

abstract features in the phrase structure tree. After the rules of the syntax have applied, these features are sometimes spelled out as affixes such as *-ed* or as function words such as *do*.

The basic design of language is universal. Universal Grammar specifies that syntactic rules are **structure-dependent** and that movement rules may not move phrases out of certain structures such as certain types of clauses, among many other constraints, including a need to not violate the X-bar schema. These constraints exist in all languages—spoken and signed—and need not be learned. UG also contains parameters of variation, such as the order of heads and complements, and the variations on movement rules. A child acquiring a language must fix the parameters of UG for that language.

References for Further Reading

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Exercises

1. Besides distinguishing grammatical from ungrammatical sentences, the rules of syntax account for other kinds of linguistic knowledge, such as:
 - a. when a sentence is structurally ambiguous. (Cf. *The boy saw the man with a telescope*.)
 - b. when two sentences with different structures mean the same thing. (Cf. *The father wept silently*. and *The father silently wept*.)
 - c. systematic relationships of form and meaning between two sentences, like declarative sentences and their corresponding interrogative forms. (Cf. *The boy can sleep*. and *Can the boy sleep?*)

Draw on your linguistic knowledge of English to come up with an example illustrating each of these cases. (Use examples that are different from the ones in the chapter.) Explain why your example illustrates the point. If you know a language other than English, provide examples in that language, if possible.

2. Consider the following sentences:
 - a. I hate war.
 - b. You know that I hate war.
 - c. He knows that you know that I hate war.
 - i. Write another sentence that includes sentence (c).
 - ii. What does this set of sentences reveal about the nature of language?
 - iii. How is this characteristic of human language related to the difference between linguistic competence and performance? (Hint: Review these concepts in chapter 1.)
3. Paraphrase each of the following sentences in two ways to show that you understand the ambiguity involved:

Example: Smoking grass can be nauseating.

- i. Putting grass in a pipe and smoking it can make you sick.
 - ii. Fumes from smoldering grass can make you sick.
- a. Dick finally decided on the boat.
 - b. The professor's appointment was shocking.
 - c. The design has big squares and circles.
 - d. That sheepdog is too hairy to eat.
 - e. Could this be the invisible man's hair tonic?
 - f. The governor is a dirty street fighter.
 - g. I cannot recommend him too highly.
 - h. Terry loves his wife and so do I.
 - i. They said she would go yesterday.
 - j. No smoking section available.
 - k. We will dry clean your clothes in 24 hours.
 - l. I bought cologne for my boyfriend containing 25% alcohol.
4. i. Consider the following baseball joke (knowledge of baseball required):

CATCHER TO PITCHER: "Watch out for this guy, he's a great fastball hitter."
 PITCHER TO CATCHER: "No problem. There's no way I've got a great fastball."

Explain the humor either by paraphrasing, or even better, with a tree structure like the one we used early in the chapter for *old men and women* (without the syntactic categories).

 - ii. Do the same for the advertising executive's (honest?) claim that the new magazine "has between one and two billion readers."
5. Draw two phrase structure trees to represent the two meanings of the sentence *The magician touched the child with the wand*. Be sure you indicate which meaning goes with which tree. (Note: Be sure your trees conform to the X-bar schema.) (Hint: *with the wand* is an adjunct, not a complement.)
6. Draw the NP subtrees for the italicized NPs in the following sentences:
 - a. *Every mother* hopes for good health.
 - b. *A big black dog* is barking.
 - c. *Angry men in dark glasses* roamed the streets.
 - d. We saw *the destruction of the house*. (Hint: * . . . and the one of the garage)

7. In all languages, sentences can occur within sentences. For example, in exercise 2, sentence (b) contains sentence (a), and sentence (c) contains sentence (b). Put another way, sentence (a) is embedded in sentence (b), and sentence (b) is embedded in sentence (c). Sometimes embedded sentences appear slightly changed from their normal forms, but you should be able to recognize and underline the embedded sentences in the following examples. Underline in the non-English sentences, when given, not in the translations (the first one is done as an example):

- a. Yesterday I noticed my accountant repairing the toilet.
- b. Becky said that Jake would play the piano.
- c. I deplore the fact that bats have wings.
- d. That Guinevere loves Lorian is known to all my friends.
- e. Who promised the teacher that Maxine wouldn't be absent?
- f. It's ridiculous that he washes his own Rolls-Royce.
- g. The woman likes for the waiter to bring water when she sits down.
- h. The person who answers this question will win \$100.
- i. The idea of Romeo marrying a 13-year-old is upsetting.
- j. I gave my hat to the nurse who helped me cut my hair.
- k. For your children to spend all your royalty payments on recreational drugs is a shame.
- l. Give this fork to the person I'm getting the pie for.
- m. khăw chyâ waă khruu maa. (Thai)
He believe that teacher come

He believes that the teacher is coming.

- n. Je me demande quand il partira. (French)
I me ask when he will leave

I wonder when he'll leave.

- o. Jan zei dat Piet dit boek niet heeft gelezen. (Dutch)
Jan said that Piet this book not has read

Jan said that Piet has not read this book.

8. Adhering to the X-bar schema, draw phrase structure trees for the following sentences (TPs): (Hint: place any adverbs directly under AdvP without concern for the internal structure of the adverbial phrase. Also, you may assume possessive terms like *my* and *her* are determiners and that there are no "small clauses.")
- a. The puppy found the child.
 - b. A surly passenger insulted the attendant.
 - c. The house on the hill collapsed in the earthquake.
 - d. The ice melted quickly.
 - e. The hot sun melted the ice.
 - f. The old tree swayed in the wind.
 - g. My guitar gently weeps.

9. Create five phrase structure trees of 6, 7, 8, 9, and 10 words. Use your mental lexicon to fill in the bottoms of the trees. (Note: make sure your trees conform to the X-bar schema and be especially cautious to distinguish adjuncts from complements.)
10. We stated that the rules of syntax specify all and only the grammatical sentences of the language. Why is it important to say *only*? What would be wrong with a grammar that specified as grammatical sentences all of the truly grammatical ones plus a few that were not grammatical?
11. In this chapter we introduced the X-bar schema, according to which each phrasal category without \bar{X} recursion has three levels of structure. Draw the subtree corresponding to the phrasal category NP (noun phrase) and give an example of the four possibilities: head only; specifier and head only; head and complement only; and specifier, head, and complement only. (Hint: Make sure your complement is not an adjunct using the *one*-replacement test.)
12. Using one or more of the constituency tests (i.e., stand alone, move as a unit, replacement by a pronoun, *one*-replacement) discussed in the chapter, determine which of the boldfaced portions in the sentences are constituents. Provide the grammatical category of the constituents.
 - a. Martha found **a lovely pillow** for the couch.
 - b. The **light in this room** is terrible.
 - c. I wonder **whether Bonnie has finished packing her books**.
 - d. Melissa slept **in her class**.
 - e. **Pete and Max** are fighting over the bone.
 - f. I gave a bone to Pete **and to Max** yesterday.
 - g. I gave a bone to **Pete and to Max** yesterday.
13. The two sentences below contain a **verbal particle**:
 - i. He ran *up* the bill.
 - ii. He ran the bill *up*.

The verbal particle *up* and the verb *run* depend on each other for the unique idiosyncratic meaning of the phrasal verb *run up*. (*Running up a bill* involves neither running nor the location *up*.) We showed earlier that in such cases the particle and *object* do not form a constituent, hence they cannot move as a unit:

- iii. *Up the bill, John ran. (Compare this to *Up the hill John ran*.)
- a. Using adverbs such as *completely*, show that the particle forms a constituent with the *verb* in [*run up*] *the bill*, while in *run* [*up the hill*], the preposition and NP object form a constituent.
- b. Now consider the following data:
 - i. Michael ran up the hill and over the bridge.
 - ii. *Michael ran up the bill and off his mouth.
 - iii. Michael ran up the bill and ran off his mouth.

Use the data to argue that expressions like *up the bill* and *off his mouth* are not constituents.

14. In terms of C-selection restrictions, explain why the following are ungrammatical:
- *The man located.
 - *Jesus wept the apostles.
 - *Robert is hopeful of his children.
 - *Robert is fond that his children love animals.
 - *The children laughed the man.

15. The complement of V may be a single NP direct object as for *find*. English also has **ditransitive verbs**, ones whose complement may be two NPs, such as *give*:

The emperor gave the vassal a castle.

Think of three other ditransitive verbs in English and give example sentences. (Note: The analysis of ditransitive verbs in X-bar theory is controversial. See Exercise 27.)

16. Tamil is a language spoken in India by upward of 70 million people. Others, but not you, may find that they talk “funny,” as illustrated by word-for-word translations of PPs from Tamil to English:

Tamil to English Meaning

the bed on	‘on the bed’
the village from	‘from the village’

- Based on these data, is Tamil a head initial or a head final language?
- What would the PS tree for a Tamil PP look like? (Note: Make sure your tree conforms to the X-bar schema.)

17. Here are three more word-for-word glosses in Tamil:

a story tell	‘tell a story’
the boy a cow saw	‘the boy saw a cow’
woman this slept	‘this woman slept’

Do these further data support or detract from your analysis in exercise 16? What would the pertinent VP and NP trees look like in Tamil, based on these data? (Hint: Just give the three levels. You may need to look at Appendix B.)

18. All *wh* phrases can move to the left periphery of the sentence.
- Invent three sentences beginning with *what*, *which*, and *where*, in which the *wh* word is not in its d-structure position in the sentence. Give both the s-structure and d-structure versions of your sentences. For example, using *when*:

When could Marcy catch a flight? from *Marcy could catch a flight when?*
(Hint: see Appendix B.)

- Draw the phrase structure tree for one of your sentences. (Hint: See the Appendices.) (Note: As always, make sure your trees conform to the X-bar schema.)

19. There are many systematic, structure-dependent relationships among sentences similar to the one discussed in the chapter between declarative and interrogative sentences. Here are some example sentences based on ditransitive verbs (see exercise 15):

The boy wrote the senator a letter.

The boy wrote a letter to the senator.

A philanthropist gave the animal rights movement \$1 million.

A philanthropist gave \$1 million to the animal rights movement.

- Describe the relationship between the first and second members of each pair of sentences.
 - State why a Move transformation deriving one of these structures from the other is plausible.
20. State at least three differences between English and the following languages, using just the sentence(s) given. Ignore lexical differences (i.e., the different vocabulary). Here is an example:

Thai:	Dèg	khon	níi	kamlang	kin.
	boy	<i>classifier</i>	this	<i>progressive</i>	eat

‘This boy is eating.’

Mǎa	tua	nán	kin	khâaw.
dog	<i>classifier</i>	that	eat	rice

‘That dog ate rice.’

Three differences are (1) Thai has “classifiers.” They have no English equivalent. (2) The words (determiners, actually) *this* and *that* follow the noun in Thai, but precede the noun in English. (3) The “progressive” is expressed by a single separate word in Thai. The verb does not change form. In English, the progressive is indicated by the presence of the verb *to be* and the adding of *-ing* to the verb.

a. French

Cet	homme	intelligent	comprendra	la question.
this	man	intelligent	will understand	the question

‘This intelligent man will understand the question.’

Ces	hommes	intelligents	comprendront	les questions.
these	men	intelligent	will understand	the questions

‘These intelligent men will understand the questions.’

b. Japanese

Watashi	ga	sakana	o	tabete	iru.
I	<i>subject</i>	fish	<i>object</i>	eat (<i>ing</i>)	am
	<i>marker</i>		<i>marker</i>		

‘I am eating fish.’

c. Swahili

Mtoto		alivunja			kikombe.	
m-	toto	a-	li-	vunja	ki-	kombe
<i>class</i>	child	he	<i>past</i>	break	<i>class</i>	cup
<i>marker</i>					<i>marker</i>	

‘The child broke the cup.’

Watoto		wanavunja			vikombe.	
wa-	toto	wa-	na-	vunja	vi-	kombe
<i>class</i>	child	they	<i>present</i>	break	<i>class</i>	cup
<i>marker</i>					<i>marker</i>	

‘The children break the cups.’

d. Korean

Ki	sonyɔn-iee		wiyu-lil	masi-ass-ta.			
ki	sonyɔn-	iee	wiyu-	lil	masi-	ass-	ta
the	boy	<i>subject</i>	milk	<i>object</i>	drink	<i>past</i>	<i>assertion</i>
		<i>marker</i>		<i>marker</i>			

‘The boy drank milk.’

Ki-nin		muɔs-il		mɔk-ass-ninya.		
ki	nin	muɔs-	il	mɔk-	ass-	ninya
he	<i>subject</i>	what	<i>object</i>	eat	<i>past</i>	<i>question</i>
	<i>marker</i>		<i>marker</i>			

‘What did he eat?’

e. Tagalog

Nakita	ni	Pedro-ng		puno	na	ang	bus.
nakita	ni	Pedro	-ng	puno	na	ang	bus
saw	<i>article</i>	Pedro	that	full	already	<i>topic</i>	bus
						<i>marker</i>	

‘Pedro saw that the bus was already full.’

21. Transformations may delete elements. For example, the s-structure of the ambiguous sentence *George wants the presidency more than Martha* may be derived from two possible d-structures:

- George wants the presidency more than he wants Martha.
- George wants the presidency more than Martha wants the presidency.

A deletion transformation either deletes *he wants* from the structure of example (a), or *wants the presidency* from the structure of example (b). This is a case of **transformationally induced ambiguity**: two different d-structures with different semantic interpretations are transformed into a single s-structure.

Explain the role of a deletion transformation similar to the ones just discussed in the following humorous dialogue between “two old married folks.”

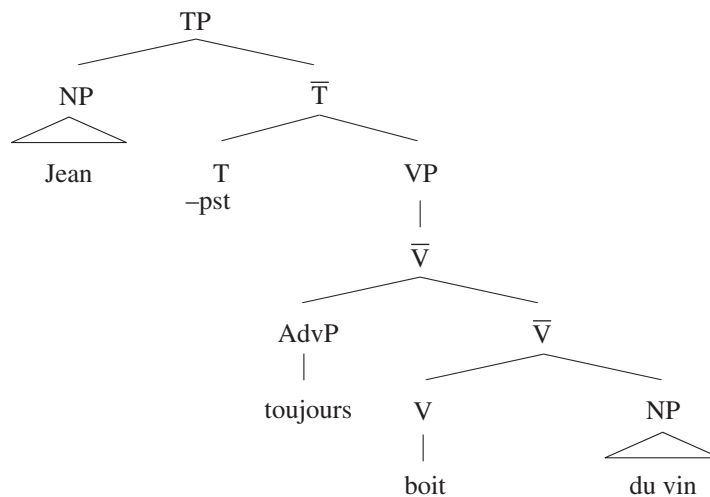
HE: Do you still love me as much as you used to?

SHE: As much as I used to what?

22. Challenge exercise: Compare the following French and English sentences:

French	English
Jean boit toujours du vin.	John always drinks some wine.
Jean drinks always some wine (*Jean toujours boit du vin)	*John drinks always some wine
Marie lit jamais le journal.	Mary never reads the newspaper.
Marie reads never the newspaper (*Marie jamais lit le journal)	*Mary reads never the newspaper.
Pierre lave souvent ses chiens.	Peter often washes his dogs.
Pierre washes often his dogs (*Pierre souvent lave ses chiens.)	*Peter washes often his dogs.

- a. Based on the above data, what would you hypothesize concerning the relative positions of adverbs of frequency (e.g., *toujours*, *jamais*, *souvent*, *always*, *never*, *often*) and the verbs they modify in French and English?
- b. Now suppose that UG specifies that in *all languages* the adverbs of frequency must precede \bar{V} , as in the tree below. What transformational rule would you need to hypothesize to derive the correct surface word order for French? (Hint: Think about the auxiliaries *have* and *be* in English and the movements they can make by referring to appendix B.)



- c. How are English and French alike; how are they different?

23. Refer to the tree structures on p. 108.
- Give the tree corresponding to the VP *cursed the day I was born the day I was born*.
Which must come first, the AdvP or the NP? (You needn't concern yourself with the internal structure of the AdvP or the NP.)
 - How would you draw tree structures (i.e., modify the PS rules) to account for NPs that contain multiple adjective phrases with intensifiers such as *the extremely intelligent, happy-about-his-grade boy*.

24. Show that an embedded CP (a CP inside a TP) is a constituent by applying the constituency tests (stand alone, move as a unit, and replace with a pronoun). Consider the following sentences in formulating your answer, and provide further examples if you can. (The boldfaced words are the CPs.)

Sam asked **whether he could play soccer**.

I wonder **whether Michael walked the dog**.

Cher believes **that the students know the answer**.

It is a problem **that Sam broke his arm**.

25. **Challenge exercise** (if you've read Appendices A and B):
- Give the d-structure tree for *Which dog does Michael think loves bones?* (Hint: The complementizer *that* must be present.)
 - Give the d-structure tree for *What does Michael think that his dog loves?*
 - Consider these data:
 - *Which dog does Michael think that loves bones?
 - What does Michael think his dog loves?

In (ii), a complementizer deletion rule has deleted *that*. The rule is optional because the sentence is grammatical with or without *that*. In (i), however, the complementizer must be deleted to prevent the ungrammatical sentence from being generated. What factor governs the optionality of the rule?

26. Dutch and German are Germanic languages related to English, and as in English, *wh* questions are formed by moving a *wh* phrase to sentence-initial position.

In what way are the rules of question formation in Dutch and German different from those in English? Base your answer on the following data:

German

- Was hat Karl gekauft?
what has Karl bought

'What has Karl bought?'

- Was kauft Karl?
What buys Karl

'What does Karl buy?'

Dutch

- Wat heeft Wim gekocht?
what has Wim bought

'What has Wim bought?'

- Wat koopt Wim?
what buys Wim

'What does Wim buy?'

iii. Kauft Karl das Buch? Koopt Wim het boek?
 buys Karl the book buys Wim the book

‘Does Karl buy the book?’

‘Does Wim buy the book?’

27. **Challenge research exercise:** X-bar theory demands binary branching and that a head may have one and only one complement. Ditransitive verbs such as *write*, *give*, etc. (they are numerous) pose problems insofar as fitting into the strict (dare we say “Procrustean”) strictures of X-bar. This research project asks you to examine the work that has been done to accommodate the facts of ditransitive verbs with X-bar theory.
28. The *one*-replacement test is an excellent way to determine whether an expression that follows a noun is a complement or an adjunct. Here are four examples of complements and four of adjuncts. Apply the *one*-replacement test to determine which is which:
- a. the man with the golden arm
 - b. a voter for proposition eighteen
 - c. my cousin’s arrival at his home
 - d. the construction of a retaining wall
 - e. the boat in the river
 - f. the ocean white with foam
 - g. the desecration of the temple
 - h. the betrayal of Julius Caesar



4

The Meaning of Language

Surely all this is not without meaning.

HERMAN MELVILLE, *Moby-Dick*, 1851

For thousands of years philosophers have pondered the **meaning** of *meaning*, yet speakers of a language can easily understand what is said to them and can produce strings of words that are meaningful to other speakers. We use language to convey information to others (*My new bike is pink*), ask questions (*Who left the party early?*), give commands (*Stop lying!*), and express wishes (*May there be peace on Earth*).

What do you know about meaning when you know a language? To begin with, you know when a “word” is meaningful (*flick*) or meaningless (*blick*), and you know when a “sentence” is meaningful (*Jack swims*) or meaningless (*Swims metaphorical every*). You know when a word has two meanings (*bear*) and when a sentence has two meanings (*Jack saw a man with a telescope*). You know when two words have the same meaning (*sofa* and *couch*), and when two sentences have the same meaning (*Jack put off the meeting*, *Jack put the meeting off*). And you know when words or sentences have opposite meanings (*alive/dead*; *Jack swims/Jack doesn't swim*).

You generally know the real-world objects that words refer to like *the chair in the corner*; and even if the words do not refer to actual objects, such as *the unicorn behind the bush*, you still have a sense of what they mean; and if the particular object happened to exist, you would have the knowledge to identify it.

You know, or have the capacity to discover, when sentences are true or false. That is, if you know the meaning of a sentence, you know its **truth conditions**. In some cases it's obvious, or redundant (*all kings are male* [true], *all bachelors are married* [false]); in other cases you need some further, nonlinguistic knowledge

(*Molybdenum conducts electricity*), but by knowing the meaning, you know the kind of world knowledge that is needed. Often, if you know that a sentence is true (*Nina bathed her dogs*), you can infer that another sentence must also be true (*Nina's dogs got wet*): that is, the first sentence **entails** the second sentence.

All of this knowledge about meaning extends to an unlimited set of sentences, just like our syntactic knowledge, and is part of the grammar of the language. One goal of linguistics is to reveal and make explicit this knowledge about meaning that every speaker has.

The study of the linguistic meaning of morphemes, words, phrases, and sentences is called **semantics**. Subfields of semantics are **lexical semantics**, which is concerned with the meanings of words and the meaning relationships among words; and **phrasal** or **sentential semantics**, which is concerned with the meaning of syntactic units larger than the word. The study of how context affects meaning—for example, how the sentence *It's cold in here* comes to be interpreted as 'close the windows' in certain situations—is called **pragmatics**.

What Speakers Know about Sentence Meaning

Language without meaning is meaningless.

ROMAN JAKOBSON

In this section we discuss the linguistic knowledge you have that permits you to determine whether a sentence is true or false, when one sentence implies the truth or falseness of another, and whether a sentence has multiple meanings. One way to account for this knowledge is by formulating semantic rules that build the meaning of a sentence from the meanings of its words and the way the words combine syntactically. This is often called **truth-conditional semantics** because it takes speakers' knowledge of truth conditions as basic. It is also called **compositional semantics** because it calculates the truth value of a sentence by composing, or putting together, the meanings of smaller units. We will limit our discussion to declarative sentences like *Jack swims* and *Jack kissed Laura*, because we can judge these kinds of sentences as either true or false. At least part of their meaning, then, will be their **truth value**.

Truth

. . . Having Occasion to talk of Lying and false Representation, it was with much Difficulty that he comprehended what I meant. . . . For he argued thus: That the Use of Speech was to make us understand one another and to receive Information of Facts; now if any one said the Thing which was not, these Ends were defeated; because I cannot properly be said to understand him. . . . And these were all the Notions he had concerning that Faculty of Lying, so perfectly well understood, and so universally practiced among human Creatures.

JONATHAN SWIFT, *Gulliver's Travels*, 1726

Suppose you are poolside and Jack is swimming in the pool. If you hear the sentence *Jack swims*, and you know the meaning of that sentence, then you will judge the sentence to be true. On the other hand, if you are indoors and you happen to believe that Jack never learned to swim, then when you hear the very same sentence *Jack swims*, you will judge the sentence to be false and you will think the speaker is misinformed or lying. More generally, if you know the meaning of a sentence, then you can determine under what conditions it is true or false.

You do not need to actually know whether a sentence is true or false to know its meaning. Knowing the meaning tells you how to determine the truth value. The sentence *copper conducts electricity* has meaning and is understood because we know how to determine whether it's true or false: for example, by use of a volt meter. We could also comment sensibly on the sentence by noting the use of copper wire in lamps. If the sentence was *Crumple-horned snork-acks incarnadine nargles* you would find it meaningless because you would not have the foggiest idea how to determine whether it is true or false. Reducing the question of meaning to the question of truth conditions has proved to be very fruitful in understanding the semantic properties of language.

For most sentences it does not make sense to say that they are always true or always false. Rather, they are true or false in a given situation, as we previously saw with *Jack swims*. But a restricted number of sentences are indeed always true regardless of the circumstances. They are called **tautologies**. (The term **analytic** is also used for such sentences.) Examples of tautologies are sentences like *Circles are round* and *A person who is single is not married*. Their truth is guaranteed solely by the meaning of their parts and the way they are put together. Similarly, some sentences are always false. These are called **contradictions**. Examples of contradictions are sentences like *Circles are square* or *A bachelor is married*.

Entailment and Related Notions

You mentioned your name as if I should recognize it, but beyond the obvious facts that you are a bachelor, a solicitor, a Freemason, and an asthmatic, I know nothing whatever about you.

SIR ARTHUR CONAN DOYLE, "The Norwood Builder," in *The Memoirs of Sherlock Holmes*, 1894

Much of what we know is deduced from what people say alongside our observations of the world. As we can deduce from the quotation, Sherlock Holmes took deduction to the ultimate degree. Often, deductions can be made based on language alone.

If you know that the sentence *Jack swims beautifully* is true, then you also know that the sentence *Jack swims* is true. This meaning relation is called **entailment**. We say that *Jack swims beautifully* **entails** *Jack swims*. More generally, one sentence entails another if whenever the first sentence is true the second one is also true in all conceivable circumstances.

Generally, entailment goes only in one direction. So while the sentence *Jack swims beautifully* entails *Jack swims*, the reverse is not true. Knowing merely that *Jack swims* is true does not necessitate the truth of *Jack swims beautifully*. Jack could be a poor swimmer. On the other hand, negating both sentences reverses the entailment. *Jack doesn't swim* entails *Jack doesn't swim beautifully*.

The notion of entailment can be used to reveal knowledge that we have about other meaning relations. For example, omitting tautologies and contradictions, two sentences are **synonymous** (or **paraphrases**) if they are both true or both false with respect to the same situations. Sentences like *Jack put off the meeting* and *Jack postponed the meeting* are synonymous, because when one is true the other must be true; and when one is false the other must also be false. We can describe this pattern in a more concise way by using the notion of entailment:

Two sentences are synonymous if they entail each other.

Thus if sentence A entails sentence B and vice versa, then whenever A is true B is true, and vice versa. Although entailment says nothing specifically about false sentences, it's clear that if sentence A entails sentence B, then whenever B is false, A must be false. (If A were true, B would have to be true.) And if B also entails A, then whenever A is false, B would have to be false. Thus mutual entailment guarantees identical truth values in all situations; the sentences are synonymous. Two sentences are **contradictory** if, whenever one is true, the other is false or, equivalently, there is no situation in which they are both true or both false. For example, the sentences *Jack is alive* and *Jack is dead* are contradictory because if the sentence *Jack is alive* is true, then the sentence *Jack is dead* is false, and vice versa. In other words, *Jack is alive* and *Jack is dead* have opposite truth values. Like synonymy, contradiction can be reduced to a special case of entailment.

Two sentences are *contradictory* if one entails the negation of the other.

For instance, *Jack is alive* entails the negation of *Jack is dead*, namely *Jack is not dead*. Similarly, *Jack is dead* entails the negation of *Jack is alive*, namely *Jack is not alive*.

The notions of *contradiction* (always false) and *contradictory* (opposite in truth value) are related in that if two sentences are contradictory, their conjunction with *and* is a contradiction. Thus *Jack is alive and Jack is dead* is a contradiction; it cannot be true under any circumstances.

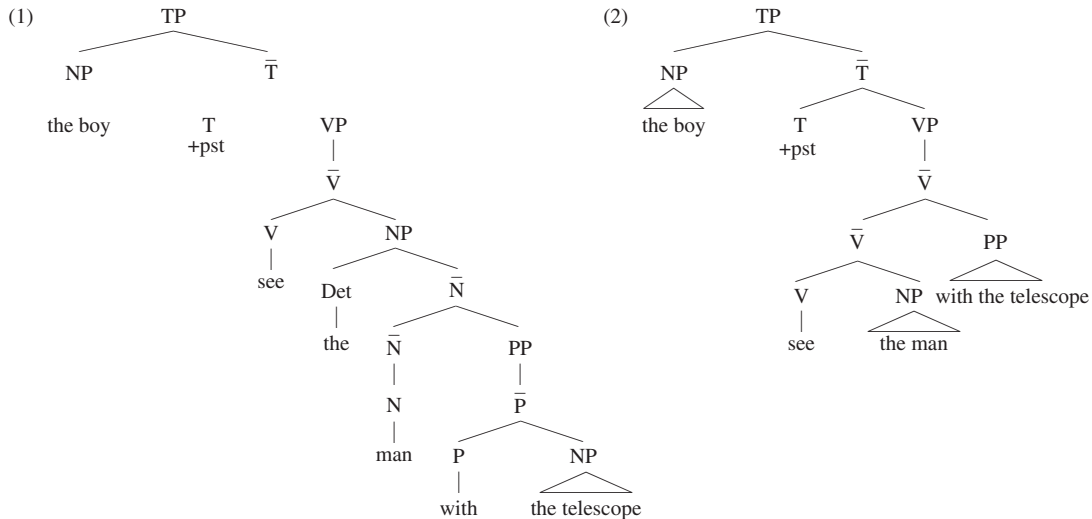
Ambiguity

Let's pass gas.

SEEN ON A SIGN IN THE LUNCHROOM OF AN ELECTRIC UTILITY COMPANY

Our semantic knowledge tells us when words or phrases (including sentences) have more than one meaning: that is, when they are ambiguous. In chapter 3 we saw that the sentence *The boy saw the man with a telescope* was an instance of structural ambiguity. It is ambiguous because it can mean that the boy saw the man by using a telescope or that the boy saw the man who was holding a

telescope. The sentence is structurally ambiguous because it is associated with two different phrase structures, each corresponding to a different meaning. Here are the two structures:



In (1) the PP *with the telescope* modifies the N *man*, so the interpretation is that the man has the telescope. In (2) the PP *with a telescope* modifies \bar{V} , the action of seeing the man, so the interpretation is that the boy saw the man by using the telescope.

Lexical ambiguity arises when at least one word in a phrase has more than one meaning. For instance the sentence *This will make you smart* is ambiguous because of the two meanings of the word *smart*: ‘clever’ and ‘feel a burning sensation.’

Our knowledge of lexical and structural ambiguities reveals that the meaning of a linguistic expression is built both on the words it contains and on its syntactic structure. The notion that the meaning of an expression is composed of the meanings of its parts and how they are combined structurally is referred to as the **principle of compositionality**. In the next section we discuss the rules by which the meaning of a phrase or sentence is determined based on its composition.

Compositional Semantics

To manage a system effectively, you might focus on the interactions of the parts rather than their behavior taken separately.

RUSSELL L. ACKOFF

To account for speakers’ knowledge of grammaticality, constituent structure, and relations between sentences, as well as for the limitless creativity of our linguistic competence, we concluded (chapter 3) that the grammar must contain syntactic rules.

To account for the knowledge that we have of the truth, reference, entailment, and ambiguity of sentences, as well as for our ability to determine the meaning of a limitless number of expressions, we must suppose that the grammar contains semantic rules that combine the meanings of words into meaningful phrases and sentences.

Semantic Rules

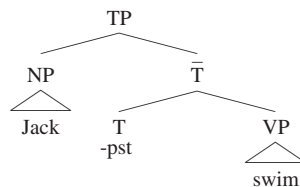
In the sentence *Jack swims*, we know that the word *Jack*, which is a **proper name**, refers to a precise object in the world, which is its **referent**. For instance, in the scenario given earlier, the referential meaning of *Jack* is the guy who is your friend and who is swimming happily in the pool right now. Based on this, we conclude that the meaning of the name *Jack* is the individual it refers to.

What about the meaning of the verb *swim*? At first, it seems as though verbs like *swim* can't pick out a particular thing in the world the way proper names do. But there is a way to think about verbs (and adjectives, and common nouns like *cake*) in terms of what they refer to. Just as the referent of *Jack* relies on what's happening in the world—whether Jack exists, and whether he's swimming in the pool right now—the referent of *swim* depends on what's happening in the world. Based in part on early philosophical work conducted by Gottlob Frege and Bertrand Russell, semanticists think that the best way to define **predicates** (verbs, adjectives and common nouns) is in terms of the individuals that those predicates successfully describe. In particular, the best way to characterize the meaning of *swim*—and a way in which that meaning is reflected in the world—is by having it denote the *set* of individuals (human beings and animals) that swim. You will see in a moment how this way of thinking about the meaning of *swim* helps us understand sentences in a way that accords with our semantic knowledge.

Our semantic rules must be sensitive not only to the meaning of individual words but also to the structure in which they occur. Taking as an example our simple sentence *Jack swims*, let us see how the semantic rules compute its meaning. The meanings of the individual words are summarized as follows:

Word	Meanings
<i>Jack</i>	refers to (or means) the individual Jack
<i>swims</i>	refers to (or means) the set of individuals that swim

The phrase structure tree for our sentence is as follows:

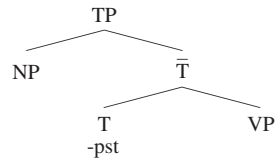


The tree tells us that syntactically the NP *Jack* and the VP *swims* combine to form a sentence (TP). We want to mirror that combination at the semantic

level: in other words, we want to combine the meaning of the NP *Jack* (an individual) and the meaning of the VP *swims* (a set of individuals) to obtain the meaning of the sentence *Jack swims*. This is done by means of Semantic Rule I.

Semantic Rule I

The meaning of



is the following truth condition:

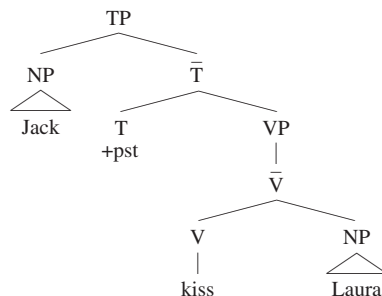
If the meaning of NP (an individual) is a member of the meaning of VP (a set of individuals), then the sentence is TRUE; otherwise it is FALSE.

Rule I states that a sentence composed of a subject NP and a predicate VP is true if the subject NP refers to an individual who is among the members of the set that constitute the meaning of the VP. This rule is entirely general; it does not refer to any particular sentence, individual, or verb. It works equally well for sentences like *Ellen sings* or *Max barks*. Thus the meaning of *Max barks* is the truth condition (i.e., the “if-sentence”) that states that the sentence is true if the individual denoted by *Max* is among the set of *barking* individuals.

Let us now try a slightly more complex case: the sentence *Jack kissed Laura*. The main syntactic difference between this example and the previous one is that we now have a transitive verb that requires an extra NP in object position; otherwise our semantic rules derive the meaning using the same mechanical procedure as in the first example. We again start with the word meaning and syntactic structure:

Word	Meanings
<i>Jack</i>	refers to (or means) the individual Jack
<i>Laura</i>	refers to (or means) the individual Laura
<i>kissed</i>	refers to (or means) the set of <u>pairs of individuals</u> X and Y such that X kissed Y.

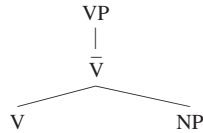
Here is the phrase structure tree:



The meaning of the transitive verb *kiss* is still a set, but this time a set of *pairs* of individuals. The meaning of the VP, however, is still a set of single individuals, namely those who kissed Laura. This may be expressed formally in Semantic Rule II.

Semantic Rule II

The meaning of



is the set of individuals X such that X is the first member of any pair in the meaning of V whose second member is the meaning of NP.

The meaning of the sentence is derived by first applying Semantic Rule II, which establishes the meaning of the VP as a certain set of individuals, namely those who kissed Laura. Now Semantic Rule I applies without further ado and gives the meaning of the sentence to be true whenever the meaning of *Jack* is a member of the set that is the meaning of the VP *kissed Laura*. In other words, the sentence is true if Jack kissed Laura and false otherwise. These two semantic rules handle a limitless number of intransitive and transitive sentences.

One last example will illustrate how the semantic knowledge of entailment may be represented in the grammar. Consider *Jack swims beautifully*, and consider further the meaning of the adverb *beautifully*. Its meaning is clearly not an individual or a set of individuals. Rather, the meaning of *beautifully* is an operation that reduces the size of the sets that are the meanings of verb phrases. When applied to the meaning of *swims*, it reduces the set of individuals who swim to the smaller set of those who swim beautifully. We won't express this rule formally, but it is now easy to see one source of entailment. The truth conditions that make *Jack swims beautifully* true are narrower than the truth conditions that make *Jack swims* true by virtue of the fact that among the individuals who swim, fewer of them swim beautifully. Therefore, any truth condition that causes *Jack swims beautifully* to be true necessarily causes *Jack swims* to be true; hence, *Jack swims beautifully* entails *Jack swims*.

These rules, and many more like them, account for our knowledge concerning the truth value of sentences by taking the meanings of words and combining them according to the syntactic structure of the sentence. It is easy to see from these examples how ambiguous meanings arise. Because the meaning of a sentence is computed based on its hierarchical organization, different trees will have different meanings—structural ambiguity—even when the words are the same, as in the example *The boy saw the man with the telescope*.

Similarly, the occurrence of an ambiguous word—lexical ambiguity—when it combines with the other elements of a sentence can make the entire sentence ambiguous, as in *She can't bear children*.

The semantic theory of sentence meaning that we just sketched is not the only possible one, and it is also incomplete, as shown by the paradoxical sentence *This sentence is false*. The sentence cannot be true, else it's false; it cannot be false, else it's true. Therefore it has no truth value, though it certainly has meaning. This notwithstanding, compositional truth-conditional semantics has proven to be an extremely powerful and useful tool for investigating the semantic properties of natural languages.

When Compositionality Goes Awry

A loose sally of the mind; an irregular undigested piece; not a regular and orderly composition.

SAMUEL JOHNSON (1709–1784)

The meaning of an expression is not always obvious, even to a native speaker of the language. Meanings may be obscured in many ways, or at least may require some imagination or special knowledge to be apprehended. Poets, pundits, and yes, even professors can be difficult to understand.

In the previous sections we saw that semantic rules compute sentence meaning compositionally based on the meanings of words and the syntactic structure that contains them. There are, however, interesting cases in which compositionality breaks down, either because there is a problem with words or with the semantic rules. If one or more words in a sentence do not have a meaning, then obviously we will not be able to compute a meaning for the entire sentence. Moreover, even when the individual words have meaning, if they cannot be combined together as required by the syntactic structure and related semantic rules we will also not get to a meaning. We refer to situations of this sort as semantic **anomaly**. Alternatively, it might require a lot of creativity and imagination to derive a meaning. This is what happens in **metaphors**. Finally, some expressions—called **idioms**—have a fixed meaning: that is, a meaning that is not compositional. Applying compositional rules to idioms gives rise to funny or inappropriate meanings.

Anomaly

Don't tell me of a man's being able to talk sense; everyone can talk sense. Can he talk nonsense?

WILLIAM PITT

There is no greater mistake in the world than the looking upon every sort of nonsense as want of sense.

LEIGH HUNT, "On the Talking of Nonsense," 1820

The semantic properties of words determine what other words they can be combined with. A sentence widely used by linguists that we encountered in chapter 3 illustrates this fact:

Colorless green ideas sleep furiously.

The sentence obeys all the syntactic rules of English. The subject is *colorless green ideas* and the predicate is *sleep furiously*. It has the same syntactic structure as the sentence

Dark green leaves rustle furiously.

but there is obviously something semantically wrong with the sentence. The meaning of *colorless* includes the semantic feature 'without color,' but it is

combined with the adjective *green*, which has the feature ‘green in color.’ How can something be both ‘without color’ and ‘green in color’? Other semantic violations occur in the sentence. Such sentences are semantically **anomalous**.

Other English “sentences” make no sense at all because they include “words” that have no meaning; they are **uninterpretable**. They can be interpreted only if some meaning for each nonsense word can be dreamt up. Lewis Carroll’s “Jabberwocky” is probably the most famous poem in which most of the content words have no meaning—they do not exist in the lexicon of the language. Still, all the sentences sound as if they should be or could be English sentences:

’Twas brillig, and the slithy toves
Did gyre and gimble in the wabe;
All mimsy were the borogoves,
And the mome raths outgrabe.

...

He took his vorpal sword in hand:
Long time the manxome foe he sought—
So rested he by the Tumtum tree,
And stood awhile in thought.

Without knowing what *vorpal* means, you nevertheless know that

He took his vorpal sword in hand

means the same thing as

He took his sword, which was vorpal, in hand

and

It was in his hand that he took his vorpal sword.

Knowing the language, and assuming that *vorpal* means the same thing in the three sentences (because the same sounds are used), you can decide that the sense—the truth conditions—of the three sentences are identical. In other words, you are able to decide that two things mean the same thing even though you do not know what either one means. You decide by assuming that the semantic properties of *vorpal* are the same whenever it is used.

We now see why Alice commented, when she had read “Jabberwocky”:

‘It seems very pretty, but it’s *rather* hard to understand!’ (You see she didn’t like to confess, even to herself, that she couldn’t make it out at all.) ‘Somehow it seems to fill my head with ideas—only I don’t exactly know what they are! However, *somebody* killed *something*: that’s clear, at any rate—’

Semantic violations in poetry may form strange but interesting aesthetic images, as in Dylan Thomas’s phrase *a grief ago*. *Ago* is ordinarily used with words specified by some temporal semantic feature:

a week ago		*a table ago
a hour ago	but not	*a dream ago
a month ago		*a mother ago
a century ago		

When Thomas used the word *grief* with *ago*, he was adding a durational feature to grief for poetic effect, so while the noun phrase is anomalous, it evokes certain emotions.

In the poetry of E. E. Cummings, there are phrases like

the six subjunctive crumbs twitch
a man . . . wearing a round jeer for a hat
children building this rainman out of snow¹

Though all of these phrases violate some semantic rules, we can understand them; breaking the rules creates the desired imagery. The fact that we are able to understand, or at least interpret, anomalous expressions, and at the same time recognize their anomalous nature, demonstrates our knowledge of the semantic system and semantic properties of the language.

Metaphor

Our doubts are traitors.

WILLIAM SHAKESPEARE, *Measure for Measure*, c. 1603

Walls have ears.

MIGUEL DE CERVANTES, *Don Quixote*, 1605

The night has a thousand eyes and the day but one.

FRANCES WILLIAM BOURDILLON, "Light," 1873

When what appears to be an anomaly is nevertheless understood in terms of a meaningful concept, the expression becomes a metaphor. There is no strict line between anomalous and metaphorical expressions. Technically, metaphors are anomalous, but the nature of the anomaly creates the salient meanings that metaphors usually have. The anomalous *A grief ago* might come to be interpreted by speakers of English as 'the unhappy time following a sad event' and therefore become a metaphor.

Metaphors may have a literal meaning as well as their metaphorical meaning, so in some sense they are ambiguous. However, when the semantic rules are applied to *Walls have ears*, for example, the literal meaning is so unlikely that listeners use their imagination for another interpretation. The principle of compositionality is very "elastic" and when it fails to produce an acceptable literal meaning, listeners

¹The line from "sonnet entitled how to run the world." Copyright 1935, © 1963, 1991 by the Trustees for the E. E. Cummings Trust. Copyright © 1978 by George James Firmage. The line from "A man who had fallen among thieves." Copyright 1926, 1954, © 1991 by the Trustees for the E. E. Cummings Trust. Copyright © 1985 by George James Firmage. The line from "here is little Effie's head." Copyright 1923, 1925, 1951, 1953, © 1991 by the Trustees for the E. E. Cummings Trust. Copyright © 1976 by George James Firmage. From *Complete Poems: 1904–1962* by E. E. Cummings, edited by George J. Firmage. Used by permission of Liveright Publishing Corporation.

try to accommodate and stretch the meaning. This accommodation is based on semantic properties that are inferred or that provide some kind of resemblance or comparison that can end up as a meaningful concept.

This works only up to a certain point, however. It's not clear what the literal meaning of *Our doubts are traitors* might be, though the conceptual meaning that the act of doubting a precious belief is self-betrayal seems plausible. To interpret a metaphor we need to understand the individual words, the literal meaning of the whole expression, and facts about the world. To understand the metaphor

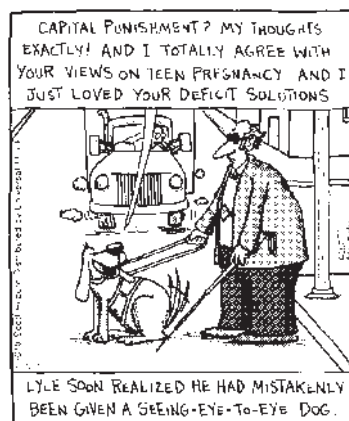
Time is money

it is necessary to know that in our society we are often paid according to the number of hours or days worked. In fact, "time," which is an abstract concept, is the subject of multiple metaphors. We "save time," "waste time," "manage time," push things "back in time," live on "borrowed time," and suffer the "ravages of time" as the "sands of time" drift away. In effect, the metaphors take the abstract concept of time and treat it as a concrete object of value.

Metaphor has a strong cultural component. Shakespeare uses metaphors that are lost on many of today's playgoers. "I am a man whom Fortune hath cruelly scratched," is most effective as a metaphor in a society like Shakespeare's that commonly depicts "Fortune" as a woman. On the other hand *There's a bug in my program* would make little sense in a culture without computers, even if the idea of having bugs in something indicates a problem.

Many expressions now taken literally may have originated as metaphors, such as "the fall of the dollar," meaning its decline in value on the world market. Many people wouldn't bat an eyelash (another metaphor) at the literal interpretation of saving or wasting time. Metaphorical use of language is language creativity at its highest. Nevertheless, the basis of metaphorical use is very much the ordinary linguistic knowledge that all speakers possess about words, their semantic properties, and their combinatorial possibilities.

Idioms



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Because the words (or morphemes) of a language are arbitrary (not predictable by rule), they must be listed in a mental lexicon. The lexicon is a repository of the words (or morphemes) of a language with their grammatical properties and their meanings. On the other hand, the meanings of morphologically complex words, phrases, and sentences are compositional and are derived by rules. We noted in chapter 2 that the meaning of some words (for example, compounds) is not predictable, so these must also be given in the lexicon. It turns out that languages also contain many phrases whose meanings are not predictable on the basis of the meanings of the individual words. These phrases typically start out as metaphors that “catch on” and are repeated so often that they become fixtures in the language. Such expressions are called *idioms*, or **idiomatic phrases**, as in these English examples:

sell down the river
 rake over the coals
 drop the ball
 let their hair down
 put his foot in his mouth
 throw her weight around
 snap out of it
 give a piece of your mind

Here is where the usual semantic rules for combining meanings do not apply. The principle of compositionality is superseded by expressions that act very much like individual morphemes in that they are not decomposable, but have a fixed meaning that must be learned. Idioms are similar in structure to ordinary phrases except that they tend to be frozen in form and do not readily undergo rules that change word order or substitution of their parts.

Thus, the sentence in (1) has the same structure as the sentence in (2).

1. She put her foot in her mouth.
2. She put her bracelet in her drawer.

But while the sentences in (3) and (4) are clearly related to (2),

3. The drawer in which she put her bracelet was her own.
4. Her bracelet was put in her drawer.

the sentences in (5) and (6) do not have the idiomatic sense of sentence (1), except, perhaps, humorously.

5. The mouth in which she put her foot was her own.
6. Her foot was put in her mouth.

Also, if we know the meaning of (2) and the meaning of the word *necklace* we will immediately understand (7).

7. She put her necklace in the drawer.

But if we try substituting *hand* for *foot* in sentence (1), we do not maintain the idiomatic meaning, but rather have the literal compositional meaning.

There are, however, some idioms whose parts can be moved without affecting the idiomatic sense:

The FBI kept tabs on radicals.
 Tabs were kept on radicals by the FBI.
 Radicals were kept tabs on by the FBI.

Like metaphors, idioms can break the rules on combining semantic properties. The object of *eat* must usually be something with the semantic feature “edible,” but in

He ate his hat.

and

Eat your heart out.

this restriction is violated.

Idioms often lead to humor:

What did the doctor tell the vegetarian about his surgically implanted heart valve from a pig?
 That it was okay as long as he didn’t “eat his heart out.”

Idioms may even show disrespect for syntax, e.g., the expression *deep six*, while containing parts that are never used as verbs, is itself a verb meaning ‘to put the kibosh on,’ yet another idiom. Where will it ever end!?

With some imagination, idioms may also be used to create what appear to be paradoxes. In many places such as Times Square in New York, a ball is dropped at midnight on New Year’s Eve. Now, if the person in charge doesn’t drop the ball, then he has “dropped the ball.” And if that person does indeed drop the ball, then he has not “dropped the ball.” Right?

Idioms, grammatically as well as semantically, have special characteristics. They must be entered into the lexicon or mental dictionary as single items with their meanings specified, and speakers must learn the special restrictions on their use in sentences.

All languages have idioms, but idioms rarely if ever translate word for word from one language to another. Most speakers of American English understand the idiom *to kick the bucket* as meaning ‘to die.’ The same combination of words in Spanish (*patear el cubo*) has only the literal meaning of striking a specific bucket with a foot. On the other hand, *estirar la pata*, literally ‘to stretch the (animal) leg,’ has the idiomatic sense of ‘to die’ in Spanish.

Lexical Semantics (Word Meanings)

“There’s glory for you!”

“I don’t know what you mean by ‘glory,’” Alice said.

Humpty Dumpty smiled contemptuously.

“Of course you don’t—till I tell you. I meant ‘there’s a nice knock-down argument for you!’”

“But ‘glory’ doesn’t mean ‘a nice knock-down argument,’” Alice objected.

“When I use a word,” Humpty Dumpty said, in rather a scornful tone, “it means just what I choose it to mean—neither more nor less.”

“The question is,” said Alice, “whether you can make words mean so many different things.”

LEWIS CARROLL, *Through the Looking-Glass*, 1871

As just discussed, the meaning of a phrase or sentence is partially a function of the meanings of the words it contains. Similarly, the meaning of a morphologically complex word is a function of its component morphemes, as we saw in chapter 2. However, there is a fundamental difference between word meaning—or *lexical semantics*—and sentence meaning. The meaning of entries in the mental lexicon—be they morphemes, words, or idioms—is conventional; that is, speakers of a language implicitly agree on their meaning, and children acquiring the language must simply learn those meanings outright. On the other hand, the meaning of most sentences must be constructed by the application of semantic rules. Earlier we discussed the rules of semantic composition. In this section we will talk about word meaning and the semantic relationships that exist between words and morphemes.

Although the agreed-upon meaning of a word may shift over time within a language community, we are not free as individuals to change the meanings of words at will; if we did, we would be unable to communicate with each other. Humpty Dumpty seems unwilling to accept this convention, though fortunately for us there are few such bad eggs among speakers. All the speakers of a language share a basic vocabulary—the sounds and meanings of morphemes and words. Each of us knows the meanings of thousands of words. This knowledge permits us to use words to express our thoughts and to understand the thoughts of others. The meaning of words is part of linguistic knowledge. Your mental storehouse of information about words and morphemes is what we have been calling the *lexicon*.

Theories of Word Meaning

It is natural . . . to think of there being connected with a sign . . . besides . . . the reference of the sign, also what I should like to call the sense of the sign. . . .

GOTTLÖB FREGE, “On Sense and Reference,” 1892

Dictionaries are filled with words and give their meanings using other words rather than in terms of some more basic units of meaning, whatever they might be. In this sense a dictionary really provides *paraphrases* rather than meanings. It relies on our *knowledge* of the language to understand the definitions. The meanings associated with words in our mental lexicon are not like what we find in a conventional dictionary, although it is a challenge to linguists to specify precisely how word meanings are represented in the mind.

If the meaning of a word is not like a dictionary entry, what is it? This question has been debated by philosophers and linguists for centuries. One proposal is that the meaning of a word or expression is its **reference**, its association with the object it refers to. This real-world object is called the *referent*.

Reference



Michael Maslin / The New Yorker Collection/Cartoonbank.com

We have already determined that the meaning of a proper name like *Jack* is its reference: the link between the word *Jack* and the person named Jack, which is its referent. Proper names are noun phrases (NPs); you can substitute a proper name in any NP position in a sentence and preserve grammaticality. There are other NPs that refer to individuals as well. For instance, NPs like *the happy swimmer*, *my friend*, and *that guy* can all be used to refer to Jack in the situation in which you’ve observed Jack swimming. The same is true for pronouns such as *I*, *you*, and *him*, which also function as NPs. In all these cases, the reference of the NP—which singles out the individual referred to under the circumstances—is part of the meaning of the NP.

On the other hand, not every NP refers to an individual. For instance, the sentence *No baby swims* contains the NP *no baby*, but your linguistic knowledge tells you that this NP does not refer to any specific individual. If *no baby* has no reference, but is not meaningless, then something about meaning beyond reference must be present.

In the fictional world, *Superman* and *Clark Kent* have the same reference—they are one and the same person. But there is more meaning to their names than that. If we substitute *Clark Kent* for *Superman* in the sentence *Lois Lane is in love with Superman* we alter its truth value from true to false. Again, we see that there must be a dimension of meaning beyond mere reference.

Similarly, *Barack Obama* and *the President* have (at this writing) the same reference, but the meaning of the NP *the President* is additionally ‘the head of

state of the United States of America,' which is an element of meaning separate from reference and more enduring.

Sense

There must be something more to meaning than reference alone. This is also suggested by the fact that speakers know the meanings of many words that have no real-world referents (e.g., *hobbits*, *unicorns*, and *Harry Potter*). Similarly, what real-world entities would function words like *of* and *by*, or modal verbs such as *will* or *may* refer to?

These additional elements of meaning are often termed **sense**. It is the extra something referred to earlier. *Unicorns*, *hobbits*, and *Harry Potter* have sense but no reference (with regard to objects in the real world). Conversely, proper names typically have only reference. A name like *Clem Kadiddlehopper* may point out a certain person, its referent, but has little linguistic meaning beyond that.

Philosophers of language dating back to ancient Greece have suggested that part of the meaning of a word is the mental image it conjures up. This helps with the problem of unicorns, hobbits, and Harry Potter; we may have a clear image of these entities from books, movies, and so on, and that connection might serve as reference for those expressions. However, many meaningful expressions are not associated with any clear, unique image agreed on by most speakers of the language. For example, what image is evoked by the words *very*, *if*, and *every*? It's difficult to say, yet these expressions are certainly meaningful. What is the image of oxygen as distinct from nitrogen—both are colorless, odorless gases, yet they differ in meaning. What mental image would we have of *dog* that is general enough to include Yorkshire Terriers and Great Danes and yet excludes foxes and wolves? And the image of *no man in no man is an island* presents a riddle worthy of a Zen koan.

Although the idea that the meaning of a word corresponds to a mental image is intuitive (because many words do provoke imagery), it is clearly inadequate as a general explanation of what people know about word meanings.

Perhaps the best we can do is to note that the reference part of a word's meaning, if it has reference at all, is the association with its referent; and the sense part of a word's meaning contains the information needed to complete the association, and to suggest properties that the referent may have, whether it exists in the real world or in the world of imagination.

Lexical Relations

Does he wear a turban, a fez or a hat?
Does he sleep on a mattress, a bed or a mat, or a Cot,
The Akond of Swat?
Can he write a letter concisely clear,
Without a speck or a smudge or smear or Blot,
The Akond of Swat?
EDWARD LEAR, "The Akond of Swat," in *Laughable Lyrics*, 1877

Although no theory of word meaning is complete, we know that speakers have considerable knowledge about the meaning relationships among different

words in their mental lexicons, and any theory must take that knowledge into account.

Words are semantically related to one another in a variety of ways. The words that describe these relations often end in the bound morpheme *-nym*. The best-known lexical relations are synonyms, illustrated in the poem by Edward Lear, and antonyms, or opposites. **Synonyms** are words or expressions that have the same meaning in some or all contexts. There are dictionaries of synonyms that contain many hundreds of entries, such as:

apathetic/phlegmatic/passive/sluggish/indifferent
pedigree/ancestry/genealogy/descent/lineage

A sign in the San Diego Zoo Wild Animal Park states:

Please do not annoy, torment, pester, plague, molest, worry, badger, harry, harass, heckle, persecute, irk, bullyrag, vex, disquiet, grate, beset, bother, tease, nettle, tantalize, or ruffle the animals.

It has been said that there are no perfect synonyms—that is, no two words ever have *exactly* the same meaning. Still, the following two sentences have very similar meanings:

He's sitting on the sofa. / He's sitting on the couch.

During the French Norman occupation of England that began in 1066 CE, many French words of Latin origin were imported into English. As a result, English contains many synonymous pairs consisting of a word with an English (or Germanic) root, and another with a Latin root, such as:

English	Latin
manly	virile
heal	recuperate
send	transmit
go down	descend

Words that are opposite in meaning are **antonyms**. There are several kinds of antonymy. There are **complementary pairs**:

alive/dead present/absent awake/asleep

They are complementary in that *alive* = *not dead* and *dead* = *not alive*, and so on.

There are **gradable pairs** of antonyms:

big/small hot/cold fast/slow happy/sad

The meaning of adjectives in gradable pairs is related to the objects they modify. The words do not provide an absolute scale. For example, we know that “a small elephant” is much bigger than “a large mouse.” *Fast* is faster when applied to an airplane than to a car.

Gradable pairs give rise to implications, so that *An elephant is bigger than a mouse* implies *A mouse is smaller than an elephant*. But beware of idioms! *Blood is thicker than water* as an idiom about family ties does not imply the nonsensical (as an idiom) *water is thinner than blood*.

Another characteristic of certain pairs of gradable antonyms is that one is **marked** and the other **unmarked**. The unmarked member is the one used in questions of degree. We ask, ordinarily, “How *high* is the mountain?” (not “How low is it?”). We answer “Ten thousand feet high” but never “Ten thousand feet low,” except humorously or ironically. Thus *high* is the *unmarked* member of *high/low*. Similarly, *tall* is the unmarked member of *tall/short*, *fast* the unmarked member of *fast/slow*, and so on.

Another kind of opposition involves pairs like

give/receive buy/sell teacher/pupil

They are called **relational opposites**, and they display symmetry in their meanings. If X *gives* Y to Z, then Z *receives* Y from X. If X is Y’s *teacher*, then Y is X’s *pupil*. Pairs of words ending in *-er* and *-ee* are usually relational opposites. If Mary is Bill’s *employer*, then Bill is Mary’s *employee*.

In English there are several ways to form antonyms. You can add the prefix *un-*:

likely/unlikely able/unable fortunate/unfortunate

or you can add *non-*:

entity/nonentity conformist/nonconformist

or you can add *in-*:

tolerant/intolerant discreet/indiscreet decent/indecent

These strategies occasionally backfire, however. Pairs such as *loosen* and *unloosen*; *flammable* and *inflammable*; *valuable* and *invaluable*; and a few others actually have the same or nearly the same meaning, despite looking like antonyms.

Other lexical relations include homonyms, polysemy, and hyponyms.



Hilary B. Price/King Features Syndicate

Words like *bear* and *bare* are **homonyms** (also called **homophones**). Homonyms are words that have different meanings but are pronounced the same, and may or may not be spelled the same. (They’re **homographs** when spelled the same, but when homographs are pronounced differently like *pussy* meaning ‘infected’ or *pussy* meaning ‘kitten,’ they are called **heteronyms** rather

than homonyms.) Near nonsense sentences like *Entre nous, the new gnu knew nu is a Greek letter* tease us with homonyms. Homonyms easily lead to ambiguity, as the confused canine in the cartoon confirms.

When a word has multiple meanings that are related conceptually or historically, it is said to be **polysemous**. For example, the word *diamond* referring to a jewel and also to a baseball field is polysemous. Many words in English are polysemous and have several separated entries in dictionaries owing to their diverse meanings.

Speakers of English know that the words *red*, *white*, and *blue* are color words. Similarly, *lion*, *tiger*, *leopard*, and *lynx* are all felines. *Hyponymy* is the relationship between the more general term such as *color* and the more specific instances of it, such as *red*. Thus *red* is a hyponym of *color*, and *lion* is a hyponym of *feline*; or equivalently, *color* has the hyponym *red* and *feline* has the hyponym *lion*.

Semantic Features

If it is true that words have meanings, why don't we throw away words and keep just the meanings?

LUDWIG WITTGENSTEIN

In the previous sections we discussed word meaning in relation to objects in the world, and this permitted us to develop a truth-based semantics. We also explored the meaning of words in relation to other words. But it is also possible to look for a more basic set of **semantic features** or properties that are part of word meanings and that reflect our knowledge about what words mean.

Decomposing the meanings of words into semantic features can clarify how certain words relate to other words. For example, the basic property of antonyms is that they share all but one semantic feature. We know that *big* and *red* are not antonyms because they have too few semantic features in common. They are both adjectives, but *big* has a semantic feature “about size,” whereas *red* has a semantic feature “about color.” On the other hand, *buy/sell* are relational opposites because both contain a semantic feature like “change in possession,” and differ only in the direction of the change.

Semantic features are among the conceptual elements that are part of the meanings of words and sentences. Consider, for example, the sentence:

The assassin killed Thwacklehurst.

If the word *assassin* is in your mental dictionary, you know that it was some *person* who murdered some *important person* named Thwacklehurst. Your knowledge of the meaning of *assassin* tells you that an animal did not do the killing, and that Thwacklehurst was not an average citizen. Knowledge of *assassin* includes knowing that the individual to whom that word refers is human, is a murderer, and is a killer of important people. These bits of information are some of the semantic features of the word on which speakers of the language agree. The meaning of all nouns, verbs, adjectives, and adverbs—the