

# Construction Morphology and the Lexicon

Geert Booij  
Universiteit Leiden

## 1. Construction morphology

Word formation patterns can be seen as abstract schemas that generalize over sets of existing complex words with a systematic correlation between form and meaning. These schemas also specify how new complex words can be created. For instance, the word formation process for deverbal nouns in *-er* in English and Dutch can be represented as follows (Koenig, 1999, Booij, 2002: 5):

(1)  $[[x]_V \text{er}]_N$  ‘one who Vs’

A word formation pattern in which use is made of a particular affix can thus be conceived of as a morphological construction in which it is only the affix that is specified whereas the slot for the stem is variable. That is, each affixation pattern is a constructional idiom (in the sense of Jackendoff, 2002).

Such affixation templates give direct expression to the fact that affixes are not lexical items by themselves: they only exist as parts of complex words, and as parts of abstract schemas for these complex words. Thus, this form of representation is in line with the basic idea of lexeme-based morphology that it is words that form the basis of morphological knowledge and productivity

The traditional notion of construction and its importance for theories of linguistic structure have recently received renewed attention within the theoretical framework of Construction Grammar. The basic idea of Construction Grammar can be summarized as follows:

“In Construction Grammar, the grammar represents an inventory of form-meaning-function complexes, in which words are distinguished from grammatical constructions only with regard to their internal complexity. The inventory of constructions is not unstructured; it is more like a map than a shopping list. Elements in this inventory are related through inheritance hierarchies, containing more or less general patterns.” (Michaelis & Lambrecht, 1996: 216)

As suggested by this quotation, both syntactic patterns and word formation patterns might be seen as constructions. This idea has been developed in a number of publications (cf. Riehemann, 1998, Koenig, 1999, Booij, 2002; 2005).

In this article I will adduce a number of arguments for this view of morphology. In section 2, the blurred boundary between derivation and compounding will be shown to support the idea of a hierarchical lexicon, with intermediate levels of generalization. Section 3 will focus on the role of paradigmatic relations in word formation, and in section 4 I will discuss the phenomenon of short cuts in word formation patterns. In section 5 some conclusions about the relation between morphology and the lexicon will be drawn.

## 2. The blurred boundary between derivation and compounding

In a hierarchical lexicon we allow for intermediate levels of generalizations. That is, there are intermediate schemas in between the individual words and the most abstract word formation schemas, which express generalizations about subsets of complex words of a certain type (Booij 2005). Such intermediate generalizations can lead to the prefixal use of the first constituents of compounds, and the suffixal use of the last constituent of compounds.

An example from Dutch is the following. The word *hoofd* ‘head’ has a number of meanings in Dutch, and is polysemous, just like its English gloss. In compounds, however, the meaning of this word is usually ‘main’, as in the following examples:

- (2) *hoofd-ingang*  
head entrance  
‘main entrance’
- hoofd-gebouw*  
head building  
‘main building’
- hoofd-bezwaar*  
head objection  
‘main objection’
- hoofd-verdachte*  
head suspect  
‘main suspect’

Therefore, we assume the following intermediate schema for NN compounds of Dutch:

- (3)  $[[\text{hoofd}]_N [\text{x}]_N]_N$  ‘main x’

in which *hoofd* has a prefix-like function and carries the meaning ‘main’. Other examples of such affix-like use of nouns can be found in Booij (2005). The words formed according to this pattern inherit this meaning property from this subschema (cf. Krieger & Nerbonne, 1993 and Hippiisley, 2001 for the formalization of inheritance mechanisms in the lexicon). Similar cases from Catalan are discussed in Vallès (2003) and from German in Stepanova & Fleischer (1985).

A telling case is that of the Dutch prefixoid *scharrel-* ‘free range’ that arose from the use of the verb *scharrel* ‘to scratch, to scrape’ in the word *scharrel-kip* ‘free range chicken’. This use has been extended to many other compounds such as:

- (4) *scharrel-vlees*  
scratch-meat  
‘free range meat’
- scharrel-ei*  
scratch-egg  
‘free range egg’
- scharrel-melk*  
scratch-milk  
‘free range milk’

This use of the word *scharrel* is a case of semantic concentration, the presence of the meaning of a word that is not a formal constituent, in this case ‘free range animal’ (Meesters 2002: 52). That is, we have to assume an intermediate schema

- (5)  $[[\text{scharrel}][\text{x}]_N]_N$  ‘free range x’

A number of compound-initial words have developed into intensifying prefixes that have started a life of their own, without a synchronic link to their original use (van der Sijs, 2001: 545, Booij, 2005).

In other cases, the metaphorical use of such word-initial nouns is restricted, and there is only analogical extension. Examples of the latter are:

- (6) dol- ‘mad’                      dol-gelukkig ‘very happy, dol-blij ‘very glad’ [unproductive]  
 piep- ‘squeak’                    piep-klein ‘very small’, piep-jong ‘very young’ [unproductive]

These are cases of analogy, but analogical patterns can be strengthened into constructional idioms, i.e. patterns with productivity. This is shown by the productive use of nouns in non-head position with intensifier meaning:

- (7) bere- ‘bear’                      bere-sterk ‘very strong’, bere-leuk ‘very nice’  
 bloed- ‘blood’                    bloed-rood ‘very red’, bloed-heet ‘very hot’, bloed-mooi ‘very beautiful’  
 kei- ‘boulder’                    kei-hard ‘very hard’, kei-ruig ‘very rough’, kei-leuk ‘very nice’  
 kut- ‘cunt’                        kut-smoes ‘bad excuse’, kut-verhaal ‘bad story’  
 rete- ‘ass’                         rete-strak ‘very fashionable’, rete-gaaf ‘very good’  
 reuze- ‘giant’                    reuze-leuk ‘very nice’, reuze-slim ‘very smart’  
 wereld- ‘world’                    wereld-meid ‘fantastic girl’, wereld-vrouw ‘fantastic woman’

The use of this kind of intermediate schemas, word formation patterns with one of the positions lexically specified, and hence constructional idioms, implies that we do not have to decide whether such morphemes are affixes or words: their specific use and meaning as parts of complex words is specified directly in the constructional idioms.

### 3. Paradigmatic word formation

Word formation schemas are constructed by language users on the basis of paradigmatic relations between words, words being the lowest nodes of the trees in a hierarchical lexicon. If this is the case, we may also expect word formation schemas to be constructed on the basis of paradigmatic relationships between words that share their stem. This is indeed the case, and this is the phenomenon called paradigmatic word formation. Examples can be found in Booij (2002: 6-9). The following is a summary of the facts concerning the formation of female nouns ending in *-ster*.

- |                    |                               |                      |
|--------------------|-------------------------------|----------------------|
| (8) <i>verb</i>    | <i>deverbal noun</i>          | <i>deverbal noun</i> |
| arbeid ‘to labour’ | arbeid-ster ‘female labourer’ | arbeid-er ‘labourer’ |
| spreek ‘to speak’  | spreek-ster ‘female speaker’  | sprek-er ‘speaker’   |
| werk ‘to work’     | werk-ster ‘charwoman’         | werk-er ‘worker’     |
| zwem ‘to swim’     | zwem-ster ‘female swimmer’    | zwemm-er ‘swimmer’   |

Given the existence of paradigmatic relations between words, the language user may conclude that female agent nouns are formed by replacing the suffix *-er* of agent nouns with the suffix *-ster*. One reason for assuming that this is the correct analysis is that when a deverbal noun in *-er* has a particular semantic idiosyncrasy, this semantic property recurs in the corresponding female noun, as is illustrated by the following examples:

- |   |  |
|---|--|
| (9) bet-wet-er ‘lit. better knower, pedant’           | bet-weet-ster ‘female pedant’          |
| oproer-kraai-er ‘lit. revolution crower, ring leader’ | oproer-kraai-ster ‘female ring leader’ |
| pad-vind-er ‘lit path finder, boy scout’              | pad-vind-ster ‘girl scout’             |
| stroop-likk-er ‘lit. syrup licker, toady’             | stroop-lik-ster ‘female toady’         |

The words in the left column are nominal compounds of which the head is a deverbal noun. Note that the common semantic idiosyncrasy of these word pairs cannot be explained in terms of a common verbal base because Dutch does not have the verbs *betweten*, *oproerkraaien*, *padvinden* or *strooplikken*.

Moreover, there are also nouns ending in *-er* without a verbal base that exhibit the same correlation (there are no verbs *reizigen* and *rederijken* in Dutch):

- |      |                                  |   |
|------|----------------------------------|---|
| (10) | <i>rederijk-er</i> ‘rhetorician’ | <i>rederijk-ster</i> ‘female rhetorician’ |
|      | <i>reizig-er</i> ‘traveler’      | <i>reizig-ster</i> ‘female traveler’      |

Third, deverbal sex-neutral nouns have the allomorph *-der* after a verbal stem ending in /t/ in order to avoid the sequence [rər]. The extra /d/ before *-er* often appears also before the suffix *-ster* (in written Dutch) even though the attachment of this suffix does not create the sequence [rər]:

- |      |                                  |                                       |
|------|----------------------------------|---------------------------------------|
| (11) | <i>aanvoer-der</i> ‘captain’     | <i>aanvoerd-ster</i> ‘female captain’ |
|      | <i>bestuur-der</i> ‘driver’      | <i>bestuurd-ster</i> ‘female driver’  |
|      | <i>woordvoer-der</i> ‘spokesman’ | <i>woordvoerd-ster</i> ‘spokeswoman’  |

On the basis of these observations we have to conclude that the paradigmatic relations between co-derivatives may lead to new patterns of word formation, in this case the substitution of one affix with another. This can be expressed by the following formula that presupposes a paradigmatic relationship between abstract word formation schemas:

- (12) [X - er]<sub>N<sub>i</sub></sub> ‘human agent’ ↔ [X -ster]<sub>N</sub> ‘female N<sub>i</sub>’

Paradigmatic word formation in the domain of compounds is seen in the phenomenon of replacive compounds created on the basis of analogy. There is often semantic evidence for analogy: if a particular idiosyncratic interpretation recurs in a newly coined complex word, this implies the existence of a specific model word. This is the case in the following examples:

- |      |  |   |
|------|--|---|
| (13) | <i>angst-haas</i> ‘lit. fear-hare, terrified person’         | <i>paniek-haas</i> ‘panicky person’                                     |
|      | <i>boter-briefje</i> ‘lit. butter-letter, marriage contract’ | <i>margarine-briefje</i> ‘lit. margarine-letter, cohabitation contract’ |
|      | <i>Kerst-man</i> ‘Christmas-man’                             | <i>Kerst-vrouw</i> ‘Christmas-woman’                                    |
|      | <i>lucht-oorlog</i> ‘air war’                                | <i>grond-oorlog</i> ‘ground war’  |
|      | <i>moeder-taal</i> ‘lit. mother language, native language’   | <i>vader-taal</i> ‘father-language, native language of father’          |
|      | <i>nieuw-komer</i> ‘lit. new-comer, recent immigrant’        | <i>oud-komer</i> ‘old-comer, immigrant who has arrived a long time ago’ |

In other cases there is no particular word that functions as a model. Hence it is the set of words that share a constituent in the same position that forms a family, a paradigm, as in

- |      |                             |  |
|------|-----------------------------|--|
| (14) | <i>-baron</i> ‘baron’       | <i>afval-baron</i> ‘lit. trash-baron, rich dealer in trash’  |
|      | <i>-marathon</i> ‘marathon’ | <i>jazz-marathon</i> ‘jazz marathon’   |
|      | <i>bliksem-</i> ‘lightning’ | <i>bliksem-bezoek</i> ‘lit. lightning visit, fast and short visit’,<br><i>bliksem-actie</i> ‘lit. lightning action, fast and short action’ |
|      | <i>mammoet-</i> ‘mammoth’   | <i>mammoet-wet</i> ‘lit. mammoth-law, all-encompassing law of education’,<br><i>mammoet-tanker</i> ‘lit. mammoth-tanker, huge tanker’      |

This reminds us of the data discussed in section 2. The examples in (14) also imply the existence of intermediate schemas, such as [[x] [*baron*]<sub>N</sub>]<sub>N</sub> ‘rich dealer in x’ (cf. Becker, 1994 for similar cases in German).

This raises the following basic question: is there an absolute distinction between rules and pattern-imitation (cf. Hay & Baayen, 2005)? I will not try to answer this question in this paper, but it is clear that the idea of construction morphology will enable us to give a sensible answer to this question because we are not forced to make such an absolute distinction thanks to the availability of intermediate schemas.

#### 4. Short cuts and template conflation

If we conceive of the lexicon as a structured set of words, with networks of paradigmatic relations between them, it is to be expected that the language user may make use of short cuts in coining new complex words. At the more general of cognitive psychology we know that human beings do this a lot. Anderson et al. (2004) refer to this phenomenon as production compilation: “Production compilation will try to take each successive pair of productions and build a single production that has the effect of both” (Anderson et al., 2004: 1045). “[T]he participant is converting from a declarative representation and a slow interpretation of the task to a smooth, rapid procedural execution of the task (Anderson et al., 2004: 1046).

Given the existence of word formation schemas as abstractions over sets of complex words, such schema can be unified into more complex schemas. For instance, the following schemas of English derivational morphology can be unified:

$$(15) \quad [\text{un-A}]_A + [\text{V-able}]_A = [\text{un}[\text{V-able}]_A]_A$$

On the basis of this complex schema we may derive adjectives of this type in one step from a verbal base, for instance, the adjective *unforgettable* from the verb *forget*. Such unified templates thus specify the co-occurrence of word formation patterns in the coining of complex words.

In this section, I will provide evidence of various sorts that show that language users make indeed use of such unified templates.

##### 4.1. Possible complex words as intermediate steps

An old observation on the interaction of word formation patterns is that possible but non-existing complex words may form an intermediate stage in the formation of an even more complex words (Booij, 1977). For instance, Dutch deverbal adjectives in *-baar* ‘-able’ form a productive derivational category, which can be subsequently prefixed with the negative prefix *on-* ‘un-’. In many cases, the intermediate adjective is only a possible word, and does not belong to the class of existing words. This is the case for, among many others, the following adjectives:

(16)	<i>verb</i>	<i>deverbal adjective</i>	<i>on-adjective</i>
	bedwing ‘suppress’	bedwing-baar ‘suppressable’	on-bedwing-baar ‘unsuppressable’
	bestel ‘deliver’	bestel-baar ‘deliverable’	on-bestel-baar ‘undeliverable’
	blus ‘extinguish’	blus-baar ‘extinguishable’	on-blus-baar ‘unextinguishable’
	verwoest ‘destroy’	verwoest-baar ‘destroyable’	on-verwoest-baar ‘undestroyable’

The same observation can be made for another class of deverbal adjectives of Dutch, those ending in the unproductive suffix *-elijk*. A few examples are listed in (17):

(17)	<i>verb</i>	<i>deverbal adjective</i>	<i>on-adjective</i>
	beschrijf ‘describe’	beschrijf-elijk ‘describable’	on-beschrijf-elijk ‘undescribable’
	herroep ‘revoke’	herroep-elijk ‘revocable’	on-herroep-elijk ‘irrevocable’
	meet ‘measure’	met-elijk ‘measurable’	on-met-elijk ‘immeasurable’

Both patterns suggest that word formation schemas can be unified into a complex schema that has started a life of its own. That is, the following unifications appear to have taken place:

$$(18) \quad \begin{aligned} [\text{on-A}]_A + [\text{V-baar}]_A &= [\text{on}[[\text{V-baar}]_A]_A \\ [\text{on-A}]_A + [\text{V-elijk}]_A &= [\text{on}[[\text{V-elijk}]_A]_A \end{aligned}$$

The formal operation that combines the two patterns is unification. Unification is the basic operation of word formation: a new word results from the unification of a template with one or more existing lexemes. Thus, a possible word has become an actual word. Given that there are word formation templates, the operation of unification can also apply to two word formation templates, not only to a word formation template and individual words. The actual rise of such unified templates is based on the possibility that the native speaker posits a direct connection between complex words and words that are two degrees less complex.

Generally, the unification of word formation templates accounts for the systematic co-occurrence of two or more word formation patterns (in the example above the formation of deverbal adjectives and *on*-adjectives). In contrast, if we conceive of word formation as a set of word formation rules, it is hard to see how the co-occurrence of two or more word formation rules can receive a formal account. Therefore, these observations support the use of word formation schemas instead of word formation rules.

As mentioned, the actual rise of such unified templates is most probably the result of the language user's ability to establish a direct relation between a word and a complex word that is two or more derivational steps away from that word. The theoretical point is that the rise of such 'short cut' templates does not imply a formal complication of the grammar because the properties of short cut templates follow from the unification of independently established word formation schemas. Once more they show that we need several levels of abstraction in a hierarchical lexicon.

The coming into being of such unified schemas means that they have become conventional templates by themselves. Thus language users may coin a new multiply complex negative adjective directly from a verbal base without an intermediate step. The unified schema is productive if the affixes involved are productive. This is the case for words with *on*- and *-baar*.

A clear advantage of this analysis is that we are not forced to assume discontinuous affixes *on-baar* and *on-lijk* for Dutch, in addition to the affixes *on*-, *-baar*, and *-lijk*. The properties of the schemas with these seemingly discontinuous affixes follow from the two underlying word formation schemas. The nested structure of these schemas is also essential: the prefix *on*- does not attach to verbal bases, only to adjectival and nominal bases (the Dutch negative prefix for verbal bases is *ont*- 'un-'). We thus explain why the prefix *on*- seems to be attached to verbal bases, without violating the condition that its base must be either an adjective or a noun.

An example of a unified template from English is the attachment of the combination of the prefix *de(s)* with the verbalizing suffixes *-ate* and *-ize* to nouns, as in

(19)	<i>noun</i>	<i>verb</i>
	caffeine	decaffeinate
	moral	demoralize
	mythology	demythologize
	nuclear	denuclearize
	Stalin	destalinize

An intermediate verb like *to stalinize* is certainly a possible verb. Yet, we should not require the existence of these verbs as a necessary intermediate step since it is not the case that the use of the verb *destalinize* presupposes that the object involved has first been subject to a process of stalinisation. That is, we assume unified templates of the following form:

(20)	$[de \ [[x]_N \ ate]_V]_V$	$[de \ [[x]_N \ ize]_V]_V$	$[de \ [[x]_A \ ize]_V]_V$
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#### 4.2. *Participia praeverbalia*

Template unification effects in combination with constructional meaning may also be observed in Dutch complex words of the following type:

(21)	a.	tand 'tooth'	ge-tand 'toothed'
		tak 'branch'	ge-tak-t 'branched'
		spits 'point'	ge-spits-t 'pointed'

b.	rok 'skirt'	kort-ge-rok-t 'short-skirted'
	jas 'coat'	wit-ge-jas-t 'white-coated'
	schouder 'shoulder'	breed-ge-schouder-d 'broad-shouldered'

The words in (21a) and the right constituent of the words in (21b) have the form of a past participle. Dutch past participles are formed by prefixing the verbal stem with *ge-*, and by simultaneously suffixing the stem with *-t* or *-d* (*-t* after a stem-final voiceless segment, *-d* otherwise). Participles can be converted to adjectives, and hence participate in AA compounding. As we noted before, possible words may form intermediate stages in word formation. The head constituents of these words presuppose a verbal stem. However, de-nominal verbs such as *spits*, *tand*, *tak*, *rok*, *jas*, or *schouder* do not exist as lexemes in Dutch. Similarly, the words *gerokt*, *gejast*, and *geschouderd* do not exist by themselves, but only in AA compounds, that is in combination with a modifying adjective.

These adjectivalized participles are an example of conversion of nouns into verbs being triggered by other morphological processes. Moreover, they also exhibit a specific semantic property. The semantic relation between a converted verb and its base noun can be quite diverse in Dutch (Booij, 1979). However, in the morphological construction under discussion here, the relation between the base N and the derived V is always that V means 'to provide with N'. For instance, the meaning of *getand* is 'provided with teeth, having teeth'. This semantic specialization underscores the construction status of this complex morphological schema.

An adjective like *breedgeschouderd* is thus an instantiation of a multiply complex template, the unification of the following templates:

(22)	N to V conversion	$[[x]_N]_V$
	Past participle formation	$[ge [x]_V d]_V$
	Participle to A conversion	$[[ge [x]_V d]_V]_A$
	AA compounding	$[[x]_A[x]_A]_A$

These templates can be unified into the following complex template, and the morphological structure of *getakt* and *breedgeschouderd* will be as follows:

(23)	a.	(i)	$[[ge[[y]_N]_V t]_V]_A$	(ii)	$[[x]_A[[ge[[y]_N]_V d]_V]_A]_A$
	b.	(i)	$[[ge[[tak]_N]_V t]_V]_A$	(ii)	$[[breed]_A[[ge[[schouder]_N]_V d]_V]_A]_A$

That is, the coinage of *breedgeschouderd* may be conceived of as the unification of template (23a ii) with the adjective *breed* and the noun *schouder*. As we may expect for a construction, the unified AA template has an additional specific semantic property as well: the scope of the modifying adjective is not the whole head constituent, but only its nominal base: this compound does not mean 'having shoulders in a broad way', but 'having broad shoulders'. This specific scope property of the words in (21b) and (23bii) can thus be specified as a property of template (23a ii). In this way we can do justice to both the idiosyncrasies of this construction, and simultaneously to the fact that the existence of this word formation template follows from independently established word formation schemas of Dutch.

Such unified templates are the loci of potential reanalysis. For instance, speakers might reanalyze the structure of *breedgeschouderd* in such a way that the intermediate verbal layer is ignored. This implies the emergence of a new (discontinuous) affix *ge ... t/d* that attaches to nouns, and derives adjectives with the meaning 'provided with N'.

#### 4.3. Idiosyncratic properties of affix combinations

Another argument for the assumption of unified templates is provided by the observation that they may have specific semantic or formal properties that do not derive from the constituent templates. This can be illustrated by the Dutch suffix *-ig* that derives adjectives from adjectives, and the suffix *heid* 'ness' that derives nouns from adjectives. The suffix *-ig* expresses the notion 'somewhat', that is, it has a relativizing meaning. Word formation with *-ig* can feed word formation with *-heid*. Schultink (1962:

172-175) observed that in many cases the existence of the intermediate de-nominal adjective in *-ig* is not implied, and hence he assumed a direct correlation between the simplex adjective and the multiply complex noun in *-igheid*:

- |      |               |                         |
|------|---------------|-------------------------|
| (24) | flauw ‘silly’ | flauwigheid ‘silliness’ |
|      | mal ‘silly’   | malligheid ‘silliness’  |
|      | naar ‘nasty’  | narigheid ‘nastiness’   |
|      | slim ‘smart’  | slimmigheid ‘smartness’ |

In Schultink’s analysis we thus have to do with a new suffix *-igheid*. The disadvantage of this analysis is that we appear to miss a generalization since the properties of the sequence *-igheid* (for instance, that it creates nouns from adjectives) are not completely unexpected (Booij, 1977: 21). Therefore, Booij (1977) proposed to assume that in addition to existing words, possible words can also feed word formation. In the hierarchical lexicon approach defended here, it is possible to express the relative autonomy of the sequence *-ig-heid* without losing the generalization that it derived from two independently established suffixes. In other words, we assume the following unified template:

- (25)  $[[[A] \textit{ig}]_A \textit{heid}]_N$

An additional observation of Schultink (1962) on the semantics of this unified template underscores its relative autonomy: words ending in *-igheid* may have the specific meaning ‘substance with the property denoted by the simplex adjectival base’:

- |      |                 |                                   |
|------|-----------------|-----------------------------------|
| (26) | glad ‘slippery’ | glad-ig-heid ‘slippery substance’ |
|      | nat ‘wet’       | natt-ig-heid ‘wet substance’      |
|      | viez ‘dirty’    | viez-ig-heid ‘dirty substance’    |
|      | zwart ‘black’   | zwart-ig-heid ‘black substance’   |

This is exactly what we expect in a constructional approach to morphology: a construction is usually an instantiation of an independently established more abstract syntactic or morphological pattern, but with specific formal or semantic properties that are unique to that particular instantiation.

#### 4.4. Embedded productivity

The productivity of a certain word formation pattern may be dependent on its being embedded in another morphological pattern. I refer to this phenomenon as embedded productivity. This is the case for verbal compounding in Dutch. That is, verbal compounds may be qualified as ‘bound compounds’. Let us first focus on NV compounding. This type of compounding appears to be unproductive in Dutch. What we do find for Dutch are the following classes of verbal compounds:

- (i) conversions of nominal compounds such as  $[[[voet]_N[bal]_N]_N]_V$ , ‘to play football’;
- (ii) isolated cases of back formation:  $[[beeld]_N[houw]_V]_V$  back-formed from *beeld-houw-er* ‘lit. statue-cutter, sculpturer’;  $[[woord]_N[speel]_V]_V$  ‘to play with words from *woordspeling* ‘word-play, pun’;
- (iii) separable complex verbs such as *piano-spelen* ‘piano-play, to play the piano’. Such verbs are not verbal compounds, but phrasal verbs; the two parts are separated in main clauses, as in *Jan speelt heel goed piano* ‘John plays the piano well’
- (iv) defective NV verbs that mainly occur in the infinitival form, such as  $[worst]_N[happ-en]_V$ ; some of these verbs have finite forms but only in embedded clauses where the two parts are linearly adjacent (... *dat Jan worsthapte* ‘that John sausage ate’).

Embedded in nominal compounds, however, NV compounds appear to be quite productive as observed in Booij (2002: 150); the following examples illustrate this pattern:

- (27) [[[aardappel]<sub>N</sub>[schil]<sub>V</sub>]<sub>V</sub>[[mesje]<sub>N</sub>]<sub>N</sub> ‘lit. potato peel knife, potato peeler’  
 [[[brand]<sub>N</sub>[blus]<sub>V</sub>]<sub>V</sub>[installatie]<sub>N</sub>]<sub>N</sub> ‘lit. fire extinguish installation, fire extinguisher’  
 [[[koffie]<sub>N</sub>[zet]<sub>V</sub>]<sub>V</sub>[apparaat]<sub>N</sub>]<sub>N</sub> ‘lit. coffee make machine, coffee maker’

In these nominal compounds the left constituent is a NV compound in which the N functions as the Patient of the verb. Remember that, as mentioned in section 2, only compounding with nominal heads is recursive. Note, however, that Dutch does not have the corresponding compound verbs *aardappelschil*, *brandblus*, and *koffiezet* as NV compounds (*koffiezetten* does occur, however, but as a phrasal, separable verb).

[NV]<sub>V</sub> compounding is not only boosted by VN compounding, but also by suffixation with the deverbal suffixes *-er*, *-ster*, *-ing* and *-erij*:

- (28) *aandacht-trekk-er* ‘attention drawer’  
*brand-bluss-er* ‘fire extinguisher’  
*gif-meng-er* ‘poison mixer, poisoner’  
*grappen-mak-er* ‘lit. jokes maker, comedian’
- kinder-verzorg-ster* ‘children’s care worker (fem.)’  
*kranten-bezorg-ster* ‘newspaper deliverer (fem.)’  
*rokkenn-naai-ster* ‘skirts sewer (fem.)’  
*vee-hoed-ster* ‘cattle herd (fem.)’
- evangelie-verkondig-ing* ‘gospel preaching’  
*hand-oplegg-ing* ‘hands imposition’  
*kinder-verzorg-ing* ‘child care’  
*tempel-reinig-ing* ‘temple cleansing’
- bijen-houd-erij* ‘bee keeping’  
*bloem-kwek-erij* ‘flower nursery’  
*vlaggen-mak-erij* ‘flag makery’  
*wijn-zuip-erij* ‘excessive wine drinking’

The proper account of complex words of the type [NV-*er*]<sub>N</sub> has evoked a lot of discussion in the morphological literature on English and Dutch (cf. Lieber, 1983, Booij, 1988, Hoekstra & Van der Putten, 1988). The main objection to assuming NV compounds as bases for these kinds of derivation (the hypothesis put forward by Lieber, 1983 for English) is that, both in English and Dutch, NV compounding is not productive (Booij, 1988, Lieber, 2004: 48). On the other hand, semantically the assumption of NV bases is attractive because the N in these examples functions as the Patient of the V. Therefore, two other analytical options have been considered in the literature. In Booij (1988), a word such as *brandblusser* ‘fire extinguisher’ is analysed as a case of NN compounding in which the head noun is a deverbal N. That is, the semantic unit corresponding with NV is not reflected by a structural unit NV. Instead, the notion ‘inheritance’ is invoked: the deverbal noun inherits the Patient argument of the verb, and the left constituent receives this Patient role. In an alternative analysis, proposed by Hoekstra & Van der Putten (1988), the Patient role is not assigned through inheritance. Instead, this role is assigned to the noun by the general principles for interpretation of the relation between the two parts of a compound.

Once we accept the idea that productivity of a certain word formation pattern may be linked to its occurrence in certain morphological constructions, a third, and attractive analytical option is offered: these words are suffixed NV compounds, that is, derived words with an NV compound as their base. This structure gives direct expression to the generalization that the noun and the verb belong together from the semantic point of view. A *grappenmaker* ‘comedian’, for instance, is someone who makes jokes, and an *aandachttrekker* ‘lit. attention drawer’ is someone who draws attention. Therefore, there is a third analytical option, now that we have a way of overcoming the problem that NV compounding is at first sight unproductive. This structural analysis is the same as that proposed by Lieber (1983).

Through unification of the templates  $[NV]_V$  and  $[V\ er]_N$  we get the template  $[[NV]_V\ er]_N$ . This latter, unified template can be qualified as productive, unlike the NV template.

The observed productivity boost of NV compounding in de-verbal word formation can be expressed by unification of the relevant templates. Hence, the following productive unified templates can be postulated for Dutch:

- (29)  $[[[N][V]]_V\ er]_N$   
 $[[[N][V]]_V\ ster]_N$   
 $[[[N][V]]_V\ ing]_N$   
 $[[[N][V]]_V\ erij]_N$

These templates will be dominated by two different word formation templates, one for NV compounding, and one for deverbal nouns in *-er*. The templates will be instantiated by complex words such as those listed in (28).

The words in (28) have often been called synthetic compounds since they seem to be cases of compounding and derivation at the same time. The account outlined above makes this notion of simultaneity more precise: structurally there is a hierarchy in that the compound is part of a derived word. The systematic co-occurrence of the two word formation processes is expressed by template unification.

#### 4.5. Template unification: conclusions

In conclusion, there are many reasons why it must be possible to specify the co-occurrence of word formation patterns: possible words as computational intermediate steps in derivation, the rise of affix combinations with properties of their own, and embedded productivity. Such co-occurrence facts can be expressed straightforwardly by means of template unification. Hence we need templates or schemas as specifications of recurrent combinations of word formation patterns. Such templates can be characterized as constructional idioms at the word level, and thus provide evidence for a constructional approach to morphology and a hierarchical lexicon.

## 5. Conclusions

In this paper we have seen that there are two basic notions that can be used to explain quite a range of word formation phenomena: construction morphology and the idea of a hierarchical lexicon, with general word formation schemas and instantiations thereof. Intermediate levels, in between the concrete individual words and the abstract word formation schema serve to make generalizations about subsets of complex words, and explain how affixes can arise from compounding patterns. In addition, this approach provides the adequate means for an insightful account of the paradigmatic dimension of word formation.

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