Predication

We have so far considered the meanings of single words, either in isolation (Chapters 2 and 3) or in relation to other words of the same kind (Chapters 4 and 5). We will now have a look at the way in which different kinds of words interact to form meaningful phrases and sentences, addressing in more detail the mechanism of composition (1.2). We will see that a phrase or a sentence is by no means a simple sequence of words, one added to the other like beads on a string. Rather, sentences have a sophisticated structure in which each part plays its own role and interacts with the others in its own way. The focus will be on the central semantic property of verbs, nouns and adjectives: their providing predications about one or more of the potential referents of the sentence. An example in 6.1 will take us into the matter. After the introduction of the basic concepts in 6.2, we will take a look at the way in which the major types of verbs, nouns and adjectives participate in predication (6.3 and 6.4). After a very brief introduction of predicate logic notation in 6.5, the second half of the chapter will be concerned with general issues of predication. The notion of *semantic roles* is introduced in 6.6. It plays an important role in understanding the grammar of verbs. In 6.7, the discussion turns to preconditions of predication, so-called selectional restrictions, and their importance for sentence interpretation.

6.1 Predications contained in a sentence

Let us take a look at the following example, a simple English sentence, and try to determine the proposition it expresses.

(1) *Johnny sent an application to a dubious company.*

The first word, *Johnny*, represents a special kind of noun, a proper name. Like pronouns (*she, I, who, something*) proper names form complete NPs.
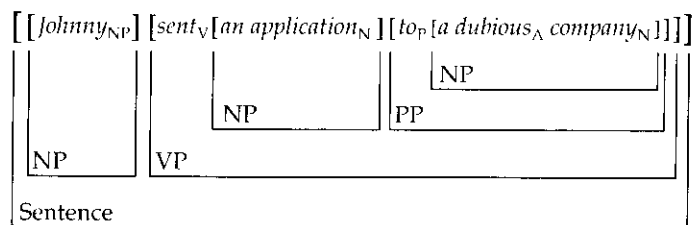
Figure 6.1 Grammatical structure of sentence (1)

Figure 6.2 Predication structure of sentence (1)

The VP contains a finite verb, i.e. a verb which carries tense and, in English, 'agrees' (see 6.6) with the subject of the sentence. Here the subject is the NP *Johnny* and verb tense is simple past. The indefinite article *a(n)* and the noun *application* form another NP, the so-called direct object of the verb. The last three words, *a dubious company* form a third NP, in this case also containing an adjective between article and noun. This NP is part of a PP (prepositional phrase) headed by the preposition *to*. The PP is the so-called indirect object of the verb. The total VP consists of the finite verb, the direct object NP and the indirect object PP. In Figure 6.1 the sentence is analysed into its syntactic components.

Let us assume a CoU in which (1) is true. Then the three NPs each provide a description of one referent. The subject NP describes its referent as an entity called *Johnny*, the direct object NP characterizes its referent as an 'application' and the indirect object NP provides the information that its referent is a dubious company. Let us call the three referents r_j, r_a and r_c, respectively. The verb contributes the information that they participate in an event of sending, r_j being the sender, r_c the recipient and r_a the object sent. Thus the meaning of the sentence constitutes complex information about these three referents. If an expression provides information about a referent, it is said to make a 'predication', or to 'predicate', about it. In Table 6.1, it is sorted out which words contribute which predications about which

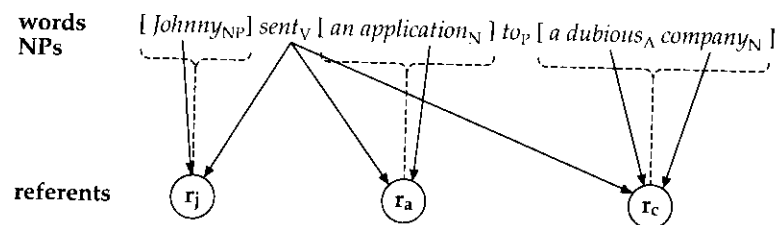| Word	Predication
Johnny	r_j is Johnny
sent	r_j sent r_a to r_c
	r_a was sent to r_c by r_j
	r_c was sent r_a by r_j
application	r_a is an application
dubious	r_c is dubious
company	r_c is a company

Table 6.1 Predications contributed by the words in (1)

referents. For the time being, we disregard the event referent of the verb (but see 6.3.2). The indefinite article and the preposition *to* are omitted from the list because they do not contribute predications.

The simple analysis shows two interesting things. First, while the nouns and the adjective relate to only one of the referents, namely the referent of the NP they belong to, the verb relates to all three referents. Second, different words in the sentence contribute predications about the same referents. Figure 6.2 depicts these relations. A broken line connects each NP to its referent, arrows point from the single words to those referents they provide information about. Figure 6.2 illustrates the central role of the verb: by predicating about all three referents, the verb ties the whole sentence together. The three NPs, in contrast, independently supply information about one referent each.

6.2 Predicates and arguments

The meanings of the predicating words in the sentence are concepts that concern one or more entities: ⟩application⟨, ⟩dubious⟨ and ⟩company⟨ concern one entity each, the event concept ⟩send⟨ concerns three. Such concepts are called **predicates**, the entities they concern are their **arguments**. Predicates are 'applied' to their arguments: for example in (1), ⟩dubious⟨ is applied to r_c and ⟩send⟨ is applied to r_j, r_a and r_c. Predicates with one argument are called one-place predicates, predicates with two arguments two-place predicates, and so on. If a predicate is applied to an appropriate set of arguments, it yields a truth value and it will be said to be true or false of its arguments. For example, if we assume a CoU where (1) is true, all the predicates are true of their arguments. But in a different CoU the predicates might yield the truth value FALSE. For example, the predicate ⟩company⟨ would be false if John sent an application to the army instead (unless the army is considered a company). Predicates define conditions on their arguments which they must fulfil for the predication to be true. You can think of a predicate as a proposition (2.2.1) with an empty slot for each argument. The truth value of the proposition depends on which arguments are filled into the empty slots.

Expressions with a predicate as meaning are called **predicate terms**. (In the literature, you will often find the term *predicate* used indiscriminately for predicate terms as well as their meanings.) Predicate terms can be verbs, nouns, adjectives or adverbs (like *rapidly*). Whether or not proper names like *Johnny* constitute predicate terms is a controversial issue. Many semanticists hold that they are just names, i.e. direct expressions for their referents. Alternatively, such nouns can be considered predicate terms that express the property of 'being called (Johnny, etc.)'. Both positions have their merits. The first position will be adopted here, but the second in Chapter 10.

Argument *terms* specify the arguments of a predicate term. But there is not always a separate term for each argument of each predicate in a sentence. In (1) the predicate expressed by *sent* has three arguments, and for each of them there is an NP that specifies it. Thus the predicate term *sent* is syntactically connected to three argument terms. The nouns in the sentence, however, simply predicate about their referents. As predicate terms they are not connected to separate argument terms. In what follows, the term **complement** will be used for all argument terms that form a separate syntactic constituent with its own referent.[1] If the argument of a predicate term is at the same time its referent, it will be called a **referential argument**. Some arguments are neither referential nor specified by a complement, e.g. the arguments of adjectives within an NP. For example, the argument of *dubious* in (1) is neither specified by a separate NP, nor is it the referent of the adjective (adjectives in general do not refer), but the referent of the whole NP *a dubious company*.

With respect to predication, special terms have been introduced for all parts of the semiotic triangle: *predicate term* for the expression part, *predicate* for the meaning part and *argument(s)* for the potential referent part. The links between expression and referent and between meaning and referent were also relabelled. The result is shown in Figure 6.3.

6.3 Verbs

Verbs are combined with a separate argument term for each of their arguments, except for the event argument to be introduced and discussed
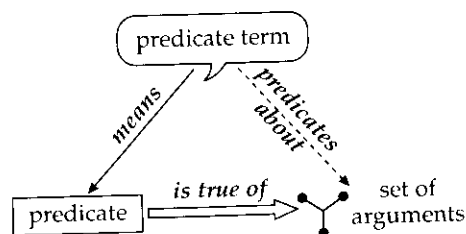

Figure 6.3 The semiotic triangle for predication

in 6.3.2. The event argument is not counted when we classify a verb as one-place, two-place, etc. The discussion will be confined to the most frequent types of verbs. If verbs, nouns and adjectives are categorized as one-, two- or three-place predicate terms, this is based on the number of arguments in standard constructions. Obviously, it is almost always possible to add further optional argument specifications to a given predicational construction. It would make little sense to try to count all *possible* arguments that might be specified for a given argument term. The issue of how many arguments a given lexical item has is, however, not trivial and will be taken up again at the end of this section.

6.3.1 Major types of verbs

Intransitive verbs

Intransitive verbs are one-place predicate terms. The only argument is specified with an NP which, in English, is always the <u>subject</u> of the sentence.

(2) a. *The cat* is **sleeping**.
    b. *The snow* has **melted**.
    c. *The door* **opened**.
    d. *The author of the love letter* did not **succeed**.

Transitive verbs

Transitive verbs are two-place predicate terms with two argument terms, the <u>subject</u> and the <u>direct object</u> of the sentence.

(3) a. *The cat* is **eating** *the dog's food*.
    b. *He* **wants** *your help*.
    c. *The dog* cannot **open** *the door*.
    d. *Thirty-one students* **filled in** *the questionnaire*.

Note that in (3d) the words *in the questionnaire* do not form a PP. *In* is part of the particle verb *fill in*, rather than a preposition. You will have noticed that the verb *open* appears as an intransitive verb in (2c) and as a transitive verb in (3c).

Ditransitive verbs

Ditransitive (or bi-transitive) verbs have three argument terms. For one group, the third argument term is an 'indirect object'. In standard English word order, an indirect object is either placed before the direct object or it is marked with *to* and placed after it.

(4) a. *He'll* **give** <u>my sister</u> <u>the keys</u>.   *He'll* **give** <u>the keys</u> <u>to my sister</u>.
    b. *I* **showed** <u>them</u> <u>the photograph</u>.   *I* **showed** <u>the photograph</u> <u>to them</u>.

Other syntactic categories of complements

It should be mentioned that verb complements are not confined to NPs. Many verbs have prepositional complements with a lexically fixed preposition, cf. *depend on, refer to, differ from*, etc. Other verbs, e.g. verbs of motion like *go* or *put*, can be combined with a wide range of PPs. Some verbs take *that*-clauses as complements (*know, believe, assume, say*), infinitives (*try/manage/begin to*) or gerunds (*start/stop/keep –ing*), to mention only the most common types.

Alternative grammatical means of specifying arguments

There are other ways of specifying arguments of verbs than combining the verb with a complement. For example, English imperative sentences usually have no subject. The corresponding argument is then construed as the addressee(s). The imperative sentence in (5a) expresses the same proposition as the corresponding declarative sentence (5b). *Put* is a three-place verb with a direct and a prepositional object.

(5) a. **Put** <u>the keys</u> <u>on the window-sill</u>.
    b. <u>You</u> **put** <u>the keys</u> <u>on the window-sill</u>.

In languages such as Spanish or Italian, the grammatical person and number are reflected in verb inflection. The subject itself can be omitted in suitable CoUs and the resulting sentences are equivalent[2] to sentences with the corresponding personal pronouns in subject position.

(6) (Spanish)

a.	*habl-o*	*árabe*	⇔	*yo*	*hablo árabe*
	speak-1s	Arabic		I	speak-1s Arabic
b.	*habl-as*	*árabe*	⇔	*tú*	*hablas árabe*
	speak-2s	Arabic		you	speak-2s Arabic

6.3.2 Referential verb arguments

Nowadays it is widely assumed that verbs also predicate about a referential argument for the event described, in addition to the arguments hitherto mentioned. (This view was adopted in 2.2.1.) There are good reasons for assuming a referential argument for verbs. First, the event argument can be considered as serving as the argument of the tense element of the verb meaning, which reasonably constitutes a predication of its own. For example, in (1) the past tense form *sent* of the verb expresses that the event of sending happened before the time of utterance. Second, the referential

verb argument can be considered the argument of certain adverbs, e.g. *carefully* in *John closed the envelope carefully*. Third, there are many nouns derived from verbs that denote an event of the kind the verb expresses, e.g. the simple *-ing* derivation in (7).

(7) *Johnny's sending an application to the company did not succeed.*

If we assume that the verb *send* has an event argument, then the meaning of the noun *sending* can be straightforwardly derived. By the derivation the referential argument of the verb becomes the referential argument of the noun. The subject (agent) argument of the verb appears as a relational argument of the noun in the typical possessive construction (see 6.4.1). Specifications of the remaining arguments are the same for the noun as for the verb.

6.3.3 Deciding on the number of arguments

The question as to how many arguments a predicate term involves is often difficult to decide. Let us mention just two aspects of the problem. Very many verbs appear in more than one construction with a different number or a different quality of argument terms. One sort of variation can be dealt with in a relatively straightforward way: the occurrence of the same form in different grammatical categories, e.g. the above-mentioned form *to open* with an intransitive and a transitive use. These must be considered to be two different verbs as they belong to different word classes (intransitive vs transitive verbs). Intransitive *open* predicates of its subject argument a certain change of state. Transitive *open* predicates of its subject argument an action which leads to a corresponding change of state of the direct object argument. Thus intransitive and transitive *open* express different predications about their respective subject arguments. Their meanings are clearly different.

The second type of variation is more difficult to handle. A verb like *eat* can be used in a wide range of constructions including the types instantiated by the following examples:

(8) a. <u>Fred</u> *is* **eating** <u>spaghetti</u>.
    b. <u>Fred</u> *is* **eating** <u>spaghetti</u> *with a plastic fork*.
    c. <u>Fred</u> *is* **eating** <u>spaghetti</u> *with a plastic fork from a big bowl*.
    d. <u>Fred</u> *is* **eating** *with a plastic fork from a big bowl*.
    e. <u>Fred</u> *is* **eating** *from a big bowl*.
    f. <u>Fred</u> *is* **eating**.

In all these constructions, unlike in the case of intransitive and transitive *open*, the verb *eat* predicates the same of its subject argument. In view of (8f) one might feel that all complements except the subject are optional. But the direct object argument is different. The concept ⟩eat⟨ necessarily involves a

second argument. Eating cannot be defined without relating to something that is eaten. Therefore that argument is understood to be involved in the situation described, even if it is not specified. *Fred is eating* is interpreted as *Fred is eating something*. This is why we feel that the direct object is omitted in (8d, e, f). This does not hold for all the other arguments that can be added: *Fred is eating* is not necessarily interpreted as *Fred is eating with something* or *Fred is eating from something*. Neither something eaten from nor something eaten with constitutes a necessary component of an eating event. Accordingly, specifications of such arguments are not syntactically missing if they are absent. Thus the basic number of arguments for ⟩eat⟨ is two, and *eat* is a transitive verb, although its direct object can be omitted. It must be added that not all transitive verbs allow the omission of the direct object. Along with many others one such verb is *eat*'s close relative *devour*.

6.4 Nouns and adjectives

6.4.1 Major types of nouns

One-place nouns

The majority of nouns constitute one-place predicate terms. Unlike verbs, one-place nouns are not combined with a separate argument term. They are primarily used as the head of referring NPs that function, for example, as a verb complement (but see 6.4.3 for the 'predicative' use.)

(9) *The **dog** managed to open the **door**.*

In (9) the argument of the one-place noun *dog* is the referent of the subject NP *the dog*, and analogously for the noun *door*. Both nouns have a referential argument.

Relational nouns

Some nouns constitute two-place predicate terms. These are called relational nouns. One group is kinship terms, e.g. *uncle* and *sister* in (10).

(10) *My **uncle** is going to marry Molly's **sister**.*

The two NPs *my uncle* and *Molly's sister* each have a referent: the speaker's uncle and Molly's sister, respectively. These are the referential arguments of the relational nouns *uncle* and *sister*. In addition to the referential argument, each noun has an argument for the one the referent is a relative of. In the terminology of kinship relations, this is called the *propositus*. In the case of *Molly's sister*, the propositus is Molly. It is specified by the NP *Molly's*, which is linked to the noun *sister* by means of the possessive 's. In the case of *my uncle*, the propositus argument is the speaker, specified by the possessive
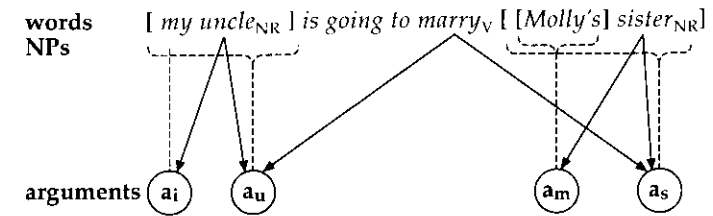
Figure 6.4 Predication structure of sentence (10)

pronoun *my*. Thus both NPs refer to an additional argument, the speaker and Molly, respectively.

In addition to the relational nouns, (10) contains the two-place verb *marry*. Thus the proposition expressed comprises three two-place predications: that someone is an uncle of the speaker's, that this someone is going to marry someone else, and that this other person is a sister of Molly's. An analysis in the style of Figure 6.2 may help to illustrate how the predicates are related to their arguments. In Figure 6.4 the subscript 'NR' is short for 'relational noun'. The four arguments a_i, a_u, a_m and a_s are short for the speaker, the speaker's uncle, Molly and her sister.

The relational argument of two-place nouns is usually specified with a possessive construction. There are three common alternatives. In the simplest one, a possessive pronoun precedes the relational noun (*my uncle*). Alternatively, a full NP with a possessive 's can be placed before the noun (*the children's uncle*). Finally, a 'possessor' can be specified by an *of*-PP following the noun (*an uncle of my mother*). Possessive arguments of nouns are generally not syntactically obligatory. They are counted as arguments proper because the meaning of the respective nouns cannot be defined other than in terms of two arguments.

There are many more relational nouns: words like *friend, neighbour, rival, boss*, abstract nouns like *name (of), height (of), occupation (of)* or linguistic notions such as *meaning (of), pronunciation (of), subject (of), argument (of)*. In some cases, relational arguments are specified by non-possessive PPs, cf. *ticket to, attack on, discontent with, equivalence to*.

6.4.2 Major types of adjectives

One-place adjectives

Most adjectives are one-place predicate terms when used in their basic form, the positive, as opposed to the comparative form. Adjectives are used in two ways. In the attributive use, the adjective, within an NP, precedes the head noun, e.g. *a dubious company, a red balloon, the stupid driver*. As we have seen, the argument of the adjective then is the referential argument of the noun. Therefore the argument of a one-place adjective is neither a

referential argument of the adjective nor is it specified by a separate argument term. It is, as it were, parasitic.

It should be mentioned that not all combinations of an adjective and a noun function this way. For example, in the NP *the alleged murderer*, the adjective cannot be interpreted as providing an independent predication about the referent of the NP: an 'alleged' murderer is not someone who is (a) alleged and (b) a murderer. Rather, in such cases the adjective modifies the predication expressed by the noun. While the noun *murderer* predicates of its argument that he or she is a murderer, the combination *alleged murderer* predicates that the argument is alleged to be a murderer. Other adjectives functioning that way are *former*, *future* or *potential*.

The second way of using adjectives is the **predicative** use. In the most common predicative construction in English, the adjective is combined with the so-called copula verb *be*, or a similar verb such as *become*, to form the VP of the sentence.

(11) *John is **silly**.*

Not incidentally, adjectives like *alleged* and *former*, which do not express an independent predication, cannot be used in this way.

Two-place adjectives

Some adjectives, e.g. *other than, different from, similar to, fond of, satisfied with, keen on*, have a second argument. It is invariably specified by a PP complement, i.e. by a separate argument term. With respect to their first argument, these adjectives behave like one-place adjectives. Combined with the PP complement they can only be used in predicative constructions such as a copula sentence or the relative clause construction in (12b) (which constitutes a second variant of predicative use). In attributive use as in (12c), adjectives with complements are ungrammatical.

(12) a. <u>My uncle</u> is very **fond** <u>of Molly's sister</u>.
b. *She wore a sweater **similar** <u>to yours</u>.*
c. **She wore a **similar** <u>to yours</u> sweater.*

A special case of two-place adjectives are one-place adjectives in their **comparative** form. The comparative adds a further argument to the adjective, an entity the first argument is compared to. Thus *big* is one-place, and *bigger* is two-place. The second argument is specified by a *than*-PP, i.e. a complement proper. If the comparative is formed of a two-place adjective, the result is a three-place predicate term (cf. (13c)).

(13) a. <u>Her hair</u> was **oilier** <u>than Julio's</u>.
b. *I hardly can imagine <u>a book</u> **more boring** <u>than this one</u>.*
c. *Actually, <u>my uncle</u> is **more fond** <u>of Molly</u> than <u>of her sister</u>.*

6.4.3 Arguments of nouns and adjectives in predicative use

Not only adjectives but also NPs, and therefore nouns, can be used predicatively. Predicative NPs do not refer.

(14) a. *John is **a teacher**.*
b. *John is **silly**.*

Both sentences have only one referent, that of the subject NP *John*. Syntactically the subject NP is a complement of the copula. Semantically it is passed on, as it were, to the predicate terms that form the VP with the copula, i.e. to the noun phrase *a teacher* or the adjective *silly*. Thus predicative NPs and adjectives are parasitic, for their first argument, on the copula. Further complements of nouns are specified in the same way as in their referential use. The predicative use does not affect the syntactic structure of the NP.

(15) a. *This is **my uncle**.*
b. *This is **a ticket** to Novgorod.*

In languages like Russian which lack a copula, the subject can be considered a complement. The equivalents of (14a, b) would simply be (16a) and (16b):

(16) a. *John učitel'* ('John teacher')
b. *John durak* ('John silly')

Table 6.2 displays the main types of predicate terms and the way in which their arguments are specified in the sentence. Predicative uses are not

Type		First argument	Further arguments
verb intransitive	*the bell **rang***	complement	—
verb transitive	*she **opened** the door*	complement	complement
noun 1-place	*the **postman***	referential	—
noun relational	*asking her **name***	referential	possessor
	*a **letter** from Johnny*	referential	complement
adjective 1-place	*a **pink** envelope*	parasitic	—
adjective compar.	***thicker** than the last one*	parasitic	complement
adjective 2-place	***full** of promises*	parasitic	complement

Table 6.2 Types of predicate terms and how their arguments are specified

included. Verbs, nouns and adjectives differ in the way their first argument is integrated into the sentence structure, but they are similar in that further arguments take the form of separate argument terms, usually NPs or PPs. For the second argument of relational nouns there is a special group of (possessive) constructions.

Before the topic of predication is continued, a brief section about predicate logic is inserted. Ultimately derived from the predicational structure of natural language (i.e. ancient Greek), more than 2000 years ago by Aristotle, it is a formal system widely used in semantics for the analysis and representation of sentence meaning.

6.5 Predicate logic notation

In so-called predicate logic (PL), a simple notation has been developed for predication. The basic expressions of predicate logic are one-place, two-place, etc. predicate terms, on the one hand, and so-called individual terms, on the other. Individual terms serve as argument terms and are interpreted as referring to 'individuals', where these are whatever may serve as an argument of one of the predicates. There are two sorts of individual terms, individual constants and individual variables. Roughly speaking, individual constants can be thought of as proper names and individual variables as something like third person personal pronouns, i.e. expressions that refer to some particular individual given in the CoU. For the current purposes, we define a predicate logic language with the following basic expressions (again, referential verb arguments are disregarded).

one-place predicate terms	**cat, application, dubious, company, sleep**[3]
two place predicate terms	**marry, sister, uncle**
three place predicate terms	**send_to**
individual constants	**j** [for Johnny], **m** [for Molly], **i** [for the speaker]
individual variables	x, y, z

The predicate terms, more precisely *predicate constants*, are combined with argument terms in a uniform way. In the most common notation, predicate terms are followed by the appropriate number of individual terms enclosed in parentheses and separated by commas. The following would be simple PL formulae with the meanings indicated.

(17) a.	**application**(x)	x is an application
b.	**uncle**(j, m)	Johnny is an uncle of Molly
c.	**send_to**(j, x, y)	Johnny sends x to y

The notation of predicate logic reflects the view that predicates are incomplete propositions with empty slots for arguments. This is why the logical properties and relations, originally defined for sentences, can be applied to predicate expressions (4.5). When combined with the appropriate number of argument terms, a predicate term yields a **formula** which is either true or false and hence a sentence in the sense of sentential logic (4.4). Formulae can be combined with sentential connectives such as negation and conjunction. This allows us to analyse the predicational part of a natural language sentence by 'translating' it into a predicate logic formula. The single predications are connected by a truth-conditional conjunction. In the following examples, referents not specified by a proper name are represented by variables. Tense, aspect (e.g. the progressive form of the verb) and articles are neglected.

(18) a. *The cat is sleeping.*
  cat(x) ∧ **sleep**(x)[4]
 b. *Johnny sent an application to a dubious company.*
  send_to(j, x, y) ∧ **application**(x) ∧ **dubious**(y) ∧ **company**(y)
 c. *My uncle is going to marry Molly's sister.*
  uncle(x, i) ∧ **sister**(y, m) ∧ **marry**(x, y)

The method makes transparent which predications a sentence contains, to which arguments they are applied and how the different predications interact by sharing arguments. In Chapter 10, predicate logic will be treated in more depth and detail and the method of semantic analysis by translation into a formal language will be of central concern.

6.6 Thematic roles

The different arguments of a verb predicate are referred to as its **roles**, or **participants**. A transitive verb has two roles, for example, the eater and the thing eaten, the opener and the opened, the helper and the helped, etc. Grammar consistently distinguishes the different roles of a more-place verb. When the verb *eat* is used in its active mode, the eater is always specified by the subject of the verb *eat* and the thing eaten by its direct object. (The analogue holds for more-place nouns and adjectives.) An important question then is whether there is *cross-verb* consistency in the way the roles of verbs are marked. Is there something common to the role of the eater and the role of the helper that is responsible for their appearing as the subject of the sentence? Is there something in common to all subjects, or to all direct or indirect objects? Can the roles that are encoded in tens of thousands of verbs be consistently categorized into a small number of abstract roles? Are these abstract roles universally applicable to all roles of all verbs in all languages? Semanticists and syntacticians have tried to

answer these questions positively. There is a good chance of succeeding, but things are not straight and simple. A first look at the data clearly shows that the subject does not always denote the same role. Consider, for example, intransitive and transitive *open* in the following sentences:

(19) a. *The door$_O$ opens.*
  b. *This key$_I$ opens the door$_O$.*
  c. *The child$_A$ opened the door$_O$.*
  d. *The child$_A$ opened the door$_O$ with her own key$_I$.*

While these sentences represent different concepts of opening, it is intuitively clear that they all fit into one scheme with three roles, (i) an animate agent A opening something; (ii) an object O that becomes open; (iii) an instrument I used to open O. In (19a), the subject specifies O, in (19b) I and in (19c) and (19d) A. Conversely, O is specified by the subject in (19a) but by the direct object in (19b)–(19d). The instrument I appears as the subject in (19b) and as a prepositional adjunct in (19d). The patterns do, however, exhibit certain regularities: if A is specified, it appears as the subject. O is always specified in the object position as long as it is not the only argument term.

Since the first attempts, back in the 1960s, at establishing a set of universal roles, many theories have been developed in different theoretical frameworks. It is now common practice to speak of **thematic roles** (θ-roles, theta-roles, with the Greek letter θ 'theta' for t̲hematic) or **semantic roles**. Some draw a distinction between thematic roles and semantic roles, but the difference need not concern us here. The inventory of thematic roles differs from theory to theory, but the roles in Table 6.3 are uncontroversial.[5]

General thematic roles are useful in several respects. For example, they help to account for the meaning relations holding between the three different verbs *open* used in (19a), (19b) and (19c, d), respectively. For predicate terms, a description of their arguments in terms of roles, their so-called **argument structure** constitutes an important part of their distinctive properties. Thematic roles also allow a proper description of phenomena like passive, which change the argument structure of a verb in a specific way.

The mechanism by which a language distinguishes the different arguments of predicate terms is called **linking**. We will not go into this complex matter here. As far as English is concerned, some simple linking rules can be stated that were already indicated in connection with (19): an agent role always appears in subject position, a theme can only be the subject if no agent is present. These rules hold for active sentences. In passive sentences, themes and other roles can be made the subject of the sentence. The agent complement is deleted, but it can be specified by an additional *by*-PP.

(20) *The door* (theme) *was opened* (passive) [*by the dog* (agent)].

Role	Description	Examples
agent	performs the action expressed by the verb	*J̲o̲h̲n̲n̲y̲ wrote a love letter* *t̲h̲e̲ c̲a̲t̲ has eaten the egg* *s̲h̲e̲ gave me the keys* *y̲o̲u̲ put the keys on the desk* *m̲y̲ u̲n̲c̲l̲e̲ marries Molly*
theme/ patient	undergoes the action/change/event expressed by the verb	*Johnny wrote a̲ l̲o̲v̲e̲ l̲e̲t̲t̲e̲r̲* *the cat has eaten t̲h̲e̲ e̲g̲g̲* *she gave me t̲h̲e̲ k̲e̲y̲s̲* *you put t̲h̲e̲ k̲e̲y̲s̲ on the desk* *my uncle marries M̲o̲l̲l̲y̲* *t̲h̲e̲ d̲o̲o̲r̲ opened* *t̲h̲e̲ s̲n̲o̲w̲ is melting*
experiencer	experiences a perception, feeling or other state	*I̲ heard him* *the outburst surprised h̲e̲r̲*
instrument	an instrument, or a cause, by which the event comes about	*t̲h̲i̲s̲ k̲e̲y̲ opens the door* *he opened the door w̲i̲t̲h̲ a̲ k̲e̲y̲* *she was shaking w̲i̲t̲h̲ f̲e̲a̲r̲*
locative	a location	*the keys are o̲n̲ t̲h̲e̲ d̲e̲s̲k̲*
goal	goal of a movement	*put the keys o̲n̲ t̲h̲e̲ d̲e̲s̲k̲*
path	path of movement	*she rode t̲h̲r̲o̲u̲g̲h̲ t̲h̲e̲ d̲e̲s̲e̲r̲t̲*

Table 6.3 Thematic roles

The subject and the direct object in English sentences differ in three ways, which illustrate three general linking strategies to be observed in the languages of the world.

- **Word order**. The subject NP precedes the finite verb, the direct object follows it.
- **Case**. The subject is in nominative case, the object in objective case. In English, though, the difference shows up only with some pronouns (*I, he, she, we, they* vs *me, him, her, us, them* and *who* vs *whom*).
- **Agreement**. The form of the verb varies with the grammatical properties of the subject, in the case of English with the grammatical person (1st, 2nd and 3rd) and number (singular or plural). Agreement shows up in the 3rd person singular *-s* of full verbs in the present tense (*he/she/it speaks̲* vs *I/you/we/they speak_*) and in the forms of the verbs *be* and *have* (*I am, you are, she is; I was, we were; have* vs *has*).

6.7 Selectional restrictions

A predicate term cannot be combined with *arbitrary* complements. In addition to the requirements of grammar, argument terms underlie semantic restrictions due to logical conditions imposed on possible arguments terms. The discussion will be restricted to verbs, but the same applies to adjectives and nouns.

6.7.1 Selectional restrictions of verbs

Two somewhat strange examples may illustrate what kinds of conditions are involved.

(21) a.   *The cook has murdered an eggplant.*
    b.   *The potatoes are frying the cook.*

If taken literally, the two sentences describe impossible situations. The verb *murder* requires a living being as its theme/patient argument, usually a human being. Only a minority of speakers of English would use the verb *murder* also for the killing of animals, probably none would use it for plants or even fruits. Likewise, the verb *fry* requires an agent argument capable of acting. It need not be a person – one could imagine an animal putting, and keeping, something on a hot stone in order to get it fried. But potatoes cannot fill this role. There are fewer problems with the theme argument of (21b). Although highly unlikely, the theme of a frying event can be a person: people are friable. But the theme role too underlies logical restrictions. For example, words, numbers, properties or addresses cannot be fried.

The logical conditions on arguments are called **selectional restrictions** (also *selection restrictions*). The notion is motivated by the idea that a predicate term selects, and thereby restricts, the range of possible arguments. Let us assume, for example, that the verb *vaccinate* requires a human being as its agent. Then, in appropriate CoUs, the following sentences comply with the selectional restrictions:

(22) a.   *The doctor himself vaccinates John.*
    b.   *The next one vaccinates John.*

The choice of the subject term in (22a) guarantees that the selectional restrictions are fulfilled: doctors are persons. It is, however, not necessary that the noun in the complement NP entails *human being*. The selectional restrictions only require that the *referent* of the complement is a person. The potential referents of the subject NP *the next one* in (22b) are by no means necessarily persons: the NP can refer to almost anything, because the pronoun *one* can

replace an arbitrary count noun. But if the subject refers to a person in the given CoU, (22b) is semantically correct.

To work out the selectional restrictions of a particular predicate term can be a very difficult task. Take, for example, the theme argument of the transitive verb *open*. What kinds of things can be opened? We can open a door, e.g. by sliding it open, and thereby create an opening in the wall that can be passed through. We can open a room by opening a door to the room. We can open our mouth. We can open our eyes. Or our arms. Or a fist. We can open a bottle or a tube by removing or opening its lid. We can open an envelope by slitting it open, or a letter by unfolding it, or a book. We can open a bank account, or a business. We can open a ceremony. We can open a computer file. We can open perspectives. These are not only different kinds of objects, but in addition *open* in almost each case means something slightly different. If I open a door or a lid, the argument that is 'opened' is moved, or removed, in order to create an opening in the enclosure of a spatial region (e.g. a room or the interior of a bottle). If I open a bag, or an envelope, the theme argument is the enclosure and the result of the act is an aperture in the enclosure. If I open a room, a trunk, a garden, a shop, a box, or my mouth, I refer to an object which *has* an enclosure in which then an aperture is brought about. So, actually, there are two or three different roles involved in these kinds of opening events: (i) a spatial region (e.g. a room) which is rendered accessible; (ii) its enclosure; and (iii) possibly, a (re)movable part of the enclosure that provides, or blocks, access to the region. Each of these roles goes with its own selectional restrictions. In the variants *open a fist, open a book, open the arms, open the wings* (of a bird), the theme arguments play yet a different role and the verb is used to express a different kind of process similar to spreading or unfolding. In the variant represented by *open a ceremony*, the selectional restrictions of the theme argument require an event or a procedure. Opening it, we start the ceremony and thereby 'enter' a certain sequence of events. Yet another selectional restriction governs the use of *open* in *I opened the style file*, or *you must open a bank account* or *she opened a computer business.*

It would be wrong to conclude that the selectional restrictions for the theme argument of transitive *open* are so general that they cover almost anything. Rather, the verb is multiply polysemous. In each of its meaning variants, the verb expresses a different process with respect to its theme argument and imposes different selectional restrictions. If we take these restrictions seriously, we will be able to explain how the meaning variants are related, e.g. the readings of *open* in *open one's eyes* and *open one's eyelids*. (By the way, this is a nice example of two expressions with the same truth conditions but different meanings, recall 4.6.1.)

One important point to be observed with selectional restrictions is that they apply not only when the predication is true of its arguments. Consider the three sentences in (23):

(23) a. *The dog opened it.*
   b. *The dog didn't open it.*
   c. *Did the dog open it?*

According to (23a), the predicate ›open‹ is true of the dog and the referent of *it*, according to (23b), it is false, according to (23c) it may be true or false. Invariably, however, the referent of *it* must fulfil the selectional restrictions of (at least one meaning variant of) *open* for its theme argument. Thus the selectional restrictions of predicate terms apply whenever the predicate term is *used*, not only when it is true of its arguments. The logical conditions captured by the selectional restrictions are prior to the question of truth or falsity. They must be fulfilled in order to be able to decide whether in the given CoU the predicate is true or false of its arguments.[6]

6.7.2 The process of fusion

The combination of a predicate term with a complement results in two sources of information about the argument. First, the complement provides an explicit specification of it. Second, the predicate contributes implicitly the selectional restrictions for the argument. These two pieces of information are conjoined when the meaning of the sentence is composed. We can think of the process as a logical conjunction (i.e. combination by *and*) of the two pieces of information. Let us call the process **fusion**, borrowing a term from Jackendoff (1990). It is illustrated in Figure 6.5. Fusion may have different results:

1 If the selectional restrictions are less specific than the argument specification, then the total description is identical to the argument specification.
2 If the selectional restrictions are more specific than the argument specification, then the total description is identical to the selectional restrictions.
3 If the selectional restrictions and the argument specification are incompatible, the total description is contradictory, i.e. inapplicable to any concrete situation.
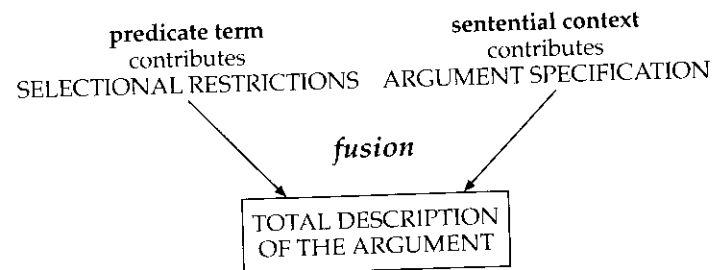

Figure 6.5 The mechanism of argument description

Example (22a), *the doctor himself vaccinates John*, illustrates case 1: the selectional restrictions add nothing to the total description, because they are already part of the argument specification. In (22b), *the next one vaccinates John*, the selectional restrictions substantially contribute to the total description, making it more specific. (21a, b) constitute examples where fusion leads to contradiction. The example shows that the selectional restrictions of a predicate term for its arguments are part of its meaning, since they contribute independently to the proposition of the sentence.

When composition is subjected to the Principle of Consistent Interpretation (3.5) which governs interpretation in context, contradictory results are generally ruled out. Thus, sentences such as (21a, b) will end up with no consistent reading at all (this is why they qualified as examples above). In other cases, the elimination of contradictory fusion will lead to disambiguation. Consider, for example, (24), assuming for the sake of the argument that the verb *drink* imposes the selectional restriction 'liquid' on its theme argument:

(24) *She drank the coffee.*

The object NP *the coffee*, taken for itself, does not necessarily denote a liquid. 'Coffee' can also be coffee powder, coffee beans or coffee plants. In (24), the selectional restriction 'liquid' rules out all but the drink variant of the meaning of *coffee*. The result is a disambiguation of the noun *coffee*.

Conversely, we can observe disambiguation of the verb:

(25) a. *She corrected her uncle.*
    b. *She corrected the error in the style sheet.*

In (25a) the specification of the theme/instrument argument requires a meaning variant of the verb in which it can be applied to persons, ruling out a reading such as the one required in (25b).

6.7.3 Selectional restrictions and meaning shifts

If fusion leads to contradiction, it may be possible to obtain an admissible reading by means of a meaning shift. Let us first consider an instance of metonymy:

(26) *Moscow declares the Chechen rebels defeated.*

The verb *declare* requires a human being or organization as its agent argument, but the given specification *Moscow* is the name of a geographic entity. In order to avoid a contradiction, we will change the meaning of *Moscow* by a metonymical shift (location → institution located there) in order

to meet the selectional restrictions of the verb. Note how the selectional restrictions serve as a guide that indicates the direction of the meaning shift.

In the case of metaphorical shifts, it is often the predicate term whose meaning is shifted, as in (27). The literal meaning of the verb *evaporate* requires some kind of physical substance. The subject, however, refers to a certain mental state. To remedy the conflict, the verb meaning is shifted to the more general meaning ⟩vanish completely⟨ with selectional restrictions that allow for this kind of argument.

(27) *His courage evaporated.*

The processes of metaphor and metonymy regularly affect selectional restrictions. If an argument term undergoes a metonymical shift, the resulting referent usually is of a different logical sort, cf. 'university' as a location vs 'university' as an institution vs 'university' as the university personnel. Likewise, metaphorical interpretation of an argument causes a shift into a different conceptual domain, usually also of a different logical sort, e.g. when 'money' is conceived of as a liquid that may 'flow'. If a predicate is interpreted metaphorically, as e.g. *evaporate* in (27), the selectional restrictions change too, as to match with the sort of objects that make up the target domain.

6.7.4 Semantic irregularity

The massive occurrence of meaning shifts in the interpretation of actual sentences blurs a question that is central to semantic analysis, the question of semantic irregularity. The notion of selectional restrictions provides us with one clear type of cases: if a specification of an argument term in the sentence is logically incompatible with the selectional restrictions, then the construction is semantically irregular. Simple as this seems to be, we have seen that semantic regularity is a question of the readings assumed for the predicate term and its argument specifications. For instance, sentence (21a) above, *the cook has murdered an eggplant* is semantically irregular only if we assume the lexical meanings of *murder* and *eggplant*. It becomes regular, i.e. interpretable, if we allow an appropriate meaning shift of either the verb or the direct object. (Possible interpretations are left up to your imagination.) It therefore makes more sense to avoid the simple notion of semantic acceptability and to replace it by a description of the conditions under which it is possible to make sense of a complex expression. We may then distinguish between degrees of acceptability, such as (i) interpretable on the basis of the lexical meanings of all components; (ii) interpretable by means of common types of meaning shifts; and (iii) interpretable only by means of uncommon types of meaning shifts. Probably, a fourth category, 'interpretable by no means at all', does not exist.

6.8 Summary

This chapter focused on predication, the semantic function of the main word classes, verbs, nouns and adjectives. Built into a sentence, each of these 'content words' adds a predication to the total proposition, about one or more referents. The three major word classes differ in how their arguments are specified (Table 6.2). Verb arguments, except for the event argument, are specified by complements, i.e. separate syntactic constituents with a referent of their own. One-place nouns are mainly used as referring expressions that predicate their referents. One-place adjectives are parasitic for their argument. One of the most important insights concerning sentence meaning is the fact that the predications contained in a sentence are interconnected by argument sharing. If you take a look back at the examples, in particular the analyses in Figure 6.2 and Figure 6.4, you will see that the network of predications includes all referents of the sentences. It is this network structure that makes a sentence a coherent semantic unit. The verb has the key role in this structure. It occupies the centre of the network like a spider in its web holding all the threads. This role of the verb corresponds to the fact that most verbs are two- or more-place predicates.

Since the meaning of a sentence is a network of predications about its referents (including reference time and event referents), the sentence as a whole can be considered one complex predicate expression about the situation referred to. For example, sentence (1) renders a complex predication about a situation: an event e takes place, at some time t; e is an event in the past (cf. past tense); it is an event of sending that involves three referents r_j, r_a and r_c, with r_j the agent, r_a the theme and r_c the goal of sending; r_j is a certain 'Johnny', r_a is an application, and r_c is a company and dubious. This is what the sentence, due to the sophisticated grammar of English, is able to express in not more than nine words. Slightly accommodating Figure 6.3 for the application to sentences, we obtain the picture in Figure 6.6 for the sentence as a complex predication about the situation referred to.

The study of predication also sheds light on the mechanism of composition. First, composition is for the most part a matter of integrating all the
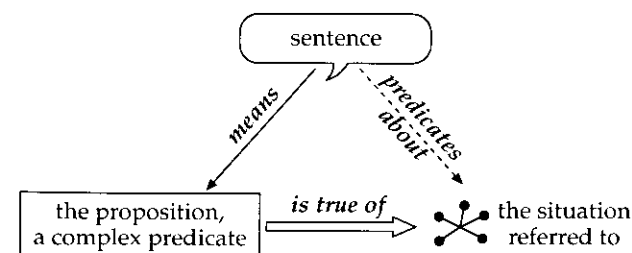

Figure 6.6 The sentence as a complex predication

predications contained in the word meanings into an overall structure. Second, we have seen how predicate terms and complements interact in the process of fusion in providing the total description of the argument.

This concludes the first part of the book, in which central semantic phenomena and concepts were introduced and interconnected. Part II will outline three major theoretical approaches. Chapters 7, 8 and 9 again will focus on word meaning, but what was said about predication will serve as background relevant in several respects. The topic of composition is taken up again in Chapter 10 on formal semantics.

Checklist

predicate	two-place adjectives
one-place, etc.	comparative
predicate term	attributive use
argument	predicative use
argument term	**predicate logic**
argument specification	**thematic roles**
complement	participants
referential argument	agent
argument sharing	theme, patient
verbs	experiencer
intransitive verbs	instrument
transitive verbs	locative, goal, path
ditransitive verbs	**linking**
subject	case
direct object	agreement
indirect object	word order
referential argument	**selectional restrictions**
nouns	fusion
one-place nouns	elimination of meanings
relational nouns	meaning shifts
possessive construction	metaphor
predicative use	metonymy
adjectives	**semantic irregularity**
one-place adjectives	

Exercises

1   What is the difference between a predicate and a predicate term, between an argument and an argument term? Discuss the four notions and explain how they are connected.
2   Discuss the ways in which arguments are specified in the sentence for different types of predicate terms.

3   Give an analysis in the style of Figure 6.4 of the following two sentences.
   (a)   *The woman took her frightened daughter to the dentist.*
   (b)   *The customers eat potato chips with wooden toothpicks.*
4   Express the predications contained in the two sentences in predicate logic formulae like those in (18).
5   Determine the thematic roles of the verb arguments in the two sentences.
6   The following examples illustrate three types of predicative NP constructions. Discuss the ways in which the NP *a born loser* gets its argument in each type of construction.
   (a)   *Peter is a born loser.*
   (b)   *She called him a born loser.*
   (c)   *Peter, a born loser, managed to be fired within three hours.*
7   Try to describe the correspondences between the two uses of the verbs *drop, break* and *load* in terms of thematic roles:
   (a)   *She dropped her bag on the floor.*   vs   *The bag dropped onto the floor.*
   (b)   *She broke the bottle.* (active)   vs   *The bottle was broken.* (passive)
   (c)   *She loaded the truck with bricks.*   vs   *She loaded bricks onto the truck.*
8   Try to formulate the selectional restrictions (consult a dictionary for possible polysemy):
   (a)   of the verb *write* for its direct object argument;
   (b)   of the adjective *expensive* for its only argument.
9   Explain in terms of selectional restrictions how the metonymical readings of the following sentences come about:
   (a)   *The university lies in the eastern part of the town.*
   (b)   *The university has closed down the faculty of agriculture.*
   (c)   *The university starts again on 15 April.*

Further reading

Givón (1993, Chapter 3) for an extensive discussion of verb types and thematic roles. Tallerman (1998, Chapter 6) on the basic facts of linking and Chapter 7 on passive and causative constructions. Radford (1988, Chapter 4) on complements and adjuncts, Chapter 7 on thematic roles and selectional restrictions. Palmer (1994) on thematic roles and grammatical relations across languages. Saeed (1997, Chapter 6) on thematic roles.

Notes

[1]   In syntactic approaches, a distinction is drawn between obligatory and optional argument terms. Only the former are called *complements*, the latter *adjuncts*. A general definition of the distinction is notoriously difficult and depends on the

theory adopted. We will not tackle the problem and use the term *complement* in a wide sense that also includes optional argument specifications.

[2]   Because the pronoun is usually omitted, its use results in some sort of emphasis on it. In this sense, the pronoun, if present, is not redundant.

[3]   It is common practice to use bold type for predicate and individual constants that correspond to natural language words.

[4]   A formula such as 'sleep(cat)' would violate the rules of PL syntax, because the predicate term **cat** is not allowed to be used as an individual term in the argument position of **sleep**.

[5]   Often thematic roles are written with small capitals (THEME, etc.). In this book small capitals are reserved for category names (see Chapter 9).

[6]   Therefore selectional restrictions constitute so-called **presuppositions**. See also Chapter 9, note 6.