9 Semantics

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9.1 What is semantics?

Semantics is the field of linguistics concerned with the study of meaning. This definition, of course, immediately raises the question: what does a semanticist take meaning to be? The answer is not so straightforward. The English verb *mean* and its derivations show that the term is used in numerous ways that have little to do with linguistics. *Mean*, *meaning* and *meaningful* in the sentences in [9.1], for instance, can be paraphrased as *intend*, *purpose* and *significant* and do not really relate to language in any way.

[9.1] a. She *means* no harm.
b. Many of our patients lack *meaning* in their lives.
c. Does your job make a *meaningful* contribution to society?

What is more, not even all linguistic meaning is traditionally regarded as included under the heading of semantics. One could characterize meaning in linguistics roughly as the content expressed in communication by means of language or as the message that a speaker conveys to a hearer. In this sense, the sentence *it's raining* can be said to possess two different meanings as a reply to the questions in [9.2]. Imagine a foreign student at a UK university. He is asked about the weather during a phone call with his dad and uses the sentence as a simple description of the current meteorological conditions in the country. This student is later invited to go for a run by his girlfriend and he utters the same sentence. As a response to her inquiry, *it's raining* is not a mere statement, however. It probably means *no, I don't* here.

[9.2] a. What is the weather like in the UK at the moment?
b. Do you want to go for a run with me?

To account for this difference in meaning, linguists need to appeal to the speaker's communicative aims and the situation in which the sentence is uttered. For traditional semanticists, such meaning falls outside of their area of research. They would relegate meaning arising in context or requiring reference to language users to other fields of linguistics, like pragmatics (see Chapter 10). So what type of meaning are they interested in? They would argue that the two ways in which *it's raining* is used in [9.2] have something in common which does not depend on the speaker, the hearer or the situation. It is this shared core that semantics has typically concentrated on. It is sometimes called **descriptive meaning**. In essence, it deals with the objective content of a message, which depicts situations or events and can be affirmed or refuted. Semantics has, in other words, been concerned more with *it's raining* as a statement about the weather than as a roundabout way of declining an invitation.

The distinction between semantics and the study of other linguistic meaning looks useful at first sight. It allows scholars to investigate how meaning comes about in isolation and how it can then be manipulated in communication. Upon closer inspection, however, meaning relies on usage to such an extent that it is often hard to draw or maintain the distinction. Consider the words *strong* and *powerful*, which appear to have very similar meanings. In the phrase *a strong*

argument, for example, the adjective can easily be replaced by *powerful*, with little or no difference in meaning. They are not identical, though. The dissimilarities come to light when one examines the contexts in which they occur. *Strong coffee* sounds perfectly normal but *powerful coffee* is a little weird and, the other way around, *a powerful engine* is fine but *a strong engine* sounds strange. To tell the two words apart, it seems almost inevitable to take their actual usage into account. In Firth's (1957: 11) famous words, 'you shall know a word by the company it keeps'. For this and other reasons, many linguists nowadays no longer accept a strict division between the field of semantics and fields like pragmatics. They are convinced that linguistic meaning can only be studied in context. Some even believe that non-linguistic meaning needs to be considered too. The present chapter will nevertheless focus on semantics in its traditional sense. A discussion of these recent advances goes beyond the scope of an introduction.

The first part of this chapter presents three different classic approaches to semantics. We start by exploring the view that meaning should be defined in terms of reference. We then examine the idea that one can capture an expression's meaning by identifying its relations to other expressions. Finally, we look at the position that meaning is to be regarded as a set of defining features that need to be checked in any use of some expression. The second part of this chapter briefly addresses three other questions that have occupied linguists working in the field: how many meanings can expressions possess, what meaning is conveyed by whole sentences and how does meaning impact the mind?

9.2 Three general approaches to semantics

9.2.1 The referential approach

Imagine a woman complimenting her partner on the dinner that she has prepared. When uttering the sentence in [9.3], she is voicing an opinion about an entity in the world, namely the meat on her plate. She is using the words *the steak* to refer to a particular physical object.

[9.3] The steak is delicious.

This act of relating a linguistic form to something that lies outside of language, in the real world or an imaginary world, is called **reference**. The phrase *the steak* is termed the **referring expression**, the actual cut of beef the **referent**.

Reference may be definite or indefinite. With **definite** reference, the speaker presumes that the hearer can identify the referent of the expression. In [9.3], for instance, it should be clear to the hearer from the situation that her partner is talking about the meat that she is eating. There is more than one way in which referents can be assumed to be identifiable, however. In [9.4a], it is probably the knowledge shared by the speech participants about, say, the area where they live that makes definite reference to the movie theater possible. In [9.4b], it is the fact that there was mention of a boy earlier in the discourse. In English, definite reference is typically signaled by the article *the* but can also be marked by possessives and demonstratives, like *my* and *those* in [9.4c]. Moreover, personal pronouns and proper names, like *them* and *Lana* in the example, are intrinsically definite.

[9.4] a. Did you know that they are closing *the movie theater*?

b. She gave birth to twins, a boy and a girl, but *the boy* died shortly after delivery.
c. *My uncle* told *them those* stories, *Lana*.

With **indefinite** reference, the speaker presumes that the hearer is not able to identify the referent of the expression. In English, this type of reference is usually indicated by the article *a*(*n*) or a so-called zero article. Compare the definite noun phrases in [9.5a] to their indefinite counterparts in [9.5b].

[9.5] a. He showed us *the room*. She gave us *the keys*.
b. He showed us *a room*. She gave us *keys*.

The sentences in [9.3] to [9.5] are all about one or more individual instances of some entity. In [9.5b], for example, *a room* is used for a single unidentifiable instance of a room and *the keys* for an un unspecified number of identifiable and distinct keys. This type of reference is sometimes called **individuative**. It contrasts with the cases of **generic** reference in [9.6].

[9.6] a. *A zombie* eats brains.
b. *Werewolves* are real.
c. *The vampire* hunts at night

The subject noun phrase in each of these examples does not serve to refer to individual supernatural beings but to an entire class of them. As [9.6] shows, in English, generic reference can be indicated in various ways. They are all somewhat different in character, though: *a zombie is scary*, for instance, sounds a little weird as a general statement (see Lyons 1977, in particular chapter 7, for an authoritative analysis of types of reference and their linguistic realizations).

It is quite obvious that, without reference, it is impossible to know what sentences mean. The question here is whether a purely referential approach to semantics, as advocated by the English philosopher John Stuart Mill (1806-1873) among others, is adequate. The answer appears to be no. Let us suppose, for argument's sake, that meaning indeed equates to reference. Expressions with the same referent would have to be regarded as having the same meaning then. But do we really want to claim that the phrases in [9.7] are identical in meaning to *Batman*? Speakers do not use them interchangeably. In a conversation about Batman and his sidekick, for instance, [9.7a] is a more suitable or likely referring expression than [9.7b] as only the former captures a relationship that is relevant at the time of speaking. This quality of [9.7a] cannot be accounted for by an exclusively reference-based theory of semantics.

[9.7] a. Robin's mentor
b. the Joker's arch-enemy

Furthermore, what would we do with expressions like *dangerous* in [9.8a] and *slowly* in [9.8b]? They do not serve to refer to any entity or event in the world themselves. Rather, the adjective is used to predicate a property of the canine entity and the adverb to modify the event of opening the door. In a similar vein, it may not be straightforward to describe what a function word like *must* in [9.8a] and a grammatical ending like *-ing* in [9.8b] exactly mean but they clearly do not involve reference.

[9.8] a. The dog *must* be *dangerous*.

b. We are open*ing* the door *slowly*.

Such non-referring or, put differently, **designating** expressions would have to be analyzed as lacking meaning in a wholly referential approach. This result seems counterintuitive and undesirable: there must be more to semantics than reference.

9.2.2 The relational approach

Sense is the term typically used for the aspect of meaning that distinguishes *Robin's mentor* from *the Joker's arch-enemy* and for the content of words like *dangerous* and *must*. The relational approach, based on insights from the so-called structuralist linguist De Saussure (1977[1916]), regards a linguistic expression's sense as originating from its links with the other expressions in the language. The idea is that the meaning of, say, *ewe* is defined by its relations to *bleat*, *flock*, *ram*, *sheep* and the like.

These relations come in two main types. The **syntagmatic** type concerns the links of an expression to the expressions that it co-occurs with in a phrase or sentence. Certain expressions are more compatible than others semantically. *Boil* in [9.9a], for instance, makes sense with *eggs* but sounds weird with *cakes* as its direct object, as in [9.9b]. This noun seems to go better with *bake* while *steak*, to give another example, fits best with *cook* or *grill*.

[9.9] a. Kim is boiling eggs.
b. ? Kim is boiling cakes.

Syntagmatic relations are thus all about how coherent the meaning of a grammatical combination of linguistic expressions is. The incoherence of [9.9b] results from a clash between the senses of the verb and the noun. Cakes are not prepared in water and therefore do not meet the requirements to be an object of *boil*. Incoherence can also be due to the fact that no extra information is offered. In *female ewe*, for example, the adjective mentions a trait that is already present in the noun. *Eggs* in [9.9a], by contrast, adds information to *boil* and is a suitable object of the verb.

The **paradigmatic** type has to do with the links of an expression to the other expressions that can occur in the same syntactic slot without rendering the sentence meaningless. Consider *eggs* in [9.9a] again. It is only one of the options that speakers have to fill the slot of direct object. Possible substitutes are given in [9.10a].

[9.10] a. Kim is boiling *broccoli* / *lobsters* / *milk*.
b. *Kim is boiling *colorful*.

These words are paradigmatically related to *eggs*. The ungrammaticality of [9.10b] shows that *colorful*, for one, is not.

Paradigmatic relations have a number of subtypes. The most well-known ones are synonymy and opposition. **Synonyms** are often defined as expressions with identical senses. This definition could be taken to suggest that we should always be able to replace an expression with its synonym. Few words that are traditionally considered synonymous pass this criterion, though. Remember the adjectives *strong* and *powerful*: they are interchangeable when modifying the noun *argument* but not when modifying *coffee* or *engine*. **Absolute synonymy** probably does not

exist. For that reason, it is perhaps better to characterize synonyms as expressions with very similar senses. One criterion that is commonly used states that they should be able to take one another's place in any declarative sentence without altering its truth value. Take *infectious mononucleosis* and *kissing disease* in [9.11]. These terms do not typically appear in the same kinds of context. Still, if [9.11a] is a true statement, [9.11b] is too and vice versa.

[9.11] a. *Infectious mononucleosis* is caused by the Epstein-Barr virus.
b. *The kissing disease* is caused by the Epstein-Barr virus.

However, many expressions that are felt to be synonymous do not satisfy this criterion either. *Assassinate* and *kill*, for instance, are similar but, as in [9.12a], we can affirm the former and refute the latter at the same time. The two terms in [9.11] do not allow this, as [9.12b] shows.

[9.12] a. Great men are *assassinated*, not *killed*.
b. ?The Epstein-Barr virus causes *infectious mononucleosis*, not *the kissing disease*.

Expressions like *assassinate* and *kill* are sometimes called **near-synonyms**.

ILLUSTRATION BOX 9.1

Can* and *may

Are the modal auxiliaries *can* and *may* synonyms? In a sentence like [9.13a], they can replace each other with little difference in meaning, although one is probably more formal than the other. They both convey permission here or, more technically, deontic modality (which also includes obligation). The two auxiliaries are not always interchangeable, however. *May* cannot express ability or so-called dynamic modality like in [9.13b] while *can* cannot be used to assess the likelihood of her coming later in [9.13c]. This last type of modality is called epistemic.

[9.13] a. *Can* / *may* I come in?
b. He *can* swim.
c. She *may* be coming later.

Can and *may* seem to have a number of related meanings, which all have something to do with the presentation or establishment of a possibility: 'be allowed to', 'be able to' and 'perhaps' (see Section 9.3.1 on polysemy). As they only overlap in one of these, it is probably a stretch to regard them as synonyms (see Coates 1983 for a ground-breaking study of the semantics of the English modal auxiliaries).

Opposites are pairs that belong together but are not compatible in some way. With **complementary** opposites like *off* and *on*, the incompatibility amounts to mutual exclusivity: if the claim *the TV is on* is true, *the TV is off* is false and the other way around. **Antonymic** opposites like *good* and *bad* do not exhibit this property. Speakers can assert that a movie is not good without meaning to say that it is bad. They may just be indifferent about the movie. In other

words, antonyms constitute opposite points on a gradable scale, with a number of values between the two. Their gradability entails that, unlike complementary adjectives like *male* and *female*, they can be modified by degree adverbs, as in [9.14a], and occur in comparative constructions, as in [9.14b].

[9.14] a. Christopher Nolan's remakes of Batman are *very good*.
b. The movie with the Joker is *better than* those with the League of Shadows.

Directional opposites concern changes of position or movements in opposite directions. *Come* and *go* are a case in point. **Converse** opposites, lastly, depict the same relation between two entities but differ in the entity chosen as the perspective from which it is presented. *Buddhism predates Christianity*, for instance, offers the one perspective and *Christianity postdates Buddhism* the other.

Two lesser-known subtypes are meronymy and hyponymy. **Meronymy** is the paradigmatic relation between, say, *wheel* and *bicycle*: a wheel is part of a bicycle. *Wheel* is called the meronym, *bicycle* the **holonym**. **Hyponymy** can be exemplified by *bicycle* and *vehicle*: a bicycle is not a part of a vehicle but a kind of vehicle. The technical term for *bicycle* here is hyponym, that for *vehicle* is **hyperonym** or **superordinate**. One of the properties that distinguishes hyponymic and meronymic relations is transitivity. If X is a hyponym of Y and Y a hyponym of Z, X is also a hyponym of Z. Put differently, *currant* is a type of *berry*, *berry* is a type of *fruit* and thus *currant* is a type of *fruit*. This property does not hold for meronymy. *Lens*, for instance, is a meronym of *eye* and *eye* one of *face* but lenses are normally not considered part of someone's face.

The relations discussed in this section tell us a lot about meaning (see Lyons 1963 for a seminal example of their usefulness). An exclusively relational approach to semantics runs into problems, however. In such a view, the sense of, say, *boil* is the total of its syntagmatic and paradigmatic links to other expressions. They include, among others, *water* and *condense*. The senses of these words, in turn, amount to the sums of their relations, partly overlapping with *boil* but also diverging from it significantly. In a way, this sequence never stops and expressions have no actual semantic substance, only direct and indirect connections to almost every other expression in the language. Moreover, if senses are purely relational, it is hard to see how children can learn them. To put it somewhat crudely: how would they know what their first word means if they are not yet familiar with the words by which it is supposed to be defined?

9.2.3 The denotational approach

In a denotational approach to semantics, the sense of an expression is seen as the defining properties that need to be fulfilled in any of its uses. For a referring expression such as *dog*, for example, the meaning is essentially the set of properties which characterizes its **denotata** or, in other words, the whole range of its possible referents, from Great Danes to Chihuahuas.

The nature of these properties is a matter of debate. The traditional view is that it is the set of characteristics that captures the essence of all potential referents. The **necessary conditions** for an entity to be called, say, *colt* are that it is a horse and that it is young and male. Any entity that does not meet one or more of these requirements is not a referent of *colt*. Any entity that satisfies all the conditions is one. It is irrelevant whether this entity has a gray or white coat or whether it is tall or short. Such characteristics are not essential to what it means to be a colt.

Together, the three properties mentioned first are **sufficient conditions** for an entity to be a referent of *colt*.

One of the most influential ways of representing the necessary and sufficient conditions of expressions is **componential analysis** (see Wierzbicka 1996 for an influential example). It breaks down senses into the smallest possible pieces of meaning. These so-called semantic features are often (but not always) binary and are used to distinguish expressions from one another. The features [male] and [adult], for instance, can serve to differentiate the senses of the equine terms in [9.15]. They apply to the words *boy*, *man*, *woman* and *girl* too, of course. To set apart the latter group from the former, we need to introduce at least one other feature, for which [human] seems a good candidate.

[9.15]	a.	*colt*	[+ male, - adult]
	b.	*stallion*	[+ male, + adult]
	c.	*mare*	[- male, + adult]
	d.	*filly*	[- male, - adult]

Componential analysis seeks to describe as much of the lexicon as possible in this manner and with a limited number of semantic features. Some linguists argue that this list of features corresponds to something real in the brain. They also take it to be universal or, put differently, to underlie meaning in any language. Other scholars are more skeptical. They wonder, for instance, whether an analysis like [9.15] of *man* [+ male, + adult], *woman* [- male, + adult], *boy* [+ male, - adult] and *girl* [- male, - adult] does justice to the dissimilarities between the pairs *man*-*woman* and *boy*-*girl*. These pairs differ in the value for [adult] but the relation between the words in each pair is presumed to be the same otherwise, namely [± male]. Yet, the female humans that *girl* denotes can be much older than the male humans that *boy* applies to. This peculiarity is absent from *woman* versus *man*.

It is not just the representation of necessary and sufficient conditions that has been criticized. People have also raised more fundamental objections to the classic denotational approach. Can we, for instance, really identify a set of essential properties for each expression that include all its potential referents? Consider the word *art*. It is used to refer to pursuits ranging from painting through literature to dance, which have little in common in the way they are performed. Many works of art are aesthetically pleasing somehow but it may be harder to see how this criterion applies to, for instance, Damien Hirst's shark in formaldehyde or Arnold Schönberg's atonal compositions. Making art often involves some actual creative skill but it is unclear whether this holds for, say, Marcel Duchamp's urinal or Andy Warhol's reproductions. Not all art belongs in museums or expresses important ideas either. In short, one possible referent of *art* may share some properties with a second one, which in turn may exhibit certain similarities to a third one that has nothing in common with the first one. The word covers what is called a network of **family resemblances**. The nature of the necessary and sufficient conditions is problematic too: they do not always correspond to the properties that a normal person takes to be relevant. *Insect*, for instance, would be characterized as an invertebrate with an exoskeleton, a three-part body, compound eyes and two antennae. Ordinary speakers of English, however, would probably think of a creeping, repulsive, small animal with legs. They are also likely to consider spiders a potential referent, though these creatures have four rather than three pairs of legs.

The more recent approach of **prototype theory**, based on psychological research by Rosch (1975), addresses the concerns. The sense of an expression is assumed to be organized around the

referents that normal speakers regard as the most characteristic and the properties that they deem important. For speakers in England, the meaning of *fruit*, for instance, would depend more on prototypical instances like apples and oranges than on, say, lychees and plantains. The latter are, in a way, less fruit-like than the former. Such peripheral members of the category share some but not all of the characteristics of the central ones and one peripheral member can have different properties in common with the prototype than another. Note also that tomatoes would play little or no part in the sense of *fruit*. Though technically fruit, they do not exhibit the characteristics that people think are relevant. They are not particularly sweet, for instance. They are not usually eaten as dessert or drunk as juice either. Prototype theory thus takes as its starting point the manner in which humans actually conceive of and categorize the world. Its claim to psychological reality seems stronger than that of componential analysis.

ADVANCES BOX 9.1

More on prototype theory

Appealing though it may be, prototype theory is not without its problems. One of them concerns the boundaries of the categories denoted by expressions. The theory tells us a lot about the varying degrees to which things are included in a category but pays little or no attention to the things that are excluded. It can, in other words, account for the fact that an atonal composition is a less prototypical instance of *art* than a classical painting. But it has more difficulties explaining why a beautiful vase may be a peripheral member of the category and a beautiful spoon may not. Both have little in common with the central members. Prototype theory involves no built-in cut-off points, which is at odds with the common linguistic behavior of saying that something falls within the meaning of some expression or not. Just imagine a dialogue where one person states *spoons are art* and the other replies *no, they aren't*. Moreover, it is perfectly possible that two categories have similar prototypes but different boundaries. The characteristic instances of *rope* and its French counterpart *corde*, for example, are the same (e.g. the thing used to moor a boat). The borderline case of *string* (e.g. of a guitar), however, is excluded in English but included in French. It is unclear how prototype theory can deal with this. Another problem has to do with the properties around which a category is organized. On the one hand, more research is needed to find out why certain properties are important to speakers and others are not. Why is being edible as dessert, for example, a feature of *fruit* in actual fact? On the other hand, it is not enough to just make a list of the properties in which members of a category are (dis)similar. Some undoubtedly carry more weight than others. The feature of being a seed-bearing structure in a flowering plant, for instance, arguably plays a more important role in *fruit* than that of being drinkable as juice. Properties can also be related to or depend on each other. Being edible as dessert, for example, is probably not unconnected to the feature of being sweet.

9.3 Three questions

9.3.1 How many meanings does an expression have?

To answer this question, let us start with *lecturer* in [9.16]. It is used to refer to a woman in the first sentence and a man in the second one. This difference does not mean that the word has two senses, though. Unlike *stewardess*, of which female is a property, *lecturer* is simply not specified for gender. The technical term for such lack of specificity is **vagueness**.

[9.16] a. Frankie told the *lecturer* that she is a bore.
b. My *lecturer* thinks that he knows everything.

Consider *bark* in [9.17] now. In the first sentence, its meaning is dog-related and, in the second one, tree-related. Still, lexicographers would not regard it as a word with two senses. Rather, they would create two separate entries in their dictionary for *bark* in [9.17a] and *bark* in [9.17b]. Note, by the way, that the former goes back to Old English *beorcan*, whereas the latter is a Middle English borrowing of Old Norse *börkr*. Expressions that have entirely unrelated meanings but just happened to sound the same are called **homophones**. As *ewe* and *you* show, they may be spelled differently.

[9.17] a. All *bark* and no bite.
b. The soil is covered with chips of *bark*.

What about *mole* in [9.18] then? It refers to an animal in the first sentence and a deep cover agent in the second one. These meanings do seem to be connected. The person resembles the animal in that they dig around for information while hoping to go unnoticed. *Mole* is a **polysemous** word: it has the same form in different but related senses.

18 a. There's a *mole* in my garden.
b. The CIA must have a *mole* in this terrorist organization.

The link between the meanings in [9.18] is **metaphorical**. A concept from one semantic domain, like fauna, is used for a concept from another domain, like espionage, based on some similarity between the two concepts. Another common type of link between the senses of a polysemous expression is **metonymy**, in which a feature associated with a certain concept serves for the entire concept. The meaning of *hand* in *all hands on deck*, for example, results from the use of a body part for a whole person.

9.3.2 How do sentences make sense?

The meaning of a sentence is traditionally seen as deriving from, on the one hand, the senses of the expressions that it consists of and, on the other, the way in which these expressions are linked to each other syntactically. In this so-called **compositional** approach to sentence semantics, the meaning of [9.19] comes about roughly as follows. We recognize the noun phrases *the prince* and *a frog* and the verb phrase *kissed a frog* and identify *the prince* as the subject and *a frog* as the direct object. Knowing the senses of *prince*, *frog* and particularly *kiss*, we assign the role of agent to the subject and that of patient to the object and understand that some identifiable prince kissed some unidentifiable frog.

[9.19] The prince kissed a frog.

The compositional view has trouble with a sentence like [9.20a], though. We can identify the phrases and grammatical relations but it is unclear how the subject and the two objects can be linked to the verb. There is nothing in *whatsapp* that immediately suggests an agent, a patient and a recipient. We do understand the sentence, of course. So where does its meaning come from?

20 a. The prince whatsapped him a picture.
b. The prince sent / gave him a picture.

The framework of **construction grammar**, as advocated by Goldberg (1995) among others, would argue that it comes from the sentence structure itself. Ditransitive clauses tend to convey the idea of transfer, as in [9.20b]. This sense is present in [9.20a] too and is contributed not by the verb but by the double object construction. In other words, the semantics of a whole sentence cannot always be predicted from its parts alone: its grammar as such may add extra meaning.

9.3.3 How are meaning and mind related?

One of the most fascinating theories of language and mind claims that meaning is relative to the specific ways different languages encode the world. The theory of **linguistic relativity** is composed of two related ideas. On the one hand, languages carve up reality in different ways. Welsh, Japanese and Himba, for instance, have a 'grue' term to refer to areas of the color spectrum typically referred to in English as *green* and *blue*. On the other hand, language shapes our perception of reality and speakers of different languages therefore think differently. Himba speakers recognize and remember greenish-blue or bluish-green color stimuli better than English speakers, who have better recognition memory for blue or green color stimuli.

The theory has become associated with the ideas of linguists Edward Sapir (1884-1939) and Benjamin Lee Whorf (1897-1941) but its philosophical roots span centuries. Famous philosopher Ludwig Wittgenstein believed that the limits of his language meant the limits of his world. What do such limits in linguistic meaning really mean? Let us answer this question with another one: is there life on Mars? This question has dominated popular culture in the 20th and 21st centuries. But the 'life on Mars' frenzy started in the 19th century, when an English-speaking amateur astronomer read an English translation of an Italian work describing 'canals' on Mars. Sagan (1980: 107) provides a lucid account:

> 'Percival Lowell was electrified by the announcement in 1877 by an Italian astronomer, Giovanni Schiaparelli, of *canali* on Mars … *Canali* in Italian means channels or grooves, but was promptly translated into English as *canals*, a word that implies intelligent design.'

Suddenly, the idea that there was life on Mars seemed entirely plausible. Contemporaries of Lowell had shown that Mars' freezing temperatures, its perpetually frozen subsurface and its atmosphere of very thin air and cloudless skies made the idea of intelligent canal builders very unlikely. Nonetheless, the semantic roller coaster of 'canals on Mars' had swept popular imagination past the point of objective consideration of the facts.

Since then, a Mars mania has swept a world that goes far beyond science, as a spate of science fiction novels and movies prominently featuring friendly and (more often) not-so-friendly Martians attests. Nowadays, through several missions and landings of automated laboratories, the

entire planet has been mapped. Not a shred of evidence has been found, either of canals or life. Lowell was misled by a predisposition to believe in life on Mars, because a single word in his native language compelled him to do so. If a single word has such power over scientific thinking and popular culture, imagine what entire semantic (and, for that matter, grammatical) patterns may do to the minds of a whole population of speakers!

ADVANCES BOX 9.2: Two empirical examples of linguistic relativity

Time flies, but in which direction?

Time is central to how we organise our lives, but time is very abstract. We cannot touch or see it. So the only way to talk about it is by using the semantics of another, more concrete domain of experience, namely that of space. For example, in Swedish, the word for future is *framtid* which literally means 'front time'. Spatially conceiving the future as in front of us (and the past as behind us) is also very common in English: We look forward to *the good times ahead* and to *leaving the past behind*. But for speakers of Aymara (spoken in Peru), looking ahead means looking at the past. The word for future (*qhipuru*) means 'behind time', so the spatial axis is reversed: the future is behind, the past is ahead. The logic in Aymara appears to be this: We can't look into the future just like we can't see behind us. The past is already known to us, we can see it just like anything else that appears in our field of vision, in front of us. These semantic differences affect how Aymara speakers gesture about events: Those that are bilingual in Spanish (a future-in-front language like English) tend to make forward moving gestures, whereas those with little or no knowledge of Spanish gesture backwards (consistent with the Aymara future-is-behind semantic pattern), when talking about the future. Mandarin Chinese employs a vertical semantic axis alongside a horizontal one. The word *xia* (down) is used to talk about future events, so when referring to the 'next day' a Mandarin Chinese speaker would literally say 'down day'. The word *shang* (up) is used to talk about the past, so 'yesterday' becomes 'up one day'. This affects the way observers perceive the spatial unfolding of the aging process. Chinese-English bilinguals were asked to arrange pictures of a young, mature, and old Brad Pitt and Jet Li. They arranged the former horizontally, with the young Brad Pitt to the left and the old Brad Pitt to the right. But the same people arranged the pictures of Jet Li vertically, with young Jet Li appearing at the top, and old Jet Li appearing at the bottom. It seems that culture and meaning form a tight bond as this context-dependent shift in behaviour with culture-specific stimuli shows.

Did Richard of York Give Battle In Vain?[1]

Colour naming and perception has also been a classic test case of linguistic relativity. Unlike time, colour is a concrete physical construct. Yet different languages vary widely in how they semantically partition the visible spectrum. Some languages like Dani (Papua New Guinea) only have two terms, dark (referring to what English speakers would call black, blue, and green) and light (referring to what English speakers would call white, red, orange and yellow). Most of the world's languages have five basic colour terms, including a term that denotes both blue and green, a so-called 'grue' term found in e.g. Himba (Namibia), Berinmo (Papua New Guinea), and historically in Welsh, Japanese, and Chinese. Russian has two separate terms for blue, one referring exclusively to darker shades, and one referring to lighter shades. Previous studies

[1] 'Richard Of York Gave Battle In Vain' is a mnemonic for remembering the colours of the rainbow: red, orange, yellow, green, blue, indigo and violet.

established that having a label for a specific colour helps us remember it faster and more accurately in recognition memory tasks. But one study tested the ability to spot colour differences on the spot, as it were. They presented Russian and English speakers with different shades of blue (arranged in triads) and asked them to spot the odd one out as quickly as they could. Russian speakers were faster and more accurate in this task than English speakers were. A study from the domain of cognitive neuroscience (the science of how the brain works when we think) showed that Greek and English speakers were aware of luminance differences in blue and green (their brains can distinguish dark from light blue, and dark from light green), but at the same time there is increased brain activation in Greek speakers for blue rather than green luminance contrasts because like Russian, Greek has two terms denoting two different categorical degrees of lightness to refer to the blue area of the colour spectrum. It appears that the investigation of linguistic relativity is moving to a more biologically grounded arena, where tangible effects of meaning on brain organization and function can be observed.

Recommended readings

Three excellent textbooks on semantics that deal with the topics examined in this chapter and more are Löbner (2002), Saeed (2009) and Cruse (2011). They all contain interesting exercises. A more advanced overview of various approaches to semantics is given in Geeraerts (2009). Lyons (1999), though quite technical, is still one of the best treatments of reference and definiteness. Semantic relations are discussed in detail by Murphy (2003). For more information about prototype theory and especially construction grammar, Croft & Cruse (2004) is a must-read. Casasanto (2008), finally, is an interesting article about linguistic relativity.

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