7.1 The semantics of categorization

Categorization is an important topic in semantics because language can be seen as means of categorizing experience. A word like *flower*, for example, categorizes an indefinitely large number of different entities in the world as all examples of a single kind of thing, the category FLOWER. The actual types of flower vary widely – think of the difference between a tulip, a carnation and a sunflower – but these differences in no way affect the categorization of all types as flowers. The same is true of other lexical categories. The types of action I might describe by saying *I am writing*, for example, cover a wide range: filling in a form with a biro, typing on a keyboard, drawing letters in freshly poured concrete with a stick, and sitting in front of a blank sheet of paper with a pen, wondering how to begin a sentence. These outward differences are all glossed over by the verb *write*, which can be used for all of these activities indifferently. For both linguists and psychologists it is a question of considerable interest how such natural language categories arise. What principles govern what may and may not be categorized under a single word like *flower* or *write*? In this section, we explore an answer to this question from the perspective of a conceptualist theory of meaning, which sees the origin of linguistic categories in the nature of human psychology.

7.1.1 Classical categorization

Standard logical approaches to language, like the ones discussed in Chapter 6, are **two-valued** approaches. This means that they only recognize two truth values, true and false. On this approach, any proposition must either be true or false. There is no room for the proposition to be partly true and partly false, or true in some respects but false in others. The two-valued approach goes hand in hand with the classical view of definition (the one assumed throughout Chapter 2). The classical view was summarized as follows by Frege in his 1903 work *Foundations of Arithmetic*:

> A definition of a concept … must be complete; it must unambiguously determine, as regards any object, whether or not it falls under the concept … Thus there must not be any object as regards which the definition leaves in doubt whether it falls under the concept; though for us men, with our defective knowledge, the question may not always be decidable. We may express this metaphorically as follows: the concept must have a sharp boundary.
>
> (In Aarts *et al.* 2004: 33)

Another way of describing this view is the idea that definitions are lists of **necessary and sufficient conditions** for particular meanings. Consider as an example the definition of *bird* as a feathered, egg-laying, flying vertebrate. This definition involves the four properties feathered, egg-laying, flying and vertebrate, and on the classical view of definition those four properties constitute necessary and sufficient conditions of birdhood:

- The conditions are **necessary** because something must meet *all* of them if it is to count as a bird – if something only has some of the

four properties, for instance, it does not count as a bird. (This might be the case with bats, which are flying and vertebrate, but which are not feathered or egg-laying.)
- The conditions are **sufficient** because *anything* that has *all four* properties counts as a bird: no further conditions need to be met.

The classical view of definition is also a view of the nature of the categories to which the definition applies. To say that the definition of bird consists of the four properties above is, quite clearly, the same thing as saying that the category BIRD is also so constituted. Accordingly, this view is often referred to as the **classical view of categorization**, or, because of the figure credited with its proposal, the **Aristotelian view of categorization**. Classical or Aristotelian categories have the following two important characteristics:

- The conditions on their membership can be made explicit by specifying lists of necessary and sufficient conditions.
- As a result, their membership is determinate: whether or not something is a member of the category can easily be checked by seeing whether it fulfils the conditions.

QUESTION Try to develop a list of necessary and sufficient conditions for the following categories: *sport*, *building*, *planet*, *book*, *animal*, *weapon* and *bodypart*. What problems do you encounter?

7.1.2 Problems with classical categories

The classical view of categorization is open to a number of criticisms. First, there are remarkably few examples of adequate definitions in the classical mould. In fact, as discussed in Chapter 2, some researchers doubt that there are *any*. We noted in 2.6 that many definitions do not seem successful in specifying necessary and sufficient conditions for membership of a given category. This is certainly true of dictionary definitions, but the same problem applies to more technical and detailed definitions like those given in semantics. To pick an example almost at random, the *Concise Oxford*'s definition of *food*, 'substance(s) (to be) taken into the body to maintain life and growth' applies just as much to medicine as it does to food like bread or apples, a circumstance which invalidates that particular definition. Similarly, the same dictionary's definition of *game* as 'contest played according to rules and decided by skill, strength or luck' does not apply to card games like patience (solitaire), which involve a single participant and are thus not contests, nor to a game in which a child throws a ball against a wall. Further, it also applies to wars and exams, which are decidedly *not* examples of games. As discussed in Chapter 2, the history of semantics is full of examples of a proposal for the correct definition of a term being shown to be inaccurate. A famous example is the previously standard definition of *kill* as 'cause to die'. Imagine that someone has tampered with the sheriff's gun in such a way as to cause it not to fire in a shoot-out with an outlaw. As a result, the outlaw is able to shoot the sheriff to death. In a case like this, we would

say that the tamperer has caused the sheriff to die, but has not actually killed the sheriff (for further problems with this case, see Fodor 1970). Furthermore, even longer and more detailed definitions like those advanced by Wierzbicka and her colleagues apparently do not resolve these problems. Cases like this occur time and time again in the history of definitional semantics. The problems of definition are discussed at length in Chapter 2 (see especially 2.6).

Rosch and Mervis outline a more influential criticism of the classical view of categorization (1975: 573–574):

> As speakers of our language and members of our culture, we know that a chair is a more reasonable exemplar of the category furniture than a radio, and that some chairs fit our idea or image of a chair better than others. However, when describing categories analytically, most traditions of thought have treated category membership as a digital, all-or-none phenomenon. That is, much work in philosophy, psychology, linguistics, and anthropology assumes that categories are logical bounded entities, membership in which is defined by an item's possession of a simple set of criterial features, in which all instances possessing the criterial attributes have a full and equal degree of membership.

In other words, the classical interpretation of categories (and hence meanings) as sets of necessary and sufficient conditions fails to do justice to the fact that there seem to be **different statuses of category membership**: some members of a category seem to be **better examples** of that category than others.

We can illustrate this with an example which has played an important role in critiques of classical categorization. Consider a colour category like RED. We can think of many shades of red, including the red of a fire-engine, the deep reds found on fruit like plums, which might also be described as purple, and very pale reds which might also be described as pink. It seems impossible to identify any single point along the scale of redness that constitutes the boundary between red and other colours, and as a result it seems clear that the category RED is *not* defined by any necessary and sufficient conditions, or anything else that might provide a clear category boundary for it. Yet there is a clear sense in which the red of a fire engine seems a better example of red than the colour of a ripe plum. In order to give an idea of the type of colour referred to by *red*, we would obviously do much better pointing to a fire-engine or a standard red rose, than to a ripe plum or the orangey-pink of a sunset, even though both of these might also be described as 'red'. RED, then, seems to be a category of which some members are better examples than others.

QUESTION What are some other categories in which some members are better examples of the category than others?

Colours are by no means the only example of categories with different statuses of category membership. Consider Figure 7.1 below, a series of representations of various cup- and mug-like objects, taken from an influential study by Labov (1973).

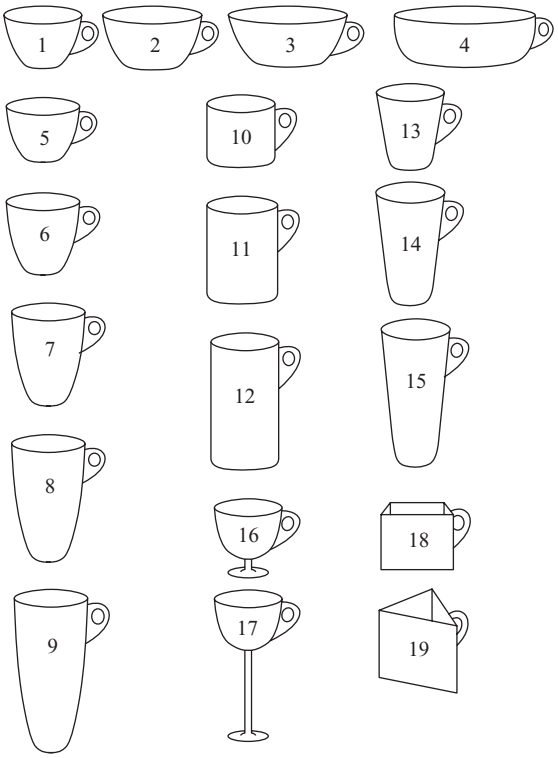

FIGURE 7.1
Series of cup- and mug-like objects (Labov 1973: 354).

It seems obvious that some of these objects, like (1), are very good examples of cups, and that others, like (11), are very good examples of mugs. There also seem to be several intermediate cases, like (7), in which it is not clear whether *cup* or *mug* is the better description, as well as others, like (17) and perhaps (4), where we might hesitate to apply *either* label. (If some of the objects were represented with accompanying saucers this might reduce the ambiguity, of course.) This is, in fact, exactly what Labov found when he asked subjects to decide which was the appropriate label in each case.

We could make similar observations about many other categories in natural language. The category CHAIR is a case in point (Figure 7.2). The chair in the centre of the diagram seems a particularly good example of the category, unlike the high chair on the middle left or the deck chair in the bottom row. The arm chair and the rocking chair also seem clear examples of the category, but somehow less obvious than the original ordinary four-legged chair. That, indeed, is the only one of the pictured chairs which is precisely that: an *ordinary* chair of the sort we might refer to through expressions like *a normal chair, an ordinary chair, a standard chair*, and so on.

There are two important points to draw from these examples:

- There are categories in which some members are better exemplars of the category than others.
- There are categories in which the boundaries of membership are not clear-cut: it is not always possible to say whether or not something is a member of the category.

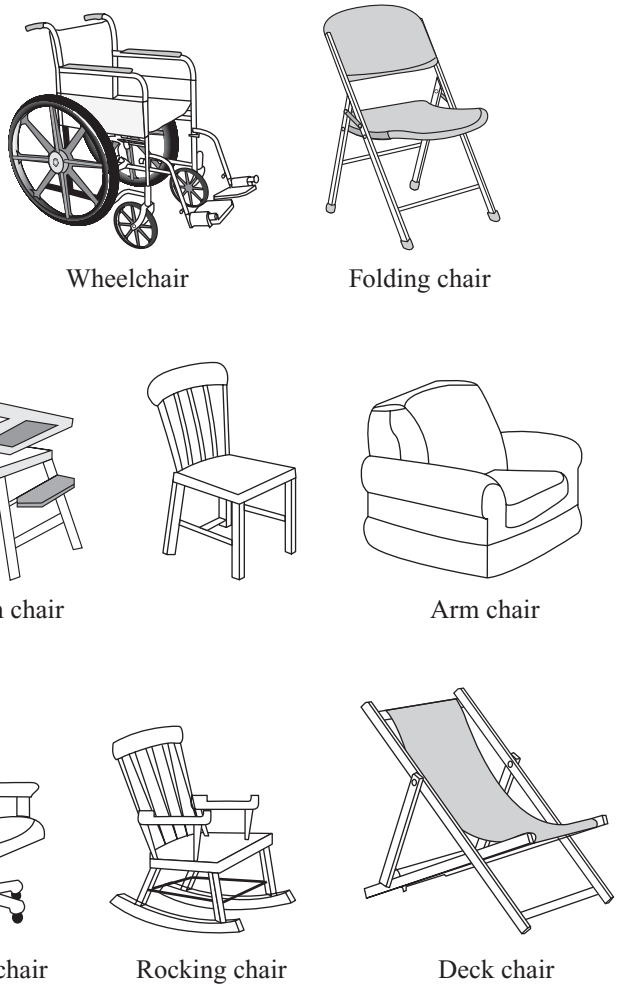

FIGURE 7.2
Chairs and non-chairs.

If categories are constituted by nothing other than sets of necessary and sufficient conditions, neither of these points is expected. The second one in particular is very unexpected: if there is a finite set of necessary and sufficient conditions for a category, we should be able to state unambiguously what a given category's members are.

What conclusions can we draw about the nature of the categories? One possible answer is that these categories are not structured in terms of necessary and sufficient conditions, but that membership in them is **graded**: a matter of degree.

7.1.3 Prototype categorization

The idea that category membership is graded is at the heart of the **prototype** theory of categorization, most strongly associated with the psychologist Eleanor Rosch and her colleagues (Rosch 1975, 1978; Rosch and Mervis 1975). Rosch was impressed by one of the many observations about meaning

made by the philosopher Ludwig Wittgenstein in his *Philosophical Investigations* (1953: §66):

> Consider for example the proceedings that we call 'games'. I mean board-games, card-games, ball-games, … and so on. What is common to them all? – Don't say: There *must* be something common, or they would not be called "games" – but *look and see* whether there is anything common to all. – For if you look at them you will not see something that is common to *all*, but similarities, relationships, and a whole series of them at that. To repeat: don't think, but look! – Look for example at board games, with their multifarious relationships. Now pass to card games; here you find many correspondences with the first group, but many common features drop out, and others appear.

The result of comparison between different types of game, Wittgenstein says, is that 'we see a complicated network of similarities overlapping and criss-crossing' (1953: §66), and he compares the relationships between different games to the family resemblances that exist in the outward appearances of members of the same family. Members of a single family might be identifiable by certain characteristic features – prominent cheek bones, a certain hair colour, a certain type of walk or laugh, and so on – without any single member of the family necessarily having all of these attributes. (In fact, it might even be the case that a particular member had none of the characteristic attributes.) In the same way, Wittgenstein suggests, members of the category 'game' might not be defined by any core of shared attributes that we could capture by listing necessary and sufficient conditions, but by a network of 'family resemblances': there is a certain set of possible attributes which tie together the members of the category GAME, but not every member of the set need possess every attribute. This is displayed in Table 7.1.

Table 7.1. Family resemblances among attributes of the category 'game'.

	Patience	Hopscotch	Cat's cradle	Tennis	bouncing a ball	Trivial Pursuit	flipping a coin	'I Spy'
mostly outdoor		×		×	×			
played with others		×	×	×		×		×
has rules	×	×	×	×		×		×
clear winner				×		×		
uses ball				×	×			
uses string			×					
uses cards	×							
uses board						×		
luck mostly determines result							×	

Rosch generalized the family resemblance structure which Wittgenstein saw in GAME to other categories. She and her colleagues conducted experiments in which subjects were asked to consider examples of different natural language categories like FRUIT, BIRD, VEHICLE, and CLOTHING, and rate them on a scale of representativity for each category. These experiments demonstrated convincingly the truth of the initial belief that some members are better examples of their category than others. For the category BIRD, for instance, subjects consistently rated robin and sparrow as better examples than penguin or emu. Rosch described this situation as one in which robin and sparrow are more **prototypical** examples of the category BIRD than emu or penguin. Prototypicality judgements for this type of category proved to be remarkably consistent across different speakers: subjects consistently converged on the same members when asked to say what the best examples of different categories were.

QUESTION Consider the categories PROFESSION, LADDER and PLANE. What are the best examples of each? Why? What are some marginal examples?

The prototype of a category, for Rosch, is not any one of its members, no matter how good an example of the category this might be. Rather than one of the members, the prototype of a category can be thought of as the **central tendency** of that category's members (see Barsalou *et al*. 1993). Any particular member of the category will be closer to or further from the prototype. What are these degrees of prototypicality based on? According to Rosch, prototypical category members are those which share the most attributes with other members of their category, and the fewest with members of other categories. BIRD, for instance, might be defined through attributes such as 'egg-laying', 'flying', 'small', 'vertebrate', 'pecks food', 'winged', 'high-pitched call', 'builds nests' and so on. Not every member of the category, however, has to possess *all these attributes*: emus, for instance, are neither small nor flying, but they are still birds. But the more attributes an example possesses the better an example of the category it appears.

Categories are not structured, then, by a set of necessary and sufficient conditions; instead, they consist of entities with various shared attributes. We can illustrate this with the category COAT, whose members might include trenchcoats, overcoats, raincoats, duffel coats, parkas, fur coats, labcoats, topcoats and frockcoats. The attributes of this category presumably include the following features:

(i) covers the body from the shoulders to the thigh/knee
(ii) worn on top of other clothing
(iii) has sleeves
(iv) for both sexes
(v) can be fastened closed
(vi) worn for protection from cold or rain

Certain examples of the category, like trenchcoats or overcoats, possess all or most of these attributes: these are the most prototypical. Less prototypical examples have fewer: a labcoat, for example, is not worn for protection

from the weather, and a parka does not extend to the thigh. The more attributes a member shares with *other*, different categories, the less typical it is of its *own* category. Think of the difference between the categories COAT and JACKET. These categories share a certain number of attributes, such as being sleeved, being able to be fastened closed, and being worn on top of other clothing. They are distinguished principally in terms of length and purpose; coats extend below the waist and are principally worn for protection from cold or wet weather, whereas jackets typically end around waist level and are not principally worn for protection against the elements. This distinction is clearly true of the most typical examples of each category: for example, it is a correct description of the difference between a woollen overcoat and a suit jacket. But when we consider less representative examples of coats and jackets, we find that they are less distinct. Parkas, for instance, which are less typical examples of coats, have a jacket attribute: they do not extend below the waist. Similarly, a light linen thigh-length jacket is not a typical example of a jacket, because it does extend beyond the waist: this is, of course, a coat-attribute. So as we move away from the central members, the differences between categories become less marked.

QUESTION Consider the following garments. How many superordinate categories do they belong to? Describe as fully as possible the prototype of each category.

dinner suit jacket
hospital gown
poncho
cape
academic gown
anorak
cardigan

QUESTION What are the attributes of the category BOAT? What attributes might the prototype of the category possess? Rank the following examples with respect to their closeness to the prototype. Are all of them members of the category? If not, what other categories might they belong to?

raft
sailboard
buoy
kayak
canoe
airboat
dragonboat
barge
catamaran
ferry
cutter
yacht

dinghy
gondola
hydrofoil
submarine
ocean liner

Prototype theory was originally developed as a theory of how concrete, visual objects, like furniture, colour or fish, are categorized. But several studies have revealed prototype effects in domains involving activities. Thus, Coleman and Kay (1981) discuss the nature of the prototype of the category LIE. Pulman (1983: 113) analysed the members of the categories KILL, SPEAK and WALK with respect to prototypicality (the leftmost verb is the most prototypical member, the rightmost the least):

KILL: *murder, assassinate, execute, massacre, sacrifice, commit suicide*
SPEAK: *recite, mumble, shout, whisper, drone, stutter*
WALK: *stride, pace, saunter, march, stumble, limp*

QUESTION Consider the structure of the category EAT. What verbs are its members? Assume that the category is arranged around a prototype, and try to specify the appropriate attributes.

The hypothesis that categories are structured in terms of prototypes is consistent with a number of experimental results. In fact, Rosch says that 'the prototypicality of items within a category can be shown to affect virtually all of the major dependent variables used as measures in psychological research' (1978: 38). For instance, Rosch and her colleagues performed experiments in which subjects were asked to verify statements about category membership of the form 'An [exemplar] is a [category name]' (e.g. 'a robin is a bird') as quickly as they could. Response times were shorter when the exemplar was a representative member of the category; subjects took less time, in other words, to confirm that a robin is a bird, than they did to confirm that an emu is. Prototype effects like these are systematic and have been confirmed widely in the experimental literature (Mervis and Rosch 1981: 96). Second, Mervis and Rosch (1981: 96–97) report experiments by Battig and Montague (1969) in which subjects were asked to list exemplars of each of 56 superordinate categories such as furniture, fruit, weapons, sports or parts of the human body. Prototypical members of the categories were found to be mentioned more frequently than non-prototypical ones. Lastly, natural languages possess mechanisms for expressing the extent to which an exemplar of a category is typical. In English, for example, a sentence like *A sparrow is a true bird* is perfectly normal, unlike *A penguin is a true bird*: sparrows, not penguins, are prototypical exemplars of the category BIRD. Conversely, *technically* can only be applied to non-prototypical category members: *A penguin is technically a bird* is acceptable, but *A sparrow is technically a bird* is not (Lakoff 1973).

Many linguists have seen the graded structure of categories discovered by Rosch as an indication of the nature of the meanings of natural language category terms. The idea that categories are structured by attributes

and degrees of membership solves some difficult problems in semantic analysis. As commented by Lehrer (1990: 380), 'When we look at some of the detailed lexical descriptions that have been done, the data themselves often have forced the investigator to posit fuzzy boundaries and partial class inclusion, implicitly acknowledging something like prototype theory.' Consider the problems associated with the definition of *game* as 'contest played according to rules and decided by skill, strength or luck'. As noted earlier, this does not apply to card games like patience (solitaire), which involve a single participant and are thus not contests, nor to a game in which a child throws a ball against a wall. Problems like this might constitute a reason to reject the definition as inaccurate, but a prototype interpretation of category membership allows us to save it. On the prototype approach, the definition can be rephrased as an identification of the *most prototypical attributes* of the category GAME: the most typical, best examples of games are precisely those which can be defined as 'contests played according to rules and decided by skill, strength or luck'. This covers football, hide-and-seek and many other games: the fact that it does not obviously apply to other activities like patience, etc., can be explained by the fact that these are not central members of the category.

7.1.4 Problems with prototype categories

For all its attractions, prototype theory is open to a number of problems, which we consider briefly in this section.

7.1.4.1 Problems identifying the attributes

The first type of problem concerns the nature of the semantic attributes on which judgements of prototypicality are based. In our discussion of categories we have simply isolated the attributes in an intuitive fashion, an apparently unproblematic procedure. For instance, it doesn't seem unreasonable to suggest that people use the attribute 'has a seat' as part of the decision about whether to classify a particular object as a CHAIR. But Rosch herself acknowledges that the ease of identification for many attributes is deceptive (1978: 42). There are essentially three problems, which we deal with in turn:

- attributes can often only be identified after the category has been identified
- attributes are highly context-dependent
- there are many different alternative descriptions of the attributes of a given category

Attribute identification depends on category identification In the 'has a seat' case, for example, the identification of this attribute seems to paradoxically depend on a prior identification of the CHAIR category itself: how do we know, for instance, that an armchair 'has a seat' unless we have already categorized it as a chair? Why do we not treat the seat of the armchair simply as a physical zone of the armchair without any particular functional significance, in the same way we treat, for example, the separately