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1. Introduction

The proper classification and demarcation of morphological phenomena is an important issue in handbooks and textbooks of morphology. This issue is not only a matter of terminological and didactic clarity. The primary purpose of a good classification is to enable the linguist to make the best generalizations possible about linguistic phenomena. By assigning a specific class of linguistic constructs to the realm of (one of the subdomains of) morphology on the basis of a specific property of those constructs, we endeavour to predict other aspects of their grammatical behaviour, on the basis of a well-articulated theory of the relevant subdomain.

Two kinds of demarcation play a prominent role in the morphological literature: the demarcation of compounds and syntactic constructs, and the demarcation of inflection and derivation. The demarcation issue in morphology that I will focus on in this paper is a third one, that between compounding and derivation. Although this demarcation issue may be less prominent in the morphological literature than the two other mentioned above, it has received some attention, for instance in Bauer (1983: 36-38), Tuggy (1992), and ten Hacken (2000).

The traditional criterion of demarcation between compounding and derivation is the following:

- (1) Compounding consists of the combination of two or more lexemes, whereas derivation is characterized by the addition of an affix, that is, a bound morpheme, to a lexeme.

In Item-and-Arrangement Morphology, the difference between compounding and derivation reduces to one property of certain morphemes, namely that they are bound. In this approach to morphology, affixes can be represented as lexical items, and will then be subcategorized as only appearing in combination with a stem. These bound morphemes are like lexical morphemes in that they may belong to a syntactic category such as N, V or A. The syntactic category label of these affixes can be percolated to the node that dominates the complex word which they form part of. In English and related languages, this percolation is executed in accordance with the Right-hand Head Rule. This is the line taken in Lieber (1980, 1992), Selkirk (1982), and Emonds (2002). This type of analysis stresses the similarities between compounding and derivation. Yet, this does not mean that the demarcation issue is solved by unifying these two types of word formation. We still have to establish criteria for determining if a particular morpheme is to be considered a bound or a free morpheme, as

we will see below. Furthermore, we want to know whether the difference between being unbound or bound correlates with other differences, such as semantic and phonological ones, and how these differences are accounted for.

The Item-and-Arrangement approach can be contrasted with one in which the morphological mechanisms of compounding and derivation are considered as radically different in nature. This is the line taken in Anderson (1992), a study that defends an Item-and-Process view of both inflectional and derivational morphology (see Stump 2001: Chapter 1 for a more detailed and sophisticated classification of morphological theories). Derivation is seen as a set of operations on lexemes that derive other lexemes. Each of these operations is a Word Formation Rule with a phonological aspect (the addition of a phonological string or some other phonological operation), a semantic aspect (the change of meaning), and a syntactic aspect (the syntactic (sub)category of the new lexeme) (see Beard 1995 for a similar view). Compounding, on the other hand, is accounted for by a set of Word Structure Rules which form part of syntax, and combine lexical stems into compounds.

Anderson's view of the difference between compounding and derivation relates to his process view of morphology. In the realm of inflection, the relation between morpho-syntactic features and their phonological spell out can be so complex that this is taken to justify the view that the phonological changes are to be seen as the spell out of morpho-syntactic features. That is, Anderson defends a realizational view of inflection (see Stump 2001: Chapter 1 for extensive motivation of this view), and extends this view of morphological rules to derivational morphology (Anderson 1992: Chapter 7). The basic advantage of this approach is that it unifies derivation by means of affixation with other kinds of word formation, performed by formal operations such as conversion, vowel alternation, and reduplication, which are not straightforwardly concatenative. However, it completely separates compounding from affixal derivation. Therefore, it is essential for the validity of this hypothesis that there is a sharp empirical distinction between compounding and affixal derivation.

In Anderson's view, this difference between compounding and derivation also implies that derived words do not have an internal morphological structure once they have been derived (the hypothesis of A-morphous Morphology). Compounds, which are created by different kind of rules, do have an internal structure that is accessible to other rules of grammar. For instance, there are rules for introducing linking elements into German compounds that must have access to the internal structure of such complex words (Anderson 1992: 297). The hypothesis of A-morphous morphology is logically independent from the analysis of derivation as a set of Word Formation Rules. In a realizational framework, one could also sustain a theory of derivational rules that do assign morphological structure to complex words. Anderson's radical claim, however, is that the assumption of morphological structure is superfluous. When a new word is formed by a derivational rule, its new phonological, syntactic, and semantic properties are specified by that rule, and the grammar need not have access to the morphological structure of a word once it has been derived.

In this paper I will argue that compounding and affixational derivation cannot be demarcated in the way proposed by Anderson. In section 2, I will show that there is no sharp boundary between compounding and affixal derivation, since there are many borderline cases. Section 3 will show that morphological and phonological rules need to have access to the internal morphological structure of derived words. In that respect, they appear to be like compounds. In section 4 I will argue that these commonalities of compounding and derivation can be accounted for in the theory of Construction Morphology that makes use of constructional schemas of varying degrees of abstractness for the description of word formation patterns.

2. Borderline cases

In this section I will present some observations that imply that there is no sharp boundary between compounding and derivation.

2.1. Prefixation or compounding?

The demarcation of prefixation and compounding is a notoriously difficult task in the morphological analysis of Romance languages. In French, for instance, some morphemes appear both as preposition, and as the first part of complex words. Are these complex words cases of compounding, or of prefixation (examples from Amiot 2004)?

(2)	a.	avant 'before'	b.	avant-guerre 'prewar period'
		après 'after'		après-ski 'id.'
		contre 'against'		contre-coeur 'id.'
		en 'in'		en-lever 'to raise'
		entre 'between'		entre-preneur 'id.'
		sur 'on'		sur-exposition 'overexposure'

The first parts of the complex words in (2b) are sometimes considered prefixes, probably because they do not correspond to content words, but to grammatical words (prepositions), whereas prototypical compounds are combinations of content words. Yet, grammatical words are also lexemes, and therefore, the words in (2b) might be classified as compounds since they are combinations of two lexemes.

Similarly, Dutch features a number of words used as preposition, adjective, or adverb for which corresponding forms are found as parts of complex words. They are usually called prefixes (Booij 2002a: 116). They do not carry the main stress of the word, just like undisputed Dutch prefixes

such as *be-* and *ver-* that do not form lexemes by themselves. If these complex words were compounds, we would expect main stress on the first constituent, as is the rule for Dutch compounds.

(3)	<i>prefix/word</i>	<i>base word</i>	<i>prefixed verb</i>
	aan ‘at’	bid ‘to pray’	aan-bid ‘to worship’
	achter ‘after’	haal ‘to fetch’	achter-haal ‘to find out’
	door ‘through’	snijd ‘to cut’	door-snijdt ‘to cut through’
		spek ‘pork’	door-spek ‘to interlard with’
	mis ‘wrong’	vorm ‘to form’	mis-vorm ‘to deform’
	om ‘around’	sluit ‘to close’	om-sluit ‘to enclose’
		cirkel ‘circle’	om-cirkel ‘to encircle’
	onder ‘under’	breek ‘to break’	onder-breek ‘to interrupt’
		titel ‘title’	onder-titel ‘to subtitle’
	over ‘over’	win ‘to win’	over-win ‘to defeat’
		brug ‘bridge’	over-brug ‘to bridge’
	vol ‘full’	maak ‘to make’	vol-maak ‘to bring to perfection’
	voor ‘before’	kom ‘to come’	voor-kom ‘to prevent’
	weer ‘again’	schijn ‘to shine’	weer-schijn ‘to reflect’

This suggests that even when each constituent of a complex word corresponds to a lexeme, this is not sufficient for classifying that complex word as a compound.

The prefixal analysis of the words in (2) and (3) implies that a lexeme may have an affixal counterpart. Obviously, we must have good reasons for this kind of proliferation. Above, I mentioned phonological evidence in the case of Dutch: these prefixes pattern with undisputed prefixes in not carrying the main stress of the complex word. Other evidence is semantic in nature. Sometimes, there is a recurring semantic difference between the word and the corresponding affix: the affix has a different meaning, or a more restricted range of meanings than the corresponding lexeme. Consider the Dutch morpheme *weer*. As an independent lexeme, it has the meaning ‘again, back’, as part of a complex word it has the meanings ‘in opposition’ and ‘in inverse direction’:

- (4) opposition: *weer-spreken* ‘to counter-argue’, *weer-staan* ‘to resist’
 inverse direction: *weer-kaatsen* ‘to reflect’, *weer-klinken* ‘to resound’

A third property that such bound morphemes with a lexemic counterpart may share with undisputed prefixes is their ability to determine the category of the complex word they create. Most prefixes in Germanic languages tend not to affect the syntactic category of the complex word they are part of, in conformity with the Right-hand Head Rule. Thus, from that point of view it does not matter

if such words are considered compounds or prefixed words. Some undisputed verbal prefixes of Dutch such as *be-* and *ver-* can be used to derive verbs from nouns, that is, they have category-changing power. The same seems to apply to some of the initial constituents of the verbs in (3), as shown in (5):

- | | | |
|-----|---------------|---------------------------|
| (5) | <i>noun</i> | <i>verb</i> |
| | title ‘title’ | onder-titel ‘to subtitle’ |
| | brug ‘bridge’ | over-brug ‘to bridge’ |

The verbs *titelen* and *bruggen* do not exist in Dutch, which means that the verbs in (5) seem to be derived from nominal bases. This then speaks in favour of classifying such morphemes as prefixes, with the implication that we distinguish between the lexeme *onder* and the prefix *onder-*, and between the lexeme *over* and the prefix *over-*.

Another borderline case from Dutch is formed by complex nouns that begin with the constituents *linker-* ‘left’ or *rechter-* ‘right’. These constituents are used productively in noun formation, as in:

- (6) linker-been ‘left leg’, linker-arm ‘left arm’, rechter-kant, ‘right side’, rechter-raam ‘right window’

These constituents are related to the adjectives *links* ‘left’ and *rechts* ‘right’, but do not occur as lexemes, and would therefore qualify as prefixes. Yet, due to their specific lexical meaning, and their relationship with these adjectives, an interpretation as bound stems seems to be more natural. They look similar to the affixoids to be discussed in the next subsection.

2.2. Affixoids

In section 2.1, we noted that morphemes as parts of complex words may differ in meaning from the same morpheme when used as an independent lexeme. The terms ‘affixoid’ and ‘semi-affix’ have been introduced to denote morphemes which look like parts of compounds, and do occur as lexemes, but have a specific and more restricted meaning when used as part of a compound.

Marchand (1969: 326) used the term ‘semi-suffix’ to denote “such elements as stand midway between full words and suffixes. Some of them are used only as second words of compounds, though their word character is still recognizable” (the words in 7b):

- (7) a. -like (godlike), -way (someway), -wise (clockwise), -worthy (praiseworthy), -ware (hardware, software);
 b. -monger (whoremonger, moneymonger, scandalmonger), -wright (playwright, shipwright)

In my opinion, *-monger* and *-wright* in (7b) should be classified as bound lexical stems, in line with Marchand's observation, and because the set of words ending in *monger* etc. cannot be extended. The relevant morphemes in (7a), which also occur as independent words, function similar to suffixes, since the set of words ending in *like*, *worthy*, and *ware* can be extended. Therefore, we may indeed classify them as semi-suffixes or suffixoids (cf. Dalton-Puffer and Plag 2001) since they are morphemes that function as suffixes and have corresponding lexemes. The notion 'suffixoid', or more generally 'affixoid' should, however, not be seen as a theoretical notion, only as a provisional classificatory term, as we will see below.

The term 'affixoid' is sometimes also applied to suffixes like German *-schaft* '-ship' and Dutch *-baar* '-able', and *-heid* '-ity'. These suffixes derive historically from lexemes. This is reflected in their phonological behaviour: they are non-cohering suffixes that behave as prosodic words of their own. For instance, they carry secondary stress. Synchronically there are no corresponding lexemes, and therefore there is conclusive evidence for these morphemes being suffixes. Hence they should not be classified as suffixoids. Instead, we classify them as non-cohering suffixes (cf. Booij 2002c).

The following Dutch words may be considered to contain suffixoids:

(8) *corresponding to adjectives*

echt 'real'	kleur-echt 'lit. colour-real, colourfast'
vrij 'free'	stof-vrij 'lit. dust-free, without dust'
arm 'poor'	zout-arm 'lit. salt-poor, low on salt'
rijk 'rich'	vezel-rijk 'lit. fibre-rich, fibrous'

corresponding to nouns

boer 'farmer'	groente-boer 'lit. vegetables-farmer, greengrocer'
	kolen-boer 'lit. coal-farmer, coal trader'
	les-boer 'lit. lesson-farmer, teacher'
	melk-boer 'lit. milk-farmer, milkman'
	patat-boer 'lit. chips-farmer, chips seller'
	sigaren-boer 'lit. cigar-farmer, cigar seller'
	vis-boer 'fishmonger, fish dealer'
man 'man'	bladen-man 'lit. magazines-man, magazine seller'
	kranten-man 'lit. newspapers-man, newspaper seller'
	ijsco-man 'lit. ice cream-man, ice cream seller'
	melk-man 'milk man, milk seller'

More examples from Dutch can be found in Meesters (2002). The reason why morphologists tend to consider the heads of these complex words as suffix-like is that they have a specific meaning when used in that context. For instance, whereas the lexeme *vrij* has a range of meanings, it only has the meaning ‘without’ when part of a complex word. Similarly, *arm* has the restricted meaning ‘with only a small amount of’ in complex words such as *zoutarm*. The morpheme *boer* ‘farmer’ (etymologically related to the English morpheme *bour* in *neighbour*), when part of a complex word, has the meaning ‘trader in’, and no longer means ‘farmer’. Crucially for a classification as semi-affix, the ‘bound’ use of these morphemes is productive (cf. Schmidt 1987, Becker 1994), as is illustrated here for *boer*. This morpheme is used in combination with nouns that do not denote agricultural products, and words with this morpheme form a series of words with a shared meaning component. A similar observation can be used for the lexeme *man* ‘man’ when used in compounds

The observation of morphemes having specific meanings and being used productively with that specific meaning also applies to the class of Dutch prefixoids:

(9) *nouns used as pejorative prefixoids:*

kanker ‘cancer’	kanker-school ‘bloody school’
kut ‘cunt’	kut-ding ‘worthless thing’
kloot ‘testicle’	klote-houding ‘bad attitude’

nouns used as prefixoids of positive evaluation:

meester ‘master’	meesterwerk ‘very good piece of work’
	meester-zet ‘masterly trick’
wereld ‘world’	wereld-vrouw ‘fantastic woman’
	wereld-vent ‘fantastic guy’

nouns used as prefixoids with intensifying meaning:

steen ‘stone’	steen-koud ‘very cold’, steen-goed ‘very good’, steen-rijk ‘very rich’
beer ‘bear’	bere-sterk ‘very strong’, bere-koud ‘very cold’, bere-leuk ‘very nice’

The prefix *bere-*, for instance, derives from the noun *beer* ‘bear’, followed by the linking phoneme *-e*. Hence, the phonological form of this prefixoid is [be:r⁶]. Attachment of *bere-* to an adjective has become a very productive means for the expression of intensification of meaning, of having the property to a very high degree. Some examples (data from a Google search) are:

- (10) bere-goed ‘very good’, bere-interessant ‘very interesting’, bere-moeilijk ‘very difficult’, bere-sterk ‘very strong’, bere-tof ‘very good’, bere-veel ‘very much’, bere-zalig ‘very pleasant’

Judging from the orthography of a number of examples from my Google search with a space between *bere* and the next word, some users of Dutch have even reinterpreted *bere* as an adverb with the meaning ‘very’. The same applies to the compound constituent *reuze-* (a combination of *reus* ‘giant’ and a linking element *-e*) which can also be used as the independent word *reuze* with the meaning ‘fantastic, great’: *een reuze vent* ‘a fantastic guy’, *Dit is reuze* ‘This is great’.

The rise of affixoids is a typical case of grammaticalization, content words becoming grammatical morphemes. As is well known from grammaticalization studies, semantic change precedes formal change. In the case of affixoids semantic change has already taken place, but there is no formal change yet: formally they are just like (real compounds), there is usually no phonological weakening involved. We also observe the layering that is characteristic of grammaticalization: besides the bound use of these words, their use as independent lexemes, with a greater range of meanings, is still possible.

The theoretical problem that there is no sharp boundary between compounding and affixal derivation is not solved, however by postulating a category of semi-affixes or affixoids; it is just a convenient description of the fact that the boundary between compounding and derivation is blurred, but does not in itself provide an explanation of why this is the case. What we need is a model of morphological knowledge that will enable us to explain these facts. In section 4 this issue will be taken up again.

These grammaticalization facts show that compounding and derivation cannot be seen as two completely different morphological mechanisms, the position defended in Anderson (1992). For the same reason, Haspelmath (1992) concluded that it makes sense to define suffixes as heads of complex words, just like the right constituents of compounds.

The inverse development, bound constituents becoming words also takes place. This is an example of degrammaticalization. An example from both English and Dutch is the use of *ex* with the meaning ‘former partner’; German also has the noun *Ex* with the same meaning. In Dutch, bound stems or prefixes such as *makro* ‘macro-, at a higher level’ and *anti* ‘anti-, against’ have developed into independent lexemes (Booij 2002a). The possibility of degrammaticalization of, in particular non-cohering, affixes into lexemes once more blurs the boundary between compounding and affixal derivation.

3. Access to morphological structure

The strong similarity between compounding and derivation leads to the conclusion that derivational affixes do exist as constituents in the morphological structure of words, just like the constituents of compounds. Derivational morphemes function as building blocks in morphological structure. This

goes against the theory of A-morphous Morphology. The following quotation from Anderson (1992) will serve to clarify this issue (cf. Bauer 1999 for relevant comments):

“No one would contest the claim that [a constituent analysis] corresponds to something which is ‘true’ of the word *discontentedness*, but it does not follow from this that the decomposition of the word is an aspect of its structure, any more than its etymology is. To see that there is an issue here, we can contrast such views, based on morphemes, with a picture of morphology as based on a system of rules, which map words (or stems) onto other words [...]. On this picture, the structure of *discontentedness* is given by a derivation:

$$\begin{array}{ccccccc}
 & & R_{\text{dis}} & & R_{\text{ed}} & & R_{\text{ness}} \\
 N[\text{content}] & \rightarrow & N[\text{discontent}] & \rightarrow & A[\text{discontented}] & \rightarrow & N[\text{discontentedness}]
 \end{array}$$

Each step of such a derivation maps the phonology, the semantics, and the syntax of its inputs onto the (corresponding) properties of its outputs. It expresses the same facts as the [constituent structure tree], such as the observation that some of the subparts of the word are themselves words, the relative scope of morphological operations, etc., but without imposing a distinct structure on derived words to represent their morphological analysis as an aspect of their form.” Anderson (1992: 260)

Let us therefore see if there is evidence for rules of grammar that need access to the morphological constituent structure of derived words. Recall that Anderson pointed out that we do need access to the constituent structure of compounds in order to specify the location of linking elements in German compounds. Dutch also has such linking elements (-s or -e) at the internal boundary of compounds. However, the linking element -e- not only appears within compounds, but also before a number of suffixes, in particular after stems ending in an obstruent (Booij 2002a):

- (11) -lijk heer-lijk ‘delicious’ drag-e-lijk ‘bearable’
 -ling twee-ling ‘twins’ vreemd-e-ling ‘stranger’
 -loos zin-loos ‘senseless’ nod-e-loos ‘without necessity’
 -nis vuil-nis ‘garbage’ begraf-e-nis ‘burial’

Therefore, if rules for the distribution of such linking elements need access to the internal structure of compounds, they need likewise access to the internal structure of derived words.

An important argument in favour of access to morphological structure is the phenomenon of base-driven restrictions discussed in detail in work by Plag (Plag 1999; Hay and Plag 2004). For example, English verbs ending in one of the suffixes *-ify*, *-ize*, or *-ate* require (one of the allomorphs

of) the suffix *-ation* for being nominalized. Use of one of the other English nominalizing suffixes such as *-age*, *-al*, *-ance*, or *-ment* is thereby excluded:

- (12)
- | | |
|-------------|---|
| steer | steerage |
| betray | betrayal |
| annoy | annoyance |
| contain | containment |
|
 | |
| magnify | magnification, *magnify-age, *magnify-al, *magnify-ance, *magnify-ment |
| verbalize | verbalization, *verbaliz-age, *verbaliz-al, *verbaliz-ance, *verbalize-ment |
| concentrate | concentration, *concentrate-age, *concentrate-al, *concentrate-ance,
*concentrate-ment |
- (Hay and Plag 2004)

An example of a base-driven restriction from Dutch is that the choice of a specific female suffix is determined by the last suffix of the base word. For instance, the female suffix *-ster*, can only be added to nouns ending in *-er*, *-aar*, or *-ier*. The following table illustrates these base-driven restrictions:

- (13) The formation of female personal nouns (Booij 2002a: 102)

<i>suffix</i>	<i>bases in</i>	<i>male noun</i>	<i>female noun</i>
-e	----	fotograaf 'photographer'	fotograf-e
es	--	voogd 'guardian'	voogd-es
	-aar	zond-aar 'sinner'	zondar-es
	-er	zang-er 'singer'	zanger-es
esse	-aris	secret-aris 'secretary'	secretar-esse
euse	-eur	mass-eur 'massagist'	mass-euse
ica	-icus	historic-us 'historian'	historic-a
ière	-ier	cabaret-ier 'id.'	cabaret-ière
in	----	leeuw 'lion'	leeuw-in
ix	-or	rect-or 'id.'	rect-rix
rice	-eur	ambassad-eur 'ambassador'	ambassad-rice
ster	-aar	wandel-aar 'walker'	wandelaar-ster
	-ier	winkel-ier 'shopkeeper'	winkelier-ster
	-er	VVD-er 'member of VVD'	VVD-ster

As the last example of (13) already illustrates, the suffix *-er* of a base noun is replaced with *-ster*, a case of paradigmatic word formation:

(14)	betwet-er 'lit. better knower, pedant'	betweet-ster 'female pedant'
	oproerkraai-er 'lit. revolution crower, ring leader'	oproerkraai-ster 'female ring leader'
	padvind-er 'lit path finder, boy scout'	padvind-ster 'girl scout'
	strooplikk-er 'lit. syrup licker, toady'	strooplik-ster 'female toady'
	rederijk-er 'rhetorician'	rederijk-ster 'female rhetorician'
	reizig-er 'traveler'	reizig-ster 'female traveler'
	aanvoer-der 'captain'	aanvoerd-ster 'female captain'
	bestuur-der 'driver'	bestuurd-ster 'female driver'
	woordvoer-der 'spokesman'	woordvoerd-ster 'spokeswoman'

(Booij 2002a: 6-7)

In the last three examples, the base nouns end in an allomorph of *-er*, the suffix *-der*. This allomorph has to be used after stems ending in [r]. The fact that this [d] also appears in female nouns such as *aanvoerdster* (where we would expect *aanvoerster* if the suffix *-ster* were attached to the verbal stem *aanvoer*) shows that this is a case of suffix replacement, with *-er* being replaced with *-ster*.

Paradigmatic word formation is the case par excellence for the accessibility of the internal structure of derived words. A related phenomenon is that of truncation (Aronoff 1976): the deletion of the last suffix of the stem before the newly added suffix, as in *nomin-ee* derived from *nomin-ate*, a notion also used by Corbin (1987) in her analysis of French word formation. As Maiden (2001: 42-43) points out, such truncation operations cannot be interpreted as phonological operations, unlike what Anderson (1992: 280ff) suggests. The pieces that are deleted or replaced are not just strings of segments, but morphological units. Hence, truncation (or suffix substitution) requires access to the internal morphological structure of derived words.

Affix substitution also occurs as a diachronic process. Maiden (2001) provides some cases from Romanian and Spanish in which the final suffix of derived words has been replaced with another one. For instance, Maiden observed the following pattern of suffix replacement for Romanian words with diminutive suffixes:

[...] "in all nouns and adjectives with suffixal *-el -ei -ea -ele* [...] the feminine adverbial singular *-ea* is subject to replacement by the etymologically unrelated diminutive suffix *-ică*." (Maiden 2001: 32)

Maiden's explanation for this replacement is that the suffix *-ea* had become ambiguous, and was therefore replaced by another, unambiguous one. This process requires that the relevant words can be segmented into a stem followed by a derivational suffix (Maiden 2001: 36).

A by now classical case of the sensitivity of morphology to the morphological structure of words is the formation of the past participle in Dutch. For regular simplex verbs, a prefix *ge-* and a suffix *t/d* (regular verbs) or *-en* (irregular verbs) are added to the stem. If the stem begins with an unstressed prefix, however, the prefix *ge-* must be omitted:

- (15) loop 'to walk' *ge-lop-en*
 ver-lóop 'to pass' *ver-lop-en, *ge-ver-lop-en*
 verbalisээр 'to fine' *ge-verbaliseer-d, *verbaliseer-d*

In the last example, the first syllable *ver-* has no prefix status, and hence, the prefix *ge-* cannot be omitted. Therefore, the morphological structure of prefixed verbs must be accessible to morphology. This point is also made in Carstairs-McCarthy (1993), a general critical discussion of the claims of Amorphous Morphology.

The morphological structure of a word may also play a role in the computation of its prosodic structure. A specification of the phonological string of segments of an affix does not suffice for computing the prosodic structure of morphologically complex words, because word-internal morphological boundaries may play a role in the division of the phonological string into syllables, feet and prosodic words. For instance, the right edge of prefixes may have to coincide with a syllable boundary even when this violates the universal constraint of syllabification referred to as No Empty Onset. Suffixes may create a prosodic word of their own. Put generally, there are constraints on the alignment of prosodic boundaries with word-internal morphological boundaries (McCarthy and Prince 1994). Such effects on the prosodic structure of words cannot be specified as part of the phonological operation performed by a Word Formation Rule, because this would imply that the creation of the prosodic structure of a complex word is part of that phonological operation. That cannot be correct since the principles of prosodification are not affix-specific. They follow the general principles for assigning prosodic structure to words. For instance, Dutch derived words ending in the suffix *-achtig* 'ish' receive their prosodic structure just as other words. Thus, the suffix *-achtig* is syllabified as *ach.tig*. The only affix-specific property concerns the alignment of its left boundary with a prosodic word boundary. Hence, a word like *rood-achtig* 'reddish' will receive the following prosodic structure and phonetic representation (the dots indicate syllable boundaries, ω stands for 'prosodic word'):

- (16) [[rood]_Aachtig]_A (ro:t)_ω(αx.t⊙x)_ω

This example shows that morphological constituent structure must be accessible for the computation of the prosodic structure of a word. Similar observations can be made for prefixed words. As pointed out in section 2, the right edge of some prefixes always coincides with a syllable boundary, even when this means that the first syllable of the stem will be onsetless. Again, morphological structure must be accessible. This is illustrated by the Dutch prefixed verb *ver-as* ‘to cremate’, with the syllable structure *ver.as*, with an onsetless second syllable (at the phonetic level the onset may be filled by a glottal stop).

In conclusion, the assignment of morphological constituent structure to words derived by means of affixal derivation appears to be well motivated, and make such derived words structurally similar to compounds. Morphological and phonological rules require information about the internal structure of derived words for their proper application.

4. Construction Morphology

The structural similarity between compounding and affixal derivation can be expressed by means of word formation schemas that express generalizations about sets of existing words, and can also be used to make new words. For instance, Dutch has right-headed compounds, suffixed nouns, and prefixed nouns. These three morphological patterns can be represented as follows:

- (17) a. compounding : $[[x]_X][y]_Y]_Y$
 b. suffixation : $[[x]_X y]_Y$
 c. prefixation : $[x[y]_Y]_Y$

The variables x and y stand for phonological strings and the variables X and Y for lexical categories. The schema for compounds expresses the generalization that Dutch compounds are right-headed since the category variable for the right constituent is identical to that of the whole word. The schema for prefixation expresses that prefixation is category-neutral, and that the syntactic category of prefixed words is identical to that of its stem. Below I will discuss to what extent there are cases of Dutch prefixation that do not conform to this schema. The difference between compounding and derivation is that in derivation one of the constituents does not have a lexical label since it does not correspond to a lexeme.

In the case of the compound schema (17a), it is possible to add the following semantic specification to that schema:

- (18) $[[x]_X[y]_Y]_Y$ ‘Y with some relation to X’

This schema is part of the lexicon, and represents the pairing of a formal structure to a semantic structure.

The schemas (17b,c) are general schemas for suffixation and prefixation respectively that do not mention specific affixes. In the traditional Word Formation Rule approach of Aronoff (1976), however, there is a rule for each individual affix, for instance, one for the English deverbal suffix *-er*. The bound nature of the morpheme *-er*, the category-determining role, and the semantic contribution of this suffix are expressed by its being specified in the relevant rule. Therefore, we may ask how these general schemas and Word Formation Rules relate.

In order to answer this question, let us apply the idea of Construction Grammar (Goldberg 1995, Kay 1997) to the domain of morphology, thus developing the theory of Construction Morphology. The basic insight of Construction Grammar is that specific instantiations of general syntactic patterns may have started to lead a life of their own, and thus deserve a specification of their own. A famous example is the English construction *V NP away*, as in *twisting the night away*. This is an example of a constructional idiom, a syntactic pattern in which one position is lexically specified (*away*), and that has a specific, not completely compositional meaning (Jackendoff 2002). Such idioms with partial lexical specification are called ‘constructional idioms’.

The morphological scheme for the Dutch and English deverbal suffix *-er* can now be interpreted as an example of a constructional idiom at the word level: deverbal nouns with *-er* have the meaning ‘one who V-s’; this meaning is to be linked to this specific instantiation of suffixation schema (17b):

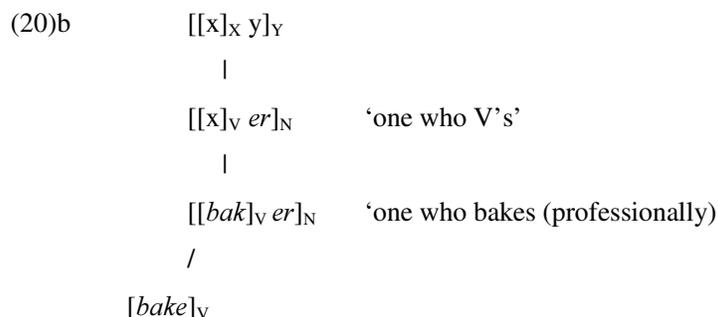
(19) $[[x]_V er]_N$ ‘one who V’s’

The basic idea of constructional schemas is that they represent generalizations about sets of complex words with varying degrees of abstraction. The complex words themselves are specified individually in the lexicon to the extent that they are established, conventionalized lexemes. The relation between the abstract scheme and the individual instantiations of that scheme can be represented as a tree with the constructional schema as the dominating node. Individual words form the lowest nodes of the trees, and inherit the properties of the nodes by which they are dominated. For instance, the word *baker* might be represented as follows in the lexicon:

(20)a

$[[x]_X y]_Y$	
$[[x]_V er]_N$	‘one who V’s’
$[[bak]_V er]_N$	‘one who bakes (professionally)’

Each lower node inherits the properties of its dominating node. These inherited properties count as redundant information on the lower node. In the case of *baker*, this word also inherits properties from its base lexeme *bake*. Hence, it will also be linked to that lexeme:



Thus, complex words must be allowed to have multiple linkings in the lexicon.

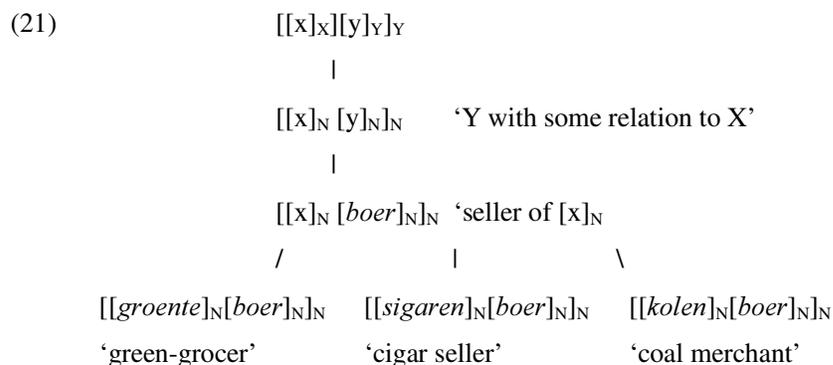
The second line in (20b) represents the schema for deverbal nouns in *-er*. New words can be formed according to this schema through the formal operation of unification. This schema can be unified with, for instance, the verb *to fax*, thus leading to the deverbal noun *faxer* 'one who faxes'. The relation between the hierarchical ordered lines of representation is that of instantiation. For instance, the word *baker* is an instantiation of the scheme for deverbal nouns in *-er*.

This use of inheritance trees can be found in a number of frameworks such as Construction Grammar, Network Morphology (cf. Corbett and Fraser 1993 and the literature mentioned there), and in Cognitive Grammar (Taylor 2002). A fine example in the domain of derivational morphology is Riehemann's analysis of German *bar*-adjectives (Riehemann 1998).

Language users acquire knowledge of these abstract morphological schemes on the basis of their knowledge of a set of words that instantiate this pattern. Once they have come across a sufficient number of words of a certain type, they can infer an abstract scheme, and will be able to extend that class of words. As Tomasello (2000: 238) points out, the endpoint of language acquisition is to be defined "in terms of linguistic constructions of varying degrees of complexity, abstraction, and systematicity". This also applies to the level of morphological constructions.

The existence of abstract, productive schemes for complex words does not mean that these words are no longer stored in the lexicon. "Instances and schemes will generally co-exist and mutually support each other" (Taylor 2002: 307).

A crucial property of Construction Morphology is that it allows for intermediate representations, in between the concrete words and the abstract pattern. Consider the Dutch compound words ending in *boer* discussed above. We may represent the information concerning these words as follows in the lexicon:



This hierarchy expresses that there is an intermediate generalization for compounds with *boer* as their right constituent. This pattern has started a life of its own, although its instantiations still conform to the schema for Dutch nominal compounds, with a specific semantic contribution of *boer* that is no longer identical to that of the lexeme *boer* ‘farmer’. The schema at the intermediate level is a constructional idiom: a construction in which one of the two positions is occupied by a specific lexical item. In this respect this schema is completely identical to that for deverbal nouns. The only difference is that the phonological string *boer* may still be linked to the lexeme *boer* with the meaning ‘one who produces and sells food’. As long as this is the case, the formal structure of these words ending in *boer* will be represented as compounds. If the semantic relationship between *boer* ‘farmer’ and these complex words has become opaque for the language user, they will be disconnected, thus turning the morpheme *boer* within these complex words into a bound morpheme.

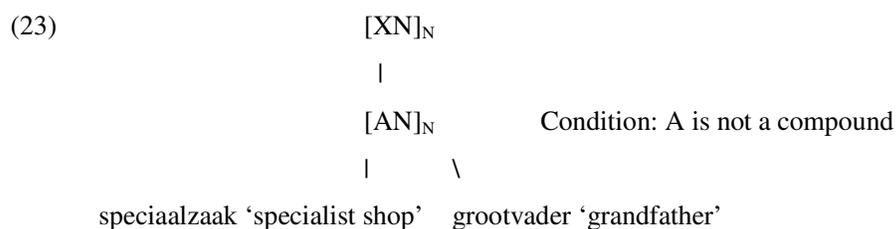
Similar constructional schemas intermediate between completely abstract patterns and the individual words that are instantiations of that pattern can be used to account for the behaviour of the other affixoids mentioned above: they are lexemes with a specific meaning when embedded in a compound structure. We may call them constructional idioms at the morphological level. Thus we get schemas for Dutch suffixoids such as:

- (22) $[x]_N [vrij]_A]_A$ ‘without N’
 $[x]_N [arm]_A]_A$ ‘low on N’
 $[x]_N [rijk]_A]_A$ ‘with a lot of N’

Again, these schemas are like those for affixal derivatives, except that the right constituents correspond to lexemes that are stored independently in the lexicon. Moreover, these schemas are dominated by a higher node with the more abstract schema $[[x]_N [y]_A]_A$. Intermediate abstract schemas such as those in (22) express that the specific meaning of a lexeme when embedded in a compound may recur. That is, there is a series of such words, and the set can be extended.

Another illustration of the importance of intermediate degrees of abstraction in lexical trees is the following. Dutch has N + N, V + N, and A + N compounds. Thus, in order to express this

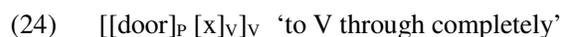
generalization, we might want to assume a general sub-schema for $[XN]_N$ compounds in the Dutch lexicon, in which X is a variable for the three classes of content words N , V , and A . However, these three patterns do not have the same status. For instance, the class of $A + N$ compounds is marginally productive and the left A constituent cannot be a compound itself, whereas $N + N$ compounding is extremely productive, and the left N can itself be a nominal compound. In other words, there must be a level of abstraction at which this differences between the different subsets of $X + N$ compounds can be specified. That is, at least the following three levels of abstraction are required for $A + N$ compounds in the lexicon of Dutch:



This approach to affixoids can also deal insightfully with Mithun’s observation for Spokane (Mithun 1999: 48-51) that suffixes with a lexemic counterpart, the so-called lexical suffixes, tend to be semantically vaguer than their lexemic counterparts. The lexical suffix is by nature part of an abstract schema, and hence is used in a more general fashion, just like the Dutch affixoids discussed above. The increasing semantic vagueness (bleaching) and, in the case of Spokane, the phonological reduction of the suffixes compared to the corresponding lexemes are characteristic effects of the grammaticalization of lexemes into affixes.

Lexical hierarchies of this sort, with individual lexemes at the bottom of the hierarchy, and abstract patterns at higher levels express the tight relationship between the paradigmatic axis and the syntagmatic axis of language structure. Words can be assigned internal morphological structure and linked to abstract construction schemas (the syntagmatic dimension) on the basis of systematic form-meaning correspondences between existing lexemes (the paradigmatic dimension).

The same account can be used for the Dutch complex verbs listed in (3) in which the first constituent has a lexematic correspondent. For each of these prefix-like lexemes there will be a construction schema. For instance, the prefix *door-* may be specified as follows as part of a constructional scheme:



This scheme is a generalization about verbs like the following



door-breken ‘to break through’
door-denken ‘to reflect upon’
door-lopen ‘to pass through’

This pattern is an instantiation of the more general schema of right-headed Dutch compounds. The morpheme *door* as used in these verbs denotes the (sometimes metaphorical) path of an action, resulting in complete affectedness of the patient of that action. Hence, the presence of *door* induces telic aspect. In other words, the traditional classification of this use of *door* as a prefix means that this word has a specific meaning when used as part of complex verbs. However, we do not have to consider *door* a prefix. It can keep its status of being the first constituent of a compound, because the meaning of *door* in this context is one of the meanings of *door* when used as a lexeme.

In some case these ‘prefixes’ seem to have category-changing power, however, which would be a problem for linking them to the compound schema of Dutch. This is, for instance, the case for the examples *ondertitelen* and *overbruggen* in (5). These verbs cannot be linked to existing base verbs *titelen* and *bruggen*, and hence they look like cases of category-changing prefixation applied to nominal bases. However, we can maintain a compound analysis by making use of the idea of ‘conflation’. This term is used here to denote the unification of two schemas for complex words.

The basic idea is that a schema can not only be unified with individual lexemes resulting into complex words, but also with another schema. For instance, the Dutch compound schema can be unified with that of conversion of nouns into verbs. Thus, we get the following output of unification:

$$(26) \quad [[x]_P [y]_V]_V + [[y]_N]_V \rightarrow [[x]_P [[y]_N]_V]_V$$

Through unification with $[onder]_P$ and $[over]_P$, we get the following sub-schemas for verbs like *ondertitelen* ‘to subtitle’ and *overbruggen* ‘to bridge’ respectively:

$$(27) \quad \begin{array}{l} [[onder]_P [[y]_N]_V]_V \text{ ‘to put N under’} \\ [[over]_P [[y]_N]_V]_V \text{ ‘to put N across’} \end{array}$$

These schemas express that the use of these prepositions in verbal compounds can trigger the use of the schema for conversion of nouns into verbs. Thus, such conflated schemas enable us to express the dependency of the use of one word formation pattern on that of another one.

The analysis in (27) implies that the category-changing power of these ‘prefixes’ is only apparent, and that they are in fact category-neutral. Thus, they are in conformity with scheme (17c). A similar analysis is possible for undisputed prefixes such as *be-* and *ver-*, but I will leave this issue out of discussion here.

Note that we observed in section 1 that these complex words are special in that it is the right constituent that carries main stress, unlike what is the case for most Dutch compounds. This can be expressed by a specific compound stress rule for words of the type $[[x]_P[x]_V]_V$. Thus, their formal status of compounds can be maintained.

The idea of ‘conflation’ may also serve to account for the co-occurrence of compounding and derivation. The term ‘synthetic compound’ has been coined by morphologists to denote complex words that seem to be formed by the simultaneous application of compounding and derivation. A clear example is the Dutch complex adjective *blauwogig* ‘blue-eyed’. There is no existing compound *blauwoog* from which this word could have been derived, nor an existing derived word *og-ig* that can function as the head of the compound *blauwogig*. Note, however, that although *ogig* does not exist, it is a well-formed, possible word of Dutch. Therefore, we might say that the head of *blauwogig* is the possible, but not existing adjective *ogig* ‘eyed’. Other examples of such synthetic compounds are given in (28):

- (28) kort-adem-ig 'short of breath'
 lang-ben-ig 'long-legged'
 twee-lettergrep-ig 'disyllabic'

The systematic co-occurrence of these two word formation patterns can be expressed by conflating the two relevant word formation schemas into a more complex one that can be said to have started a life of its own. This is confirmed by a specific semantic property of this class of words, the restricted semantic scope of the adjectival modifier. For instance, the scope of *blauw* in *blauwogig* is not the whole head of the word *ogig*, but only its nominal base *oog* since the word means ‘having blue eyes’:

- (29) $[A [N-ig]_A]_A$ ‘having N with property A’

In this schema, two slots, one for an adjective and one for a noun are open. This template does not introduce a new formal type of complex words, but it expresses that it is the combination of two independently motivated word formation processes that systematically and productively co-occur. That is, the simultaneous use of the two schemas appears to enhance their productivity. The two schemas that are conflated here are:

- (30) $[A A]_A$ $[N-ig]_A$

Each of these schemas is motivated independently by the existence of the relevant types of words (AA compounds and denominal adjectives in *-ig* respectively). Their combination into one scheme has gotten a life of its own, with a specific constructional meaning, in which the left A constituent has

scope over the nominal base of the adjectival head. The relevant part of the lexicon will be structured as follows:

$$\begin{array}{rcccl}
 (31) & [A A]_A & [N-ig]_A & & \\
 & \backslash & / & & \text{[relation of unification]} \\
 & [A [N-ig]_A]_A & \text{'having N with property A'} & & \\
 & / & \backslash & & \text{[relation of instantiation]} \\
 & \text{blauw-og-ig 'blue-eyed'} & \text{lang-har-ig 'long-haired'} & &
 \end{array}$$

If this analysis is correct, it is another proof of the thesis that compounding and affixal derivation cannot be assigned to different modules of the grammar.

The Construction Morphology approach defended above has the additional advantage that the same representational format can be used as that for constructional idioms. Jackendoff (2002) introduced the notion of constructional idiom to denote multi-word units of which some positions are fixed, but other variable. Good examples of constructional idioms are the different types of particle verb in Dutch and German. They are phrasal units of which the particle position is lexically fixed, and the verbal position is variable (Booij 2002b). Another nice illustration of the importance of this notion is the class of Frisian genitive compounds such as *koken-s-doar* 'kitchen-GEN-door, the door of the kitchen', which have phrase-like properties (Hoekstra 2003). As will be clear now, the notion constructional idiom is also adequate for schemas with a specific derivational affix, and for the class of compounds ending in *-boer*. The difference between a derivational suffix and the compound constituent *boer* is that the latter is also linked to the independent lexeme *boer* 'farmer'. The notion 'affixoid' thus receives a formal interpretation in terms of linking patterns in the lexicon, and is therefore not to be seen as a theoretical term that introduces a third class of morphemes besides lexical morphemes and bound morphemes. An affixoid is a lexeme that occurs in a subschema for compounds in which the other position is still a variable, that is, without a lexical specification. Such schemas are intermediate between concrete individual compounds and fully abstract schemes for compound structures. The specific and recurrent meaning of a lexeme in the compound structure is specified at this intermediate level.

5. Conclusions

The boundary between compounding and affixal derivation can be crossed in the course of history of a language. Therefore, we cannot give two completely different formal accounts of these two types of word formation. Derivational affixes are pieces of morphological structure, just like the constituents of compounds. This position leads us to expect that compounding and derivational affixation do not differ in accessibility for rules of grammar. This expectation appeared to be borne out by the facts.

The strong similarity between derivation and compounding can be insightfully accounted for in the theory of Construction Morphology. Derivational patterns and sub-patterns of compounding are constructional idioms, schemas that are intermediate between the individual complex words in the lexicon, and more abstract schemas of word formation. An additional advantage of this approach is that it can be easily extended to the analysis of productive multi-word combinations that function as lexical units such as particle verbs and phrase-like compounds.

Finally, we may ask if the relation between lower and higher nodes and that between complex words and their base words in the lexical inheritance trees is monotonous. Monotonicity means that information on lower nodes cannot overrule or erase information on higher nodes (cf. Riehemann 1998 for a discussion of this issue). If lexemes as parts of compounds have more restricted meanings than when used as words by themselves, as illustrated above, this implies that we have to allow for non-monotonicity. That is, we need the notion 'default inheritance': a lower node inherits the properties of its dominating nodes unless these are overruled by specification on that lower node.

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