd* or **abc* cannot be derived using the instructions in (3). The sequences *abcd, abbcd, acdcd, abcdcdcd,* and *abcdcdcdcd* are all grammatical in this language, however. Can you work out which rules must apply to derive each of these?

The simple rule system in (3), far from being a grammar for human languages, still is not as simple as it looks. The "language" it produces has some of the salient properties of the syntax of human languages that we wish to focus on. To be specific, it has the properties of **generativity**, **ambiguity**, **hierarchical structure**, and **infinite recursion** (i.e., productivity). We will now see how the grammar in (3) shows these characteristics.

First, it is **generative** because it gives a schematic strategy that describes a set of sentences completely. (Recall that languages that have productivity, i.e., infinite output, cannot be described by listing and thus can only be described generatively in this way.) Thus, this toy grammar has one of the desirable properties that we would want in a grammar for human languages.

Second, human languages contain some structurally **ambiguous** sentences, and a grammar for a human language should reflect this property. The grammar in (3) has the power to produce structurally ambiguous sentences. Consider the sentence *abcd* in this language. It could be derived in two different ways, each resulting in a different constituent structure, i.e., a different way of grouping words together. The two different derivations are given in (5):

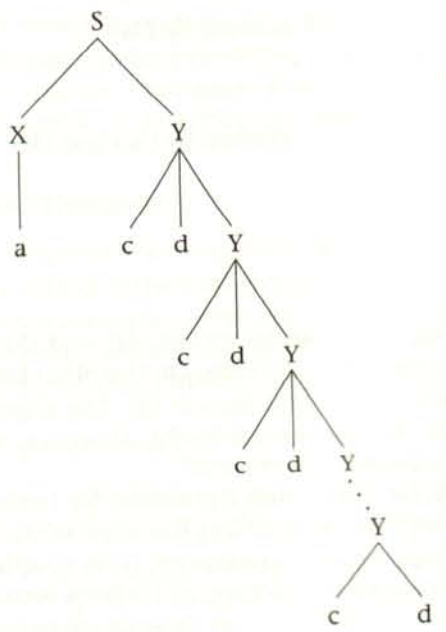
(5a)



Example (5a) shows a structure where *ab* is a constituent and *cd* is another, since by using (3b) one could combine *a* and *b* to form X; and by using (3f), *c* and *d* can be combined to form Y. The grouping is [*ab*] [*cd*] in (5a). In (5b), on the other hand, the grouping is [*a*] [*bcd*], using (3c) and (3d). If (3b), (3c), or (3d) were to be removed from (3), the grammar in (3) would lose the power to represent structural ambiguity, since it is the presence of *all* these rules that allow *b* to be part of either X or Y.

Third, the language produced by (3) contains infinitely many sentences, just as human languages do. Rule (3e) can be used *ad infinitum* to keep generating longer sentences (i.e., *cd* can be added any number of times), and no matter how many sentences have already been generated, there are always more sentences that the grammar can generate. Rule (3e) is an example of a **recursive** rule. Example (6) shows how this works:

(6)



Finally, the grammar produces sentences with **hierarchical structure**, not just linear order. It has phrasal categories X and Y, which have internal complexity of their own.

With the properties of PS rules that (3) illustrates in the background, let us now look at a PS grammar for human languages, focusing on English.

Phrase Structure Rules for English

As a speaker of English, you know how to put together constituents of each syntactic category of English. (This knowledge is, of course, largely unconscious: you may not be able to explain how to form complex constituents in English, but your linguistic behavior still shows that you know how to do it.) You know, for example, that a sentence (S) of

English can be formed by joining a noun phrase (NP) with a verb phrase (VP), as in (7). You also know that, as shown in (8), an NP may be formed by joining a determiner (DET) with a constituent containing a noun (N). And you know that a VP may consist of a (transitive) verb followed by a direct object NP, as in (9).

(7)	S	=	NP	+	VP
			John		snored.
			Everyone		fled the volcano.
			The mayor		smoked a cigar.
			A book		lay on the table.
(8)	NP	=	DET	+	N
			the		mayor
			a		book
			every		student
			my		python
(9)	VP	=	V	+	NP
			fled		the volcano
			smoked		a cigar
			imitated		a flamingo
			squeezed		some fresh orange juice

We can represent these three pieces of information in a succinct way with the following three PS rules.

(10)	S	→	NP VP
(11)	NP	→	DET N
(12)	VP	→	V NP

The arrow in these rules can be read as "may consist of." Thus rule (10) is just a concise way of saying "a sentence may consist of a noun phrase followed by a verb phrase"; similarly, rule (11) just says "a noun phrase may consist of a determiner followed by a noun." Now, what does rule (12) say?

Recall from File 6.3 that a syntactic category is a group of constituents with different structures that share certain properties. NPs, for example, could be composed of DET + N, as in (8) above, but they may also have the following structures:

(13) My uncle from France

A rule for this NP would look like:

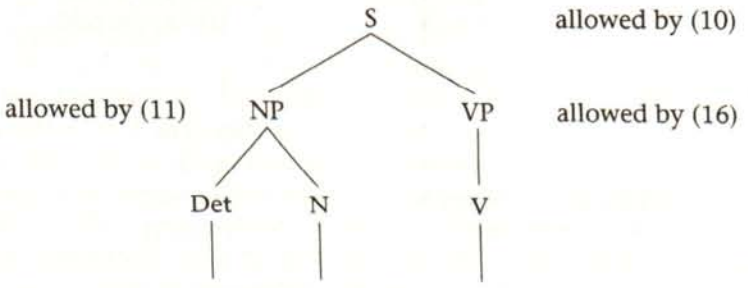
(14) NP → NP PP

Rules (10), (11), (12), and (14) specify five ways in which constituents can be combined to form larger, more complex constituents. Some constituents, however, do not result from the combination of smaller constituents; instead, they consist of a single word. For example, a noun phrase may just consist of a proper name (e.g., *John, Paris*), a plural noun (e.g., *elephants, leaves*), or a noun referring to a substance (e.g., *clay, gasoline*); similarly, a verb phrase may just consist of an intransitive verb, such as *sneeze, die, vanish,* or *elapse.* These sorts of knowledge can also be represented with PS rules:

(15) NP → N
(16) VP → V

The set of rules for NPs, so far (11), (14), (15), and (16), express the generalization that all of these structures belong to one category by the name of NP. However, given the PS rules we have developed so far, the grammar (i.e., the collection of all the rules) will generate ungrammatical as well as grammatical sentences. For example, using the entire set of rules given above, the following tree structure can be generated:

(17)



Now, words from the lexicon must be selected from the appropriate lexical categories and inserted below the lexical category nodes in this tree. But any word that belongs to the category V may be inserted, including intransitive verbs. Inserting such a word would generate a sentence such as **The children chased,* which of course is not grammatical. Therefore, information about subcategories must be included in the PS rules. Thus, (16) would be written:

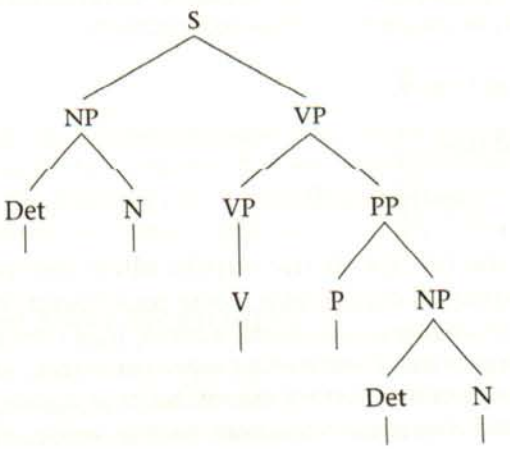
(18) VP → V_i

where the subscript (i) indicates that this V must be chosen from the subcategory of intransitive verbs. Transitive verbs (verbs that must take NP objects) will also be called for in other PS rules. What would the PS rule for VPs containing transitive verbs look like?

A similar situation exists for NPs. Leaving (15) as it is would generate a sentence such as **boy woke up in the middle of night.* How might rule (15) be rewritten to prevent this?

It is very important to understand that PS rules express generalizations over many individual sentences. The term **rule** is used because a rule describes a pattern found in a language. Many sentences can have the structure in (19):

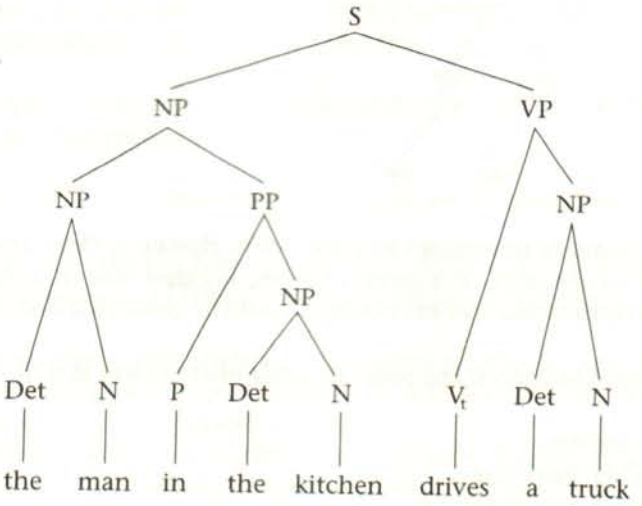
(19)



For example, *The dog ran through the woods, The woman jumped on the bug, Some students read during the night, Our books fell to the floor,* and *The rain fell from the sky* all have this structure, and this pattern is reflected in the fact that the same PS rules generate each of these sentences.

However, once you understand the structure of a particular sentence, you can determine what PS rules must be involved in deriving that structure. For example, using constituency tests and our knowledge of lexical and phrasal categories, we can determine that the structure of the sentence *The man in the kitchen drives a truck* is as follows:

(20)



Starting at the S node, we can formulate the PS rules that generate this structure. The S is composed of an NP and a VP (as usual), so a rule that expresses this fact would be written as (10) above: S → NP VP. The highest NP is composed of an NP and a PP. A rule that expresses this fact would be written as NP → NP PP, and so on.

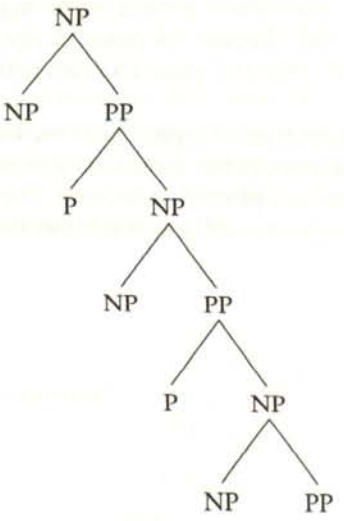
Infinity and Recursion

One of the things linguists attempt to do is to analyze the structure of sentences in a given language and construct a set of rules that can generate the grammatical sentences of that language but that does not allow the generation of ungrammatical sentences. In addition, the set of rules must be able to generate an infinite number of sentences. One of the ways this can be accomplished is by using recursive rules, as discussed above. One example of recursion in English involves the pair of rules in (21) and (22) below.

(21) NP → NP PP
(22) PP → P NP

Together these rules generate phrases such as *the man with the dog, the painter from California, some preachers in their pulpits, a large ant in my drink,* and so on. But notice that when one rule is applied in succession, the pair is recursive; note that since NP occurs on the left of the arrow in (21) and on the right in (22), it would be possible to continue to use them over and over to form a tree such as that in (23):

(23)



Of course, every sentence terminates at some point. However, there always exists the possibility that given a sentence of a certain length, another one that was longer could be created. Thus, an infinite number of structures could be generated from just these two rules alone.

The property of infinity is the result of other phenomena as well. Consider:

(24) He's a big dog.
He's a big, furry dog.
He's a big, furry, shy dog.
He's a big, furry, shy, energetic dog.

It seems English allows any number of adjectives to be inserted into the NP. We can represent this fact in the PS rules with some extra notation. The symbol "+" on a constituent in a PS rule means "one or more." Parentheses around a constituent indicate that it is optional. Thus the rule:

(25) NP → DET (ADJ^{+}) N

is the way to express "an NP may consist of a DET, possibly followed by one or more ADJs, followed by an N."

A similar phenomenon exists for constituents involving conjunctions (CONJ). Consider the following sentence:

(26) Mary walked to Zeke's house.

We can add on to this sentence in a number of ways to form an infinite number of new sentences. One way to add on to sentence (26) is to add more NPs with conjunctions, e.g.:

(27) John and Mary walked to Zeke's house.
Bill, John, and Mary walked to Zeke's house.
Jane, Bill, John, and Mary walked to Zeke's house.

In principle, there is no limit to the number of new NPs that we could connect to the subject of (26) in this way. Similarly, we can use *and* to connect one or more new VPs to the predicate of (26):

(28) Mary walked to Zeke's house and delivered the letter.
Mary walked to Zeke's house, delivered the letter, and ran home.
Mary walked to Zeke's house, delivered the letter, ran home, and read the paper.

No matter how many new VPs we connect to the predicate of (26), we will never reach a point at which another one cannot be added. Likewise, we can connect any number of new prepositional phrases to *to Zeke's house* in (26):

(29) Mary walked to Zeke's house, to the post office, to the bookstore, and to the new Burger Barn.

And we can connect any number of new sentences to (26) itself:

(30) Mary walked to Zeke's house, John drove to the post office, Bill stopped by the bookstore, and Jane checked out the new Burger Barn.

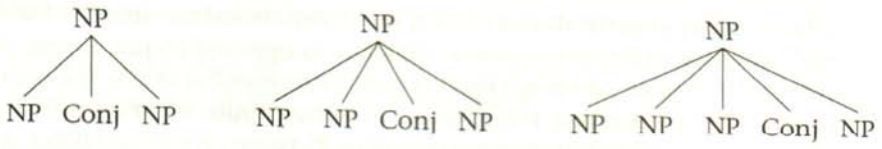
Thus, another reason why there are an infinite number of English sentences is that it is possible to use conjunctions such as *and* and *or* to connect an indefinitely large number of expressions of any given syntactic category.

Again, with some new notation, we can write PS rules that will generate all of the sentences above. Let us illustrate how this is done for the NP phrases discussed so far, and leave it as an exercise for the reader to develop PS rules for the other constituents. If we examine the structures of the sentences in (27), we note that the addition of new NPs within the subject NP follows a pattern. When two NPs make up the subject NP, the conjunction separates them, e.g., *Mary and John*. When a third NP is added, the conjunction still precedes the final NP, and when a fourth is added this pattern remains. Thus, an NP may consist of any number of NPs, the conjunction, and another NP. Thus, we can express the pattern of conjoined NPs with the rule in (31):

(31) NP → NP^{+} CONJ NP

The three smallest trees that (31) generates are those in (32)

(32)



Some Phrase Structure Rules for English

Below is a list of some PS rules for English, some of which have been introduced above. This list is a convenient reference, but it is by no means exhaustive.

(33)

i.	S	→	NP VP
ii.	NP	→	DET (ADJP*) N
iii.	NP	→	PRO
iv.	NP	→	N_{pr}
v.	NP	→	(DET) (ADJP*) N_{pl}
vi.	NP	→	(DET) (ADJP*) N_{m}
vii.	NP	→	NP PP
viii.	VP	→	AUX VP
ix.	VP	→	V_{i}
x.	VP	→	V_{t} NP
xi.	VP	→	V_{dt} NP NP
xii.	VP	→	VP PP
xiii.	ADJP	→	(ADV*) ADJ
xiv.	PP	→	P NP
xv.	NP	→	NP* CONJ NP
xvi.	S	→	S* CONJ S

Note that the subscripts stand for the following subcategories: ($_{pl}$) for plural nouns, ($_{pr}$) for proper nouns, ($_{c}$) for count nouns, and ($_{m}$) for mass nouns; ($_{i}$) for intransitive verbs, ($_{t}$) for transitive verbs, and ($_{dt}$) for ditransitives.

Summary

In this file we have discussed phrase structure rules, which are linguists' models of a language user's knowledge of how constituents are put together and categorized in his or her language. PS rules may be regarded as generating a certain set of tree diagrams—or, in a related sense, as generating a certain set of sentence structures; a set of PS rules that generates sentence structures in some language, as opposed to just listing them, is thus a generative set of rules. Although there is an infinite number of possible sentences in English or in any human language, it is possible to write a finite set of rules that generates them all. This is because of two special properties of PS rules: on the one hand, a single PS rule may allow an expression to consist of an indefinitely large number of constituents; and on the other, a finite set of PS rules may be recursive—that is, may be used over and over again to generate a tree of indefinite length.

Exercises

1. Examine the following set of rules and answer the following questions *based only on these rules.*

S	→	NP VP	DET	=	the, some
NP	→	DET N	N	=	elephants, raccoons, tigers, bears, grain, peanuts, mice
VP	→	V_t NP			
VP	→	V_i	V_t	=	eat, scare
VP	→	VP* CONJ VP	V_i	=	gallop, swim
			CONJ	=	and

   a. For each of the following sentences, circle *yes* if these rules generate it; circle *no* if it is not generated by these rules.

i. The elephants and the mice eat peanuts.	yes	no
ii. Elephants eat peanuts.	yes	no
iii. The tigers scare the grain.	yes	no
iv. The raccoons eat the grain, scare the mice, and swim.	yes	no
v. The tigers gallop.	yes	no
vi. The tigers eat some grain and scare the mice.	yes	no

   b. Draw the trees for two of the sentences for which you circled *yes*.

   c. What changes can be made to this set of rules so that it will generate the sentences for which you circled *no*? Be specific in your suggested changes.

   d. Does this set of rules generate an infinite number of sentences? Why or why not?

2. a. Write a set of phrase structure rules that generates all of the following sentences. (Hint: draw the tree diagrams for each sentence first.)

      i. John strummed his guitar.
      ii. Janet played the trumpet.
      iii. Marilyn sang.
      iv. Larry danced.

   b. Give a sentence that your set of rules does not generate.

   c. Write a single rule that, when added to your set of rules, allows it to generate both of the following sentences:

      v. John sang and danced.
      vi. John sang, danced, and played the trumpet.

   d. Give two other sentences that your revised set of rules now generates.

3. In File 6.4 on subcategories, the following type of sentence was introduced:

      i. Sally claimed Bill bought the car.
      ii. Robert said he plays the piano.
      iii. Cathy denied her mother lives in Reno.

   a. In prose, say what the structure of the verb phrases in these sentences is.

b. Write a single rule that, in conjunction with the other rules from (33), generates all of the verb phrases in (i)–(iii).

c. List the other phrase structure rules that are needed to generate all of the sentences in (i)–(iii).

d. Show how the rule you have written for the verb phrases results in recursion together with (an)other rule(s). (Draw a tree diagram and explain how the rules are recursive.)

4. Look back at the list of phrase structure rules in (33). Examine (xii) carefully.

a. Think of at least two sentences that would have the structures generated by (xii) in conjunction with (ix) and then two generated by (xii) and (x).

5. Look back at the list of phrase structure rules in (33). You may have noticed that the PS rules for NPs with an ADJ constituent and the ADJP were modified somewhat from what had been presented in the text. For ease of reference one such NP rule and the ADJP rule are rewritten below:

$$\begin{array}{lcl} \text{NP} & \rightarrow & \text{DET } (\text{ADJP}^*) \text{ N}_c \\ \text{ADJP} & \rightarrow & (\text{ADV}^*) \text{ ADJ} \end{array}$$

Determine why the "(ADJP*)" was added to the NP rule, replacing just an "(ADJ*)" (i.e., why an adjective phrase, and not just an adjective is needed in the NP rule), by thinking up sentences in English that have a structure that would necessitate the modified rule. (Hint: consider adverbs such as *very* and *quite*.)