

---

## An outline for a semantic categorization of adjectives

Frans Heyvaert

Instituut voor Nederlandse Lexicologie, Leiden

*The aim of this paper is to sketch some basic principles on which a full semantic categorisation of adjectives can be founded that will allow for constructing uniform description templates for the individual categories. The underlying idea is that there should be a one to one correspondence between the category and the template used, like it is the case for most of the existing categorisations of nouns. For that purpose adjectival categories need to be defined by 'adjectival' expressions (mostly with present or past participles as their head). Since this procedure generates only a limited number of very general categories (more or less parallel to the verb categories containing static relations), the templates are extended with some semantic features among which the feature domain, plays an important role since it offers the opportunity to specify on a subcategorical level the information that most existing proposals for adjective categorisation give: the conceptual field in which the adjective is to be situated. These conceptual fields for adjectives appear moreover to play an important part in the construction of noun templates, not in terms of form but also in terms of content. The ultimate aim of this proposal is to construct a kind of template building grammar the elements of which can be used equally for nouns, verbs and adjectives.*

### 1. Lexicography and semantic categorization<sup>1</sup>

The emergence of electronic monolingual dictionaries in the last two decades has largely increased the need for a greater uniformity in lexical descriptions, not only in their formal outline (structure, information categories), but also on the microstructural level in the rendering of their semantic content. Electronic organization of dictionaries in the form of databases has multiplied the search possibilities for the user drastically. To name just a couple of things, it can enable users to look up easily the paradigmatic environment of a word (synonyms, near-synonyms, antonyms, hyponyms, hypernyms and other kinds of related words) and it can help them to find words on the basis of elements of their meaning description. These aims can of course only be realised if the semantic descriptions of words are carried out on a systematic basis, making use of description templates. Such templates can take different forms, according to the purposes they serve. When used as a tool to systematise meaning descriptions in dictionaries, it should be recommended that they have as much as possible the same kind of structure as actual descriptions in dictionaries have. This means that they are best organized in terms of a *semantic core* modified by some *features*, adding further attributive information to that core. A well usable template for dictionary descriptions would be something like

*Meaning core [...] Feature type 1 [...] Feature type 2 [...] ...*<sup>2</sup>

where what is to be filled in under *meaning core* in the normal case is the direct hypernym of the word defined, or a higher hypernym, or, by lack of a simple word, a hypernymic expression and *feature types* are defined by the set of possible semantic relations of the modifiers to the *meaning core* (such things like *place, time, manner, frequency* and so on). What comes between square brackets are the concrete realisations for a particular word. Words with the same semantic core form together a *semantic category* in which at least part

---

<sup>1</sup> Thanks to Lut Colman, Carole Tiberius and Egbert Beijk for critical comments on a former draft of this paper, and to Nigel Barclay for making my English understandable.

<sup>2</sup> Such formulas should of course not be viewed as the form of actual descriptions in a dictionary, but rather as some structure underlying them for the sake of improving and guiding the retrieval.

of the semantic behavior of the individual words is common. Moreover it is probable that for each category a certain selection can be defined out of the set of possible feature types that is applicable to its members.

The kind of categorisation and the type of category structure sketched here apply without many difficulties to noun description, as is illustrated by a number of quite satisfactory organised on-line lexical databases of the *WordNet* type, like *Cornetto* for Dutch (for an introduction see a.o. Vossen 2006 and Vossen, Maks, Segers and Van der Vliet 2008) and *Germanet* for German. In these databases the lexicon is organised in terms of *synsets*, which are paradigmatic semantic complexes, consisting of synonyms, antonyms, hyponyms and hypernyms. For clarity's sake, these databases do not aim at categorising words, but by defining these synsets, they offer a workable tool for categorisation. The hyponym-hypernym relation in fact offers a sound basis for that, the hypernym being the category name for its set of hyponyms (internally organised in terms of synonymy, near-synonymy, antonymy and possibly other types of relations). The hyponyms inherit the semantic properties of the hypernym and have moreover some supplementary semantic structure of their own. This way a quite elaborate 'natural' internal structure of the noun class can be built in terms of hierarchies of classes. This is especially clear in the case of nouns denoting concrete objects. A Lippizaner is a horse. A horse is a mammal. A mammal is an animal. Above that, there is still the category 'living being', but there is no single word for that. Here we are obliged to make use of a hypernymic expression for category definition.<sup>3</sup> Also with abstract nouns the same hyponymy-hypernymy chains do show. To take one example from the Princeton version of *WordNet*: the chain *excitement – joy – emotion – feeling – state – attribute* shows such an organisation of a part of the abstracts lexicon.

The reason why so much attention is paid here to a categorisation of nouns, is not the nouns themselves, but the fact that it shows the principles of one type of categorisation: an organisation of the lexicon in terms of itself, with hypernyms as category names for their hyponyms and semantic properties of words partly explicable through inheritance. This type of categorisation has the very interesting advantage that the category name can be incorporated directly as the semantic core in the description template of a word. We will call it henceforth the *semantic analysis type* of categorisation. This type is common practice for nouns, but not so much for the other major parts of speech: verbs and adjectives.

For verbs and adjectives as well one can make use of the *WordNet* type databases, but the results are not as satisfactory as with the nouns, since the chains of lexical hyponyms and hypernyms are clearly less elaborate and less obvious. For verbs this can be demonstrated by the *WordNet* chain *resell – sell – change – transfer*. The hierarchic relation between *resell* and *sell* is clear, but on the next higher level the usefulness of the hypernym as a category name looks rather doubtful. *Change* is too much burdened with ambiguity to be able to function as such. It should be replaced by an unambiguous term, which will have to be a complex expression like *change possession*, since a single word for it is missing. Another problem is

---

<sup>3</sup> There are also some 'in between' categories like 'vertebrate', 'odd-toed ungulate', which are legitimate science-based categories, but do not have a very high score as 'folk'-categories, and as such are rather unlikely to be used by dictionary users in a search strategy. And there are categories like 'domestic animal', but domestic animals are also cats, dogs, chickens, geese or cows. This category is based on a different principle of categorisation and as such crosses the different elements of the categorisation above. If one wants to give it a place in the description templates, this can better be done on the level of the features.

presenting *transfer* as a hypernym for *change*. One cannot really imagine a transfer without change (compare also Fellbaum 1990 for other types of semantic relations between verbs). In the linguistic literature of the last decades several proposals have been made for a semantic categorisation of verbs. Jackendoff (1972) devotes a whole chapter to a theory about it, which is further refined in Jackendoff (1976). Also proposals by Dik (1978, 32 - 34) and Miller and Johnson-Laird (1976, 526 ff.) have to be mentioned. A thorough survey of the field can be found in Levin (1993). Mention should also be made of the Berkeley Framenet, which is special in that sense that it categorises verbs entirely in terms of the semantic roles of their semantic environment.

For adjectives, finally, the Princeton *WordNet* does not even have hyponym-hypernym relations. The European databases *Cornetto* and *GermaNet* offer some semantic categorisation, but not in terms of vertical semantic relations between words. They categorise in terms of expressions like *perceptual adjectives*, *spatial adjectives*, *spirit-related adjectives* and so on. These are not adjectival, but nominal expressions, and because of that, this type of category names cannot be incorporated directly in descriptive templates, and there are no semantic properties to be inherited from the category name.

A brief impression of the state of affairs in adjective research will be given in section 2. But first some more attention must be paid to the observation just mentioned about the different ways of categorising, by means of hyponym-hypernym relations and by means of category definition in terms of a nominal expression.

When overviewing the literature on semantic classification of words, one can roughly discern two basic types of classifying: the first is an organisation in terms of semantic analysis, the second an organization in terms of the conceptual fields or themes to which the words refer. The properties of the first type have already been discussed. The categorization is based on the semantic decomposition of words into cores and attributes (like in analytic definitions in dictionaries), with the semantic core defining the category. This type of categorization allows for some predictions about the presence of some meaning properties by inheritance and about argument structures.

The second type of categorisation relates the word to the domain in the world to which it belongs. In such an approach, for instance, nouns like *nurse*, *scalpel*, *bypass*, *patient*, *surgeon* and so on could be taken together in a category 'nouns related to hospitals'. This is of course a completely imaginative example, and it is not very probable that such a category would ever be used by a lexicographer, but it reveals the nature of this type of categorisation. The words in such a category do not necessarily have any semantic structure in common (in the example, there are persons, instruments and actions involved), and thus this practice does not lead to uniformity of semantic description of the class members. But it may have the advantage of being an easy tool for dictionary users to guide them in some search procedures. This approach will be called henceforth the *conceptual field* type of categorization.

On the whole one can say that for nouns both types of categorisation seem to coincide: the hypernym defining the class can in most cases also be regarded as defining the conceptual sphere of the nouns categorized. However, even here both ways of categorising do not always coincide. This can be illustrated, among others, by food names. In *WordNet* a word like *steak* is listed under the (indirect) hypernyms *meat* and *food*. In this case, however, there cannot be inheritance of semantic properties, *meat* and *food*, contrary to *steak*, being mass nouns. In this case the categorization is only conceptual field-based.

In the case of verbs and adjectives the conceptual field approach is much more common practice. Jackendoff's 1972 and 1976 proposals about verbs are clearly based on semantic analysis, but they range only over a limited set of basic verbs. The most encompassing work in the field, Levin (1993), presents some kind of mixed model. The main categories she discerns are of the conceptual field type, as is shown by category names like *verbs of change of state*, *verbs of creation*, *psych-verbs*. But on a subcategorical level, distinctions are made on the basis of syntactic similarities and similar meaning paraphrases.

The state of affairs for adjective categorization will be discussed in section 2. below.

Summarizing this, one can conclude that for both ways of categorising there are some pros and cons. The semantic analysis method has the strongest explanatory power and leads naturally to uniformity in the description of the class members, but has the disadvantage that sometimes the higher a category is situated in the hierarchy, the more abstract and vague it becomes, and, because of that, the less comprehensible for the average dictionary user. The conceptual field method offers the most practical and useful information for the dictionary user, but it lacks a basis to provide the category members with templates for uniform semantic descriptions. Moreover there is the question what kind of things conceptual fields are: are they 'given'; are they the result of a common feeling in the language community; or are they just created ad hoc, more or less arbitrarily, inspired by momentary needs? In the case of the semantically based approach, we have at least the word itself and the inferences that can be made with it (*Every horse is an animal*) as objective criteria for making category distinctions.

Most certainly the semantic analysis approach will please the semanticist most, and the conceptual field approach will be most useful for the average dictionary user. But a good 'general' lexicographical project should be able to serve both audiences. Maybe the best thing a lexicographer can do is to use both categorisations next to each other, treated as different information categories in one and the same template.

## **2. Adjectival meaning types**

The rest of this paper will be devoted to adjective categorisation. In section 3. a proposal will be formulated for a possible outline of such a categorisation. The present section will be devoted to an overview of the different kinds of meaning distinctions that must be taken into account. What is presented here is not meant to be a real survey of the state of affairs in semantic adjective research, it is only meant to call under attention the issues at stake and the relevant terminology associated with it.

From the grammatical point of view the typical adjective is characterized by four main features: predicative usage, attributive usage, postpositive usage and usage with comparatives, superlatives and intensifiers such as 'very' or 'completely' (see Huddleston 1984). Another typical adjective feature is that it can be used as an adverb. But there are also many 'atypical' adjectives: some can only be used attributively, some only predicatively, still others are not gradable or cannot be used adverbially. These are clearly grammatical phenomena but they may correlate with semantic properties. This, however, is not a question to investigate here systematically, it is worth a separate study.

From the semantic point of view there is a broad agreement to divide adjectives into two main categories: *descriptive* and *relational* adjectives. The latter have only a 'relational' semantic content: they denote a relation between their subject and another nominal concept. So, for

instance, *chemical* has as its only semantic content ‘related to chemistry’. This distinction however meets some problems. The decision to put a particular adjective in one of both categories is sometimes slightly arbitrary. And some words that formally look like relational adjectives have a fairly rich meaning content. So, for instance, *Orwellian* is not just ‘related to Orwell’, but ‘being like the totalitarian world in Orwell’s *1984*’. The borderline between both categories is vague, but there exists a large amount of so-called *pertainisms*, and for these the categorisation as relational adjectives can be maintained.

There are also some small groups of adjectives which belong to neither category. First there are the *privative* and the *conjectural* adjectives (*fake, imaginary, possible, probable*), and second, there are some *evaluative* adjectives that have no further descriptive content (for instance *damn, bloody, fucking*).

In the category of descriptive adjectives one can find some further distinctive oppositions, creating subcategories. Adjectives may be *absolute* or *gradable* (an opposition that correlates with the presence or absence of comparative and superlative), they may have a *scalar* meaning (like adjectives denoting a size) or not or they can have an *extensional* or an *intensional* meaning (cf. Kamp 1975, where the distinguished categories are called *intersective* vs. *non-intersective* adjectives). The latter distinction has to do with use differences as is shown by *heavy* in *heavy suitcase* and *heavy drinker*, where in the first case the thing itself is modified, and in the second case not the person but the property ‘drinker’. Here again some parallel with the grammatical behavior can be indicated: intensional adjectives are never used predicatively.

From Dixon (1982) on some elaborate semantic categorisations for adjectives have been proposed. Dixon himself discerns as categories: *dimension, physical property, colour, age, value, speed, human propensity, similarity, difficulty* and *qualification*. A very detailed proposal is that by Hundsnurscher and Splett (1982), which has been adopted by Cornetto as well as Germanet (Maks, Vossen, Segers and Van der Vliet 2008). They discern 13 main classes (*perceptual, spatial, temporality-related, spatio-temporal, material-related, body-related, mood-related, spirit-related, behavior-related, social-related, quantity-related, relational, general*), which are in turn each divided into several subclasses. So for example the category of perceptual adjectives is subdivided in lightness (*bright, dark*), colour (*red, blue, indigo*), sound (*harsh, soft*), taste (*sweet, sour, bitter*), smell (*aromatic*) and surface (*soft, rough*) and the category of spatial adjectives is subdivided in dimension (*long, short*), direction (*northern, frontal, rear*), localisation (*close, overseas*), origin (*foreign*), spatial distribution (*full, sparse, overcrowded*) and form (*round, rectangular*).

All categorisation proposals mentioned here have in common that they appear to be of the conceptual field type. Categories are not defined in terms of (direct) hypernyms, but in terms of a noun or a nominal word group denoting some domain in the world, by expressions such as *adjectives related to x*, or *x-related*, or, as in the case of *dimensional* or *spatial*, an adjective that is not a hypernym at all but an attribute to *adjective*.

The problem that has to be investigated in the next section is whether this is inevitable, and whether an alternative type of categorisation in terms of semantic analysis and hypernymic expressions (adjectives hardly have single words as hypernyms) is possible.

### 3. A proposal

As can be guessed from section 1., the aim of this paper is to formulate a proposal for the principles underlying a useful categorisation of adjectives in which both basic ways of categorising are reconciled. To this aim, first two assumptions about the basic semantic role of the adjective in phrases and in sentences have to be discussed.

The first assumption is that semantically spoken, adjectives behave either as predicates or as predicate modifiers. They are treated as such in semantic theories based on logic, and there are no overwhelming reasons why this practice should not work for natural language semantics as well. If we talk about a white flower, we mean something that is white and that is a flower, whether or not we do that in a language containing P's, Q's and x's. When we call somebody a heavy drinker, we mean that he drinks heavily. Extensional adjectives in a natural language can be interpreted as simple predicates, like verbs. Intensional adjectives and privative adjectives are to be interpreted as predicate modifiers, like adverbs or adverbial phrases.

But of course adjectives do not function fully as verbs, but rather as 'defective' verbs. They only share a very restricted set of semantic valencies with the verbs. To name just one thing: adjectives have no tenses. In fact their semantic abilities coincide more or less with those of the present and past participles, which are also tenseless verb forms. Moreover in most of the cases adjectives can be paraphrased by an expression having a participle as its head. So for instance *green* can be paraphrased as 'having a colour like grass' and *viral* as 'caused by a virus'. If we take these paraphrases for meaning definitions - most dictionaries have definitions that look more or less like them - it becomes immediately clear that some semantic patterns can be deduced from them, like 'having the colour x' and 'caused by x'. These patterns have the form of and can function as meaning categories conceived according to the semantic analysis principle. It should also be remarked that in these paraphrases the distinction between a descriptive and a relational adjective becomes rather narrow. Both paraphrases consist of a relational predicate and a second argument, the first argument being the noun modified. The difference that remains is that in the case of the descriptive adjective this second argument is further modified and in the case of the real pertainism it is not. Whether this observation can be generalized may be an interesting topic for further investigation.

Languages like English have a group of verb types which can be characterized as denoting static relations between two or more arguments. These relations are such things as 'be'<sup>4</sup>, 'have as a possession', 'have as a property', 'belong to', 'descend from', 'cause', 'be caused by', 'govern', 'be named', 'be worth', and a few others. In the line of the semantic analysis approach these relations constitute verbal semantic categories, even if they sometimes only have one member. Given this basically verbal (or at least predicative) content of the typical adjective, and also given the widespread lexicographic practice to use participles like *having*, *being* or *caused* as the head of adjective definitions, it seems plausible to assume that basic adjective categories are directly related to some of the verbal categories and that they share the semantic properties of those categories, however poor these may be in most cases. In fact, often adjective categories will be 'derived' from some verb category. This verbal category will in most cases consist of two-place static predicates, while the derived adjective category will contain one-place predicates, the category members having 'swallowed' one of the

---

<sup>4</sup> Not in its copula and auxiliary senses.

arguments. It may be pretty safe to assume that by the following three basic categories *having [x] as a property*, *being in the situation [x]* and *being valued as [x]*<sup>5</sup> a pretty vast majority of the extensional descriptive adjectives can get a first rudimentary categorisation. They are three archetypal ways of describing things: revealing their inherent properties, revealing external influences on them and revealing judgments on them. For pertainsisms the picture is much more diffuse: there is a whole range of relations possible between the subject and the related nominal concept, varying from the most general *being related to* to such specific relations like *causing* and *descending from*.

A second assumption relates to the normal semantic function of (attributive as well as predicative) adjectives: to modify nouns.

Something that is particularly elucidating on this matter is the name the adjective bears in Dutch: *bijvoeglijk naamwoord*, as opposed to the Dutch name for the noun: *zelfstandig naamwoord*. Let us say that the namegiving implies that they are both considered as some kind of nouns (*naamwoord*), but that their status is different. The noun is viewed as independent (*zelfstandig*), the adjective is not. It is hard to translate the word *bijvoeglijk* since it happens to be used only in the combination just mentioned. A translation that comes close, would be *additional*, a word that suggests at the same time that what is denoted by the adjective is not the main thing, and that it contains something above what was to be expected. So the Dutch name for the adjective suggests that it contains nominal semantic information that is added to the nominal information given by the noun modified. In other words: a combination of a noun with an adjective offers semantically a new noun with a more complex semantic structure. If *butcher* has as its semantic content ‘person preparing meat for consumption’, then *bald butcher* can be analysed as ‘person preparing meat for consumption and having no hair on his head’. As we see, in this paraphrase the adjective *bald* has the same type of semantic function as the inherent property ‘preparing meat for consumption’: they both consist of a participle complemented by some arguments and modifiers, and they both modify the semantic core of the defining formula (‘person’) and restrict its semantic range.

At this point also the semantic structure of nouns becomes relevant for the discussion of adjectives. As is demonstrated in Wierzbicka (1985), a lexicographical description of a noun, in order to adequately account for the use of that word, should exceed the limits of the traditional *specificans – specificatum* definition, and instead should take the form of an elaborate description of the whole conceptual structure of the word. This stance is also adopted in the Dutch dictionary project ANW (= Algemeen Nederlands Woordenboek) where nouns are analysed in so-called semagrams: elaborate descriptions on the basis of fixed templates for each noun category. These templates consist of a semantic core (the category name) and a number of slots for modifying expressions (modification categories like ‘size’, ‘colour’, ‘cause’, ‘place’ and so on, which have to be filled with concrete information for each individual noun).

If, as suggested above, the semantic behaviour of adjectives is the same as that of the ‘inherent’ semantic modifiers of the noun, then those noun templates may prove a useful vehicle for the conception of a categorization for adjectives. In the first place because the set of modifier slots in the noun templates gives an overview of the ways in which nouns can be modified, not only in terms of inherent features but also by adjectives, as will be the

---

<sup>5</sup> At the surface these are complex expressions but their complexity only serves to disambiguate the highly polysemous *having* and *being*.

hypothesis in this proposal. And in the second place, since each nominal template disposes of a restricted set of modifier slots, adjective categorization is linked immediately to restrictions on the nouns the category members can be combined with.

At this moment also the conceptual field strategy for categorisation enters the scene. Notions like ‘size’, ‘colour’, ‘cause’, ‘place’ are dimensions of semantic modification for nouns, but for the modifiers themselves (the adjectives) they form the conceptual realms in which the individual adjectives can be situated. One can observe a remarkable correspondence between the set of noun modifier slots as used in the ANW and some detailed proposals for adjective categorization, especially those in Cornetto and GermaNet. Sometimes both systems match exactly, sometimes several Cornetto or GermaNet categories can be taken together in one ANW modifier slot.

As a conclusion a proposal can be formulated about semantic categorisation of adjectives, founded on two principles. First: semantically spoken, adjectives are predicates and should be described and categorised as such. Second: the different ways in which adjectives (or let’s be cautious and say: the main body of adjectives) can modify nouns is a mirror image of the modification types that can be found in the internal semantic structure of the noun. Adjective categories correspond to noun modifier slots. In fact, it is imaginable that for every adjective-noun construction a single noun can be formed with exactly the same semantic content. To make this a little more concrete, the proposal will be illustrated with a few examples. Within the field of *property*-adjectives the *feeling* category can be characterized by the definition frame

Having as a property (*domain*) in the domain of feeling (*property*) [x].

Within this frame an individual feeling adjective like *happy* can be defined as:  
Having as a property (*domain*) in the domain of feeling (*property*) [an experience of pleasure]. This frame can be extended by features like *cause* and *duration*.

Similar templates can be constructed for colour, size, form, dimension, character, behavior adjectives and so on, within the realm of property adjectives, and the same goes for situation adjectives and evaluative adjectives. In the latter two cases the general structure is the same but, as has been proposed above, the predicate that functions as the semantic core is different. As an overall structure of extensional descriptive adjective templates, something consisting of a predicate head of the type that was introduced in the foregoing, accompanied by the necessary slots for feature types, seems to be able to cover the large majority of the cases. Practical application will have to show how large that majority is. The conceptual fields that were on the basis of most proposals for adjective categorisation can be incorporated in the template as feature type slots.

Purely relational adjectives are categorised by the relational predicates that were mentioned above. So *viral* and *bacterial* can be classified under *caused by [x]*, *atavistic* and *ancestral* under *descending from [x]*.

Intensional adjectives have to be categorized in a different way, since they do not function as modifiers to entities but to predicates. They can be treated the same way as features in verb templates and be categorized under the same kind of feature type slot. So for instance *heavy* in *heavy drinker* would belong to a category *to a degree [x]*, *former* to a category *in a time*

*[x]* and *local* to a category *in a place [x]*. The same may be more or less appropriate for privative and conjectural adjectives.

#### 4. Final remarks

Apart from the elaboration of these basic principles into a full categorization of adjectives there are a few other issues that should be taken into account. The first one is that of the three major parts of speech the adjective is the one that is most sensible to antonymy, even to such a degree that the antonym really seems to be part of the concept itself. So antonymy should one way or another get its place in the adjectival template. A second remark concerns typical adjective polysemy, as is for instance demonstrated in synaesthesia and in some category changes like with the two senses of *sad* in *I am sad* and *this is a sad book*. An organised account for adjective meaning by means of templates may well reveal some systematic mechanisms behind these meaning relations. At the same time the *sad*-example makes clear that in category templates also the subject type must be involved, as is also demonstrated by the correlation between meaning and subject in *intelligent girl* ‘girl with a high intelligence’, *intelligent animal* ‘animal with a human-like intelligence’ and *intelligent machine* ‘machine performing like an intelligent being’.

## References

- ANW [Algemeen Nederlands Woordenboek]. <http://anw.inl.nl>.
- Dik, S.C. (1978). *Functional Grammar*. Amsterdam: North-Holland Linguistic Series.
- Dixon, R.M.W. (1982). *Where Have all the Adjectives Gone? and other Essays in Semantics and Syntax*. The Hague: Mouton.
- Fellbaum, C. (1990). 'English Verbs as a Semantic Net'. In *International Journal of Lexicography* 3 (4). 278 – 301.
- FrameNet: *The FrameNet Project*. <http://www.icsi.berkeley.edu/~framenet/>.
- GermaNet. <http://www.sfs.uni-tuebingen.de/GermaNet/>.
- Huddleston, R. (1984). *Introduction to the Grammar of English*. Cambridge: Cambridge University Press.
- Hundsnurscher, F.; Splett, J. (1982). *Semantik der Adjektive im Deutschen: Analyse der semantischen Relationen*. Wiesbaden: Westdeutsches Verlag.
- Jackendoff, R. (1972). *Semantic Interpretation in Generative Grammar*. Cambridge (Mass.): MIT Press.
- Jackendoff, R. (1976). 'Towards an Explanatory Semantic Representation'. In *Linguistic Inquiry* 7.1. 89 – 150.
- Kamp, H. (1975). 'Two theories about adjectives'. In Keenan, E. (ed.). *Formal Semantics of Natural Language*. Cambridge: Cambridge University Press. 123–155.
- Maks, I.; Vossen, P.; Segers, R.; van der Vliet, H. (2008). 'Encoding Adjectives in the Dutch semantic database Cornetto'. In *Proceedings of LREC-2008*. Marrakech.
- Levin, B. (1993). *English Verb Classes and Alternations: A Preliminary Investigation*. Chicago: University of Chicago Press.
- Miller, G. A.; Johnson-Laird, P.N. (1976). *Language and Perception*. Cambridge: Harvard U.P.
- Vossen, P. (2006). *Cornetto: Een lexicaal-semantische database voor taaltechnologie*. Dixit Special Issue, Stevin.
- Vossen, P.; Maks, I.; Segers, R.; Van der Vliet, H. (2008). 'Integrating Lexical Units, Synsets, and Ontology in the Cornetto Database'. In *Proceedings of LREC-2008*. Marrakech.
- Wierzbicka, A. (1985). *Lexicography and Conceptual Analysis*. Ann Arbor: Karoma Publishers, Inc.
- WordNet: *WordNet. A lexical database for the English language*. <http://www.cogsci.princeton.edu/~wn/>.