

Construction Morphology and the Parallel Architecture of grammar

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Abstract

This paper presents a systematic exposition of how the basic ideas of Construction Grammar (CxG) (Goldberg 2006) and the Parallel Architecture (PA) of grammar (Jackendoff 2002) provide the framework for a proper account of morphological phenomena, in particular word formation. This framework is referred to as Construction Morphology (CxM).

As to the implications of CxM for the architecture of grammar, the article provides evidence against a split between lexicon and grammar, in line with CxG. In addition, it shows that the PA approach makes it possible to be explicit about what happens on which level of the grammar, and thus to give an insightful account of interface phenomena. These interface phenomena appear to require that various types of information are accessible simultaneously, and it is argued that constructional schemas have the right format for expressing these mutual dependencies between different types of information.

1. Introduction

The aim of this paper is to present a systematic exposition of how the basic ideas of Construction Grammar (CxG) (Goldberg 2006) and the Parallel Architecture (PA) of grammar (Jackendoff 2002) can be used for - and are essential for - a proper account of morphological phenomena, in particular word formation phenomena. Although the framework of CxG has been developed and used since the 1980s, its application to the level of the word, that is Construction Morphology (CxM), has been lagging behind. A first codification of CxM can be found in Booij (2010), and in this paper we will elaborate on the ideas presented in this monograph and discuss new facts that form evidence for CxM and PA.

As to the implications of CxM for the architecture of grammar, we will provide evidence against a split between lexicon and grammar, in line with CxG. In addition, we will show that the PA approach enables us to be explicit about what happens on which level of the grammar, and thus to give an insightful account of interface phenomena. These interface phenomena appear to require that various types of information are accessible simultaneously, and we will argue that constructions have the right format for expressing these mutual dependencies between different types of information.

Section 2 presents a brief outline of PA and argues why PA is essential for a proper characterization of constructional schemas on the word level. Section 3 argues for the use of schemas and second-order schemas for the description of the relational network between lexical items. Section 4 discusses how morphology and syntax interact, and section 5 summarizes our findings concerning the architecture of grammar.

2. Construction Morphology and the Parallel Architecture

Constructions, both at the word and the phrase level, are usually pairings of form and meaning. A simple example is the morphological construction $[N\text{-}hood]_N$, which is instantiated by nouns such as *sainthood* and *motherhood* with the meaning ‘quality denoted by the base noun’.¹ The systematic

correspondence between form and meaning in this kind of nouns can be captured by the following constructional schema:

$$(1) \quad \langle [[x]_{N_i} \text{ hood}]_{N_j} \leftrightarrow [\text{Quality of SEM}_i]_j \rangle$$

The schema is demarcated by angled brackets. The left part of the schema specifies the form of this particular class of words, and the right part specifies its meaning. The double arrow denotes the correspondence relation between the two. The co-indexation of parts on the left and parts on the right of the double arrow specifies how formal constituents contribute to the meaning of the construction as a whole. SEM stands for the meaning of a constituent, in this example the base noun.

This constructional schema has two functions. On the one hand it motivates existing nouns of this type, that is, it makes the relation between form and meaning for a subset of established English words less arbitrary. On the other hand, it functions as a recipe for the coinage of new nouns in *-hood*, as this morphological construction is productive, witness forms such as *daddy-hood*, *object-hood*, and *legend-hood* (examples from Bauer et al. (2013, p. 249)).

The way in which the form side of the schema is represented in (1) is a simplification. Complex words have two types of formal structure: morphological structure and phonological structure. The morphological structure is a linear and hierarchical arrangement of lexical categories and affixes, and the phonological structure is a linear and hierarchical arrangement of sound segments and prosodic categories such as the syllable, the foot, and the prosodic word. Hence, the formal representation of the left part of schema (1) is a conflation of the phonological and the morphological tier. In (2), we have elaborated the schema to show all three levels of representation:

$$(2) \quad \langle ((x)_{\omega-i} ((\text{hud})_{\sigma})_{\omega-k})_j \leftrightarrow [N_i \text{ Suff}_k]_{N_j} \leftrightarrow [\text{Quality of SEM}_i]_j \rangle$$

The symbols σ and ω stand for ‘syllable’ and ‘prosodic word’ respectively.

Schema (2) illustrates that the phonological structure and the morphological structure of words are not necessarily isomorphic. The suffix *-hood* has the status of independent prosodic word, but it is a bound morpheme and therefore not a word in the morphosyntactic sense of the term.

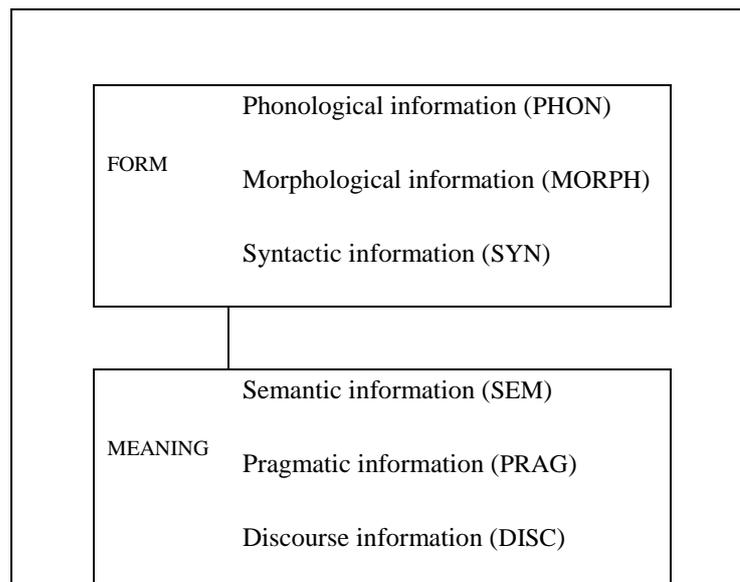
The three parallel representations for both words and phrases and for the constructional schemata that they are instantiations of, constitute the basic ingredients of the Parallel Architecture, a theory of grammar developed by Ray Jackendoff and summarized in (3), simplified for expository reasons (cf. Jackendoff 2002, p. 125):

(3) *Parallel Architecture*

Phonological structure ↔ Morpho-Syntactic structure ↔ Conceptual structure

The level of conceptual structure comprises the semantic (SEM), pragmatic (PRAG) and discourse (DISC) properties of language constructs (Jackendoff 2002, chapter 12). A similar view can be found in Croft (2001):

(4) Constructions as pairings of FORM and MEANING



Each type of structure is subject to the rules or constraints that hold for a particular type of representation. Prosodic structure is governed by phonological rules or constraints such as those for building syllables and higher-level prosodic constituents. Morphological and syntactic structure (morpho-syntactic structure, for short) is governed by the rules of syntax and morphology. Conceptual structure is specified by the constraints and regularities of conceptual representations. The double arrows in (3) stand for correspondence relations between these different types of information within a particular language construct. Correspondence relations may also be referred to as *interface* relations.

In the default case, the lexical specification of a word comprises these three levels; hence, each word is a specification of interfaces between three pieces of information. The same holds for constructional schemas for words, which are generalizations over sets of words. The interface between the different levels of representation in a constructional schema may be subject to general principles or constraints that hold for more than one schema. For instance, in Dutch prefixed words, the word-internal prefix boundary always coincides with a syllable boundary. This generalization can be expressed in an abstract schema that dominates all Dutch prefixed word constructions.

An important feature of PA is that different types of information (phonological, syntactic/morphological and semantic) are simultaneously accessible. For instance, the attachment of an affix to a base may be dependent on prosodic properties of the base, which must therefore be available for this morphological operation. Hence, information on the level of phonological structure must be accessible for the expression of generalizations on the morphological level. Evidence for the simultaneous relevance of morphological and prosodic structure has been given in (Booij & Lieber 1993), who point out that this goes against the idea that morphology precedes phonology, a traditional assumption in generative grammar. An example from English is that the comparative suffix *-er* only attaches to adjectives that are monosyllabic or bisyllabic with a light second syllable (as in *big – bigger, happy – happier*).² This generalization cannot be expressed if morphology (the construction of complex words) is assumed to precede phonology, since phonology provides essential information on the syllable structure of the base words for this morphological process.

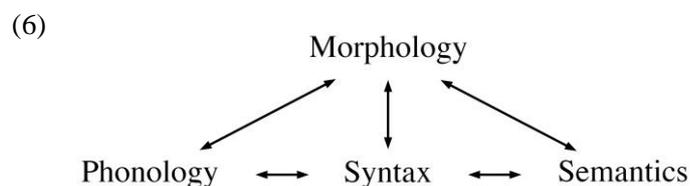
The prosodic properties of affixes may also play a role in constraints on the stacking of affixes. For instance, in Dutch, a number of suffixes are *closing* suffixes that block further suffixation

of complex words. However, there is one exception: suffixes that form prosodic words by themselves can nevertheless be added after a closing suffix. The diminutive suffix *-je*, for example, is normally not followed by any other suffix in the same word, but it can be followed by suffixes like *-achtig* ‘-like’ and *-loos* ‘-less’ that form prosodic words of their own (Booij 2002b) (the *-s-* is a linking element, the final vowel *e* /*ə*/ of *-je* is deleted before a vowel):

- (5) vriend-je ‘friend-DIM’ *vriendj-ig ‘friend-DIM-like’ vriend-je-s-loos ‘friend-DIM-less’
 sprook-je ‘tale-DIM, fairy tale’ *sprookj-ig ‘fairy tale-like’ sprookje-s-achtig ‘fairy tale-like’

This example illustrates once more that morphological generalizations and constraints on the morpho-syntactic level may have to refer to properties of words at another level of representation, the phonological level. This is a type of interface between different levels of representation that grammars have to allow for.

Morphological and syntactic information belong to the same level of representation in PA. They both deal with the formal hierarchical structure of linguistic constructs, of words and of combinations of words respectively. In section 3 below we will discuss how syntax and morphology interact and feed each other. Thus, the following connections hold between morphology on the one hand, and phonology, syntax, and semantics (in the broad sense of conceptual structure) on the other:



The Parallel Architecture of grammar predicts at least the following connections between the morphological structure of words and other (sub-)levels of grammar:

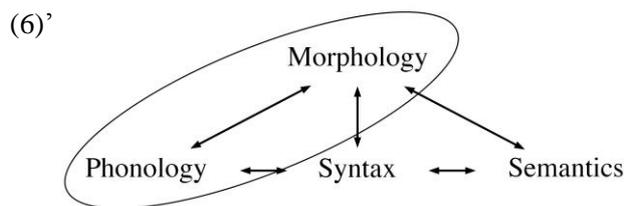
- an interface between morphology and phonology

- an interface between morphology and semantics

In addition, there is also interaction between morphology and syntax, which are located on the same tier. In this article these three connections will be investigated in detail. In particular, we will argue that multiple types of information have to be available simultaneously. The notion ‘construction’ as developed in Construction Grammar and Construction Morphology allows us to account straightforwardly for this simultaneity.

2.1. The interface of morphology and phonology

For the orientation of the reader, the connection between morphology and phonology in PA is indicated below as the circled part of figure (6):



The literature on the interface between morphology and phonology is vast. Useful compendia of the state-of-the-art in this domain are Trommer (2012) and Inkelas (2014). Here is a (non-exhaustive) list of such interface phenomena:

(7) The interface of morphology and phonology

<i>Type of interface</i>	<i>Example</i>
Phonological output conditions may govern the selection of allomorphs and competing affixes	The Dutch plural suffixes -s and -en are distributed such that plural forms end in a

(Booij 1998; Booij & Van der Veer 2015; Burzio 2005; Rubach & Booij 2001).	trochee, e.g. <i>cánon-s</i> ‘canons’ versus <i>kanónn-en</i> ‘guns’.
Prosodic morphology: morphological processes may be defined in terms of prosodic categories (McCarthy & Prince 1986; Lappe 2007).	The construction of monosyllabic nick-names in English: <i>Alfred</i> > <i>Alf</i> , <i>Elizabeth</i> > <i>Beth</i> .
Non-isomorphy between morphological and prosodic constituents (Dixon 1977, Booij & Rubach 1984; Booij 1985; Zuraw et al. 2014).	In the default case, suffix boundaries in English do not coincide with syllable boundaries, but prefix boundaries do coincide with syllable boundaries: <i>bak-er</i> (be:) _σ (kər) _σ versus <i>un-able</i> (ʌn) _σ (e:) _σ (bəl) _σ .
Different (often morphologically defined) strata of the lexicon or specific sets of complex words may be subject to (partially) different phonological systems (sets of constraints) (Inkelas 1998, 2014; Plag 1998; Caballero 2011)..	In Dutch complex words ending in a non-native suffix, the suffix carries the main stress of the word, whereas native suffixes are stress-neutral and never carry the main stress of the word: <i>absurd-itéit</i> ‘absurdity’ versus <i>absúrd-heid</i> ‘absurdity’.
Affix stacking can be conditioned by prosodic properties of affixes (Booij 2002b; Caballero 2010).	Dutch diminutive suffixes can only be followed by suffixes that form a prosodic word of their own.
Distribution of affixes may be conditioned phonologically (phonological subcategorization) (Booij & Lieber 1993; Caballero 2010).	English comparative suffix <i>-er</i> appears only after stems that are either monosyllabic or bisyllabic with a light final syllable.

The interface between these two levels of representation can be illustrated by the distinction between cohering and non-cohering affixes (Booij 1985; Dixon 1977). Cohering affixes form one prosodic domain with the stem to which they attach. For instance, the English deverbal suffix *-er* is a cohering suffix. Therefore, the syllabification pattern – syllable boundaries are indicated by a dot - of a deverbal noun like *baker* is *ba.ker* (be)_σ(kəɹ)_σ rather than *bak.er* (bek)_σ(əɹ)_σ. That is, the internal morphological boundary is ignored in the syllabification pattern. On the other hand, English suffixes like *-ship* and *-hood*, and the Dutch suffix *-achtig* ‘-like’ mentioned in (5) form prosodic words of their own; they are non-cohering suffixes, even though they are bound morphemes. Hence, Dutch *schaapachtig* ‘sheepish’ is syllabified as *schaap.achtig* rather than *schaa.pachtig* (compare English *shee.pish* with syllabification across the morphological boundary), and in *lente-achtig* /ləntəxtəx/ ‘spring-like’, deletion of the stem-final schwa before the initial vowel of the affix does not take place: *[ləntəxtəx]. This contrasts with what is the case in words with vowel-initial cohering suffixes. For instance, *zijde-ig* ‘silk-y’ /zɛidə-əx/ is realized as [zɛidəx]. Non-cohering suffixes of Dutch do not affect the stress pattern of the base, and since they form a domain of stress assignment by themselves, they carry a (secondary) stress of their own. Cohering suffixes on the other hand form one domain of stress assignment with their stem. Hence, the computation of the phonological properties of a complex word requires access to information about the individual morphological constituents of that word.

The theoretical consequence of the existence of such patterns is that there are subclasses of morphological constructions for which the alignment of morphological and prosodic boundaries needs to be specified (McCarthy & Prince 1993). Alignment is therefore an interface phenomenon, a form of correspondence between morphology and phonology.

In prosodic morphology, a morphological process is partially defined in terms of prosodic categories. For instance, nicknames such as *Lizzy* (from *Elizabeth*) and *Patty* (from *Patricia*) instantiate a schema in which the words are bisyllabic and end in *-y* (Alber & Arndt-Lappe 2012; Lappe 2007). Hence, the constructional schema for these nicknames contains a prosodic template, the bisyllabic trochaic foot.

The empirical correctness of the implication of the PA that morphological and phonological information are simultaneously accessible and mutually dependent is also pointed out by Burzio

(2005, p. 2): “All interactions between the lexicon and the grammar or between morphology and phonology that are logically conceivable under a parallel architecture are in fact attested. In particular, the phenomenon of phonologically controlled suppletion reveals that morphological decisions are sometimes made based on the output of the phonology”. Burzio’s example is the Italian stem variation of the type *vád-o/and-iámo* ‘I/we go’. The stem *vad-* is chosen when the stem has to carry the main stress of the word; otherwise *and-* is used.

In sum, there is substantial evidence for the necessity of morphological and phonological information to be accessible simultaneously. The Parallel Architecture predicts this to be the case. In CxM this simultaneity is used to express morphological and phonological generalizations.

An important argument for a constructional approach to morphology is the observation that a morphological construction may have holistic properties, that is, properties that do not derive from its constituents. This applies, for instance, to the semantics of morphological constructions, as we will see below. Interestingly, and as expected in a constructional approach, morphological constructions may also have holistic phonological properties, that is, properties that do not follow from the phonology of their constituents. For instance, Dutch nominal compounds always carry main stress on the modifier constituent. Hence, the stress pattern is a property of the nominal compound construction. In this and other instances, phonological properties of complex words depend on the morphological properties of these words, and hence they are a case of morphology-conditioned phonology.

In a number of recent studies of the interface between morphology and phonology, Inkelas came to the same conclusion: “[...] each individual morphological construction is associated with its own phonological subgrammar ” (Inkelas 2014, p. 45). Let us illustrate this by the way in which inalienable nouns are pluralized in Ngiti, a Central-Sudanic language spoken in Congo: “Even though the singular forms have different tonal patterns, all plural forms have a Mid-high tone pattern, the Mid tone being realized on the initial V-syllable and the High tone on the root syllable” (Kutsch Lojenga 1994, p. 135):

- | | | | |
|-----|-----------------|---------------|----------------|
| (8) | <i>singular</i> | <i>plural</i> | |
| | àba-du | abá-du | ‘my father(s)’ |

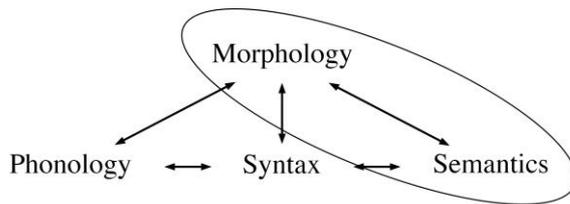
abhu-du	abhú-du	‘my grandfather(s)’
adhà-du	adhá-du	‘my cowife/cowives’

The Ngiti plural (inalienable) nouns in (8) have a tone pattern Mid-High, whatever the tone pattern of the corresponding singular nouns. Hence, there is a construction-specific correspondence between morphological (plural) and phonological (tone Mid-High) properties.

2.2. The interface between morphology and semantics

Next, we will consider the interface between morphological form and meaning. The circled part of figure (6) indicates which connection we are dealing with:

(6)'



A general form of interface between these two levels of representation is that morpho-syntactic and morpho-semantic features³ of words require a semantic interpretation. For instance, in many languages nouns are specified for the feature [number] and are either [singular] or [plural]. We call ‘number’ a morpho-syntactic property of English, as it is expressed by specific morphology and plays a role in syntax, for instance in subject-verb-agreement. However, it does not suffice to specify the meaning of [plural] as ‘more than one, denoting more than one entity’, and the meaning of [singular] as ‘denoting one entity’. Plural nouns can receive a generic interpretation, and when one asks ‘Do you have children’, the answer may be ‘Yes, one’. That is, the question does not presuppose that one has more than one child. Singular nouns may also receive a generic interpretation. A sentence like ‘I love the opera’ may be interpreted as ‘I love operas in general’, and there is no implication that the object of

love is a single opera. Hence, we need semantic interpretation rules for such morphological features that depend on syntactic environment.

Similar observations can be made concerning the semantic interpretation of a morpho-semantic feature like [past tense] in English. The formal expression of [past tense] is morphological in nature. The semantic interpretation depends on the syntactic context: a past tense verb does not always denote a situation before the moment of speaking. In fact, the past tense can even be used with a future interpretation, as in *If we went tomorrow, we might avoid the storm.*

An important contribution of CxG to the analysis of the syntax-semantics interface is that it has drawn attention to the holistic semantic properties of constructions: meanings that cannot be derived from the constituents of a construction, but are properties of the constructions as such (Goldberg 2006). This insight also applies to morphological constructions. A straightforward example is the semantic interpretation of reduplication. As is well known, reduplication patterns can have all kinds of meaning, often, but not always, iconic. In Malay, for instance, total reduplication is used to express plurality, as in:

- (9) ana ‘child’ ana-ana ‘children’
 rumah ‘house’ rumah-rumah ‘houses’

The plural meaning cannot be derived from one of the constituents; it is the copying or doubling configuration as such that evokes the meaning of plurality. This holistic meaning can be accounted for by a schema of the following form:

- (10) <[N_i N_i]_{N_j} ↔ [PLUR [SEM_i]]_j >

In the semantic representation, the semantic operator PLUR (= PLURALITY) appears without a corresponding co-indexed constituent in the morpho-syntactic representation, because it is a property of the reduplication (= doubling) construction itself.

The process of total reduplication of predicates is used in the Papuan variety of Malay to express intensity (Kluge 2014):

- | | | |
|------|-----------------------|--------------------------------------|
| (11) | pintar ‘to be clever’ | pintar-pintar ‘to be very clever’ |
| | swak ‘be exhausted’ | swak-swak ‘to be very exhausted’ |
| | tertawa ‘to laugh’ | tertawa-tertawa ‘to laugh intensely’ |

This holistic meaning contribution of the reduplication pattern can be expressed by the following schema:

- (12) $\langle [V_i V_i]_{V_j} \leftrightarrow [\text{High Degree of SEM}_{i,j}] \rangle$

In various European languages reduplication is used to express the holistic meaning ‘having the prototypical properties of’. For instance, in Spanish a *café-café* is a cup of coffee of the highest quality, made as it should be (Felú Arquiola 2011). The same holds for compounds such as English *salad-salad* (a real salad, as it should be) (Ghomeshi et al. 2004) and Dutch *werk-werk* ‘lit. work-work, real work, paid work’. Jackendoff (2010, p. 351, fn. c) endorses the analysis in Whitton (2007) that this kind of reduplication “marks an item as contrastive along some scale or another, and the appropriate scale is chosen pragmatically”. Therefore, this kind of reduplication has been characterized as Contrastive Reduplication.

In Italian and French, reduplication of verbs is used to create nouns that denote repeated or intense action (Thornton 2008). The reduplication also effects category change, from V to N, and in this sense the construction is exocentric as there is no constituent that could have triggered the category change from Verb to Noun.

- | | | |
|------|---------|---|
| (13) | Italian | fuggi-fuggi ‘run.away-run.away, stampede’ |
| | | pigia-pigia ‘push-push, stampede’ |
| | French | coupe-coupe ‘cut-cut, machete’ |

pousse-pousse ‘push-push, rickshaw’

Thus, this type of reduplication has holistic properties both on the morpho-syntactic and the semantic level.

Another motivation for the use of schemas is that in actual language use two word formation processes may be used simultaneously. For instance, a number of Dutch negative adjectives with the prefix *on-* ‘un-’ and the suffix *-elijk* ‘-able’ do not have an established positive counterpart:

- | | | |
|------|---|--------------------------------------|
| (14) | <i>on-afscheid-elijk</i> ‘inseparable’ | <i>afscheid-elijk</i> ‘separable’ |
| | <i>on-beschrijf-elijk</i> ‘indescribable’ | <i>beschrijf-elijk</i> ‘describable’ |
| | <i>on-herroep-elijk</i> ‘irrevocable’ | <i>herroep-elijk</i> ‘revocable’ |
| | <i>on-omstot-elijk</i> ‘undisputable’ | <i>omstot-elijk</i> ‘disputable’ |

The positive adjectives on the right are well-formed, but do not belong to the Dutch lexicon of established words. The formation of these negative adjectives from verbal stems, without the positive adjectives being available in the lexicon, can be understood as being based on a unified complex schema:

- (15) $[on [x]_A]_A + [[x]_V \textit{elijk}]_A = [on [[x]_V \textit{elijk}]_A]_A$

Unification is the basic operation that builds grammatical structure, and the unification of word formation schemas explains how multiply complex words can be formed without an intermediate complex base.⁴

Unification of word formation schemas also explains how English prefixes have developed a seemingly category-determining character, which goes against the generalization for Germanic languages expressed by the Right-hand Head Rule (Williams 1981) that the rightmost element of a complex word determines its syntactic category. For instance, the English prefix *out-* is added to verbs

to form verbs, as in *out-grow* and *out-lay*. However, it can also be attached to nouns and adjectives, as in *to out-dollar* and *to out-absurd*, witness the following examples:

- (16) And when money buys the senator's vote ... we're outnumbered and outdollared.
He would do one pose, and I would try to out-absurd him. (Bauer et al. 2013, p. 353)

This category-changing use of prefixes can be seen as the effect of the unification of two productive word formation schemas: prefixation of verbs with *out-*, and conversion of nouns and adjectives to verbs:

- (17) $[out [x]_V]_V + [N/A]_V = [out [[x]_{N/A}]_V]_V$

Unification of prefixation with conversion also explains why an English prefix such as *en-* acquired category-changing power, as in the verbs *en-code* and *en-feeble*, whose base is a noun and an adjective respectively (see Nagano (2011) for English and Michel (2014) for similar phenomena in German).⁵

The phenomenon of exocentric compounding is another example of a correspondence between morpho-syntax and semantics, in which holistic properties are involved. Exocentric compounds are compounds in which there is no constituent that functions as head. The English compound *water heater* is not exocentric, but endocentric, as the second constituent *heater* functions as its semantic head: a *water heater* is a certain type of heater. Romance languages are well known for their exocentric compounds. For instance, in *chauffe-eau* 'water heater' neither *chauffe* 'to heat' nor *eau* 'water' is the head as this word denotes an instrument:

- (18) *French [VN]_N compounds*
chauffe-eau 'lit. heat-water, water heater'
coupe-ongles 'lit. clip-nails, nail clipper'
garde-barrière 'lit. keep-gate, gate keeper'
grille-pain 'lit. toast-bread, toaster'

Italian [VN]_N compounds

lava-piatti ‘lit. wash-dishes, dish washer’

mangia-patate ‘lit. eat-potatoes, potato eater’

porta-lettere ‘lit carry-letters, postman’

rompi-capo ‘lit. break-head, brain teaser’

In the morpho-syntactic representation of this type of compound, there is no constituent that corresponds with the Agent or Instrument part of the meaning of these compounds. This can be expressed in the constructional schema, where Agent/ Instrument on the semantic level remains is not co-indexed with a formal constituent :

(19) <[[V_k][N_i]_{N_j} ↔ [Agent / Instrument of SEM_k on SEM_i]_j >

Schema (19) thus specifies the interface between a piece of morpho-syntactic information and a piece of semantic information. Because the semantic information ‘Agent / Instrument’ is construction-specific, it is marked on the outer brackets of the semantic complex and co-indexed with the whole of the form complex.

2.3. Pragmatic and discourse properties of morphological constructions

The level of representation of conceptual structure may be split into various sublevels that concern different interpretational aspects of a construction, as mentioned in (4). As far as the pragmatic dimension is concerned, this level may also be assumed to include the dimension of style and register. The classic example of register-sensitive morphology is the construction of diminutives which may function as expressions of endearment and of negative appreciation (Dressler & Barberesi 1994; Kiefer 1998).

Not only derived words, but also specific inflectional forms of words may have specific discourse properties. For instance, in Dutch and German the infinitival form of verbs can function as an imperative, when used as a single-word-sentence. In Dutch, past participles can be used for the same imperative function (Coussé & Oosterhof 2012). The syntactic context is usually either a single-word-sentence (optionally with a 2nd person pronoun), or a combination with the negative adverb *niet* (with verbs that express a negative attitude or activity):

(20) In-gepakt! ‘lit. packed up, get lost!’

Op-gelet (jullie)! ‘lit. watched out, watch out, you.pl!’

Op-gedonderd (jij)! ‘lit. up-thundered, get lost, you.sg!’

Niet geklaagd! ‘lit. not complained, do not complain!’ (but: *geklaagd! ‘complain!’)

The observation that the participle has an imperative meaning when used as a sentence by itself or in combination with *niet* ‘not’ shows that this is a case of mutual dependence between a syntactic and morphological construction. This use of past participles occurs predominantly with particle verbs with the particle *op-* which denotes cognitive activation. The style of speech in which this construction can be used is strongly directive. Hence, this imperative use of past participles also has a stylistic dimension.

In sum, a full account of morphological constructions has to encompass a description of the kind of properties exemplified in this section.

3. Schemas and second-order schemas

The morphological facts discussed so far point in the direction of a non-derivational theory of grammar, in which the correspondences between different - simultaneously available - levels of representation are spelled out. An additional argument against a derivational approach is the observation that the relationships between complex words cannot always be expressed in terms of

derivational relationships. Instead, we need second-order schemas to express these relationships, as will be shown in this section.

The necessity of second-order schemas (schemas of schemas) for the analysis of certain word formation patterns has been argued for in Booij (2010, p. 31-36). One argument for second order schemas in the domain of word formation is provided by patterns of affix replacement (Booij 2002a; Booij 2010). For instance, Dutch deverbal nouns may be derived from verbs ending in the verbalizing suffix *-eer* by replacing this suffix with the suffix *-atie*. Alternatively, deverbal nouns may be formed by means of the addition of the suffix *-ing*. Hence, we get the following pattern:

(21)	<i>verb stem</i>	<i>deverbal noun</i>
	constat-eer ‘observe’	constat-eer-ing / constat-atie ‘observation’
	reden-eer ‘reason’	reden-eer-ing / reden-atie ‘reasoning’
	situ-eer ‘situate’	situ-eer-ing ‘localization’ / situ-atie ‘situation’

Aronoff (1976, p. 88-98) discussed similar data from English. An example is the relation between the verb *nomin-ate* and its nominal derivative *nomin-ee*. Aronoff’s solution for the affix replacement patterns was to assume a type of rule that deletes a suffix before another suffix: *nomin-ate-ee* > *nomin- \emptyset -ee*. The drawback of this account is that it presupposes that the order of derivation for such word pairs can always be determined. But for a word pair like *aggression-aggressive*, another case of ‘affix replacement’, this is not obvious. Therefore, Bochner (1993, p. 81 ff) argued that in order to account for this type of morphological relationship, we’d better make use of higher order schemas that combine two schemas into a third one. The words *aggression* and *aggressive* can be related by the schema pair <[X-ion]_N> ≈ <[X-ive]_A> without necessitating the existence of a verb **aggress*, and without deriving one word from the other (the formal details of this type of account are explained below).

A similar case of ‘affix replacement’ can be found in the following English word pairs in *-ism* and *-ist* (Booij 2010, p. 31-36):

(22)	altru-ism	altru-ist
	aut-ism	aut-ist
	bapt-ism	bapt-ist
	commun-ism	commun-ist
	pacif-ism	pacif-ist

Even though they have no corresponding base word, the meaning of each member of a pair can be defined in terms of that of the other member. The meaning of the word in *-ist* can be paraphrased as ‘person with the disposition or ideology denoted by the word in *-ism*’. A communist may be defined as an adherent of communism. Inversely, we might also define communism as the ideology of communists. In many cases it is not possible to decide which of the two corresponding nouns is the basic one. Therefore, instead of a derivational relationship we need a formalism that expresses the parallelism between two types of complex words with a shared root, the second order schema. For instance, the following paradigmatic (non-derivational) relationship between the schemas for nouns in *-ism* and nouns in *-ist* can be assumed:

$$(23) \langle [x-ism]_{Ni} \leftrightarrow [Disposition/Ideology]_i \rangle \approx \langle [x-ist]_{Nj} \leftrightarrow [Person\ with\ Property\ related\ to\ SEM_i]_j \rangle$$

where SEM_i refers to the meaning Disposition/Ideology. (23) is an example of a second-order schema. The symbol \approx is used in Booij (2010) to indicate a paradigmatic relationship between two constructional schemas. This symbol has no theoretical status, and is only used for expository purposes. The paradigmatic relationship is formally expressed by the two schemas sharing some of the indexes and variables.

The paradigmatic relationship between these two schemas may lead to the coining of new words. For instance, if we know what *determinism* is, we can easily coin the word *determinist*, and then we know that this word denotes a person adhering to determinism. The same holds for nouns ending in *-ist* with a word as their base, such as *Marxist* (< Marx) and *socialist* (< social). A Marxist is an adherent of Marxism and not necessarily a follower of Marx, since Marxism as a doctrine

encompasses more than the ideas of Marx. In fact, Marx himself declared that he was not a Marxist. Similarly, a socialist is not necessarily a social person, but an adherent of the ideology of socialism. Hence, we need a second-order schema like (23) for an adequate account of the semantics of certain sets of words in *-ist*. The meaning of these nouns in *-ist* is not simply a compositional function of their constituent parts, as it contains the meaning of a related word with the same degree of complexity. Crucially, even though semantically the word in *-ism* is the starting point for the word in *-ist*, this does not mean that the actual order of derivation necessarily reflects this semantic asymmetry. For instance, the word *abolitionist* may have been coined before *abolitionism*. So, another advantage of second-order schemas like (23) is that they allow for word formation in both directions.⁶ We find such systematic paradigmatic relationships between sets of complex words across Germanic (Becker 1990, 1994) and Romance languages (Vallès 2003).

An additional formal argument for this type of analysis for relationships between non-native complex words in particular is that non-native roots exhibit all sorts of idiosyncratic allomorphy. For instance, correlated to the noun *Plato* we find *platon-ist*, *platon-ism* and *platon-ic*. That is, in complex words the allomorph of the base word *Plato* is systematically *platon-*. This is accounted for by the analysis proposed here, because all related words will share this stem allomorph. When we apply schema (23) to the word *platonism*, the value of the variable *x* is *platon*, and hence this allomorph will appear in the paradigmatically related words of specified types as well. Similarly, the allomorph *mis-* of *mit-* (as in *submit*) appears both in *submiss-ion* and *submiss-ive*, which is predicted by a second order schema for nouns in *-ion* and adjectives in *-ive*.

In sum, second order schemas provides the means for expressing systematic formal and semantic relationships between sets of complex words with the same degree of morphological complexity.⁷

Second-order schemas are also necessary for a proper account of the use of reduction patterns in morphology, a topic discussed in (Alber & Arndt-Lappe 2012). A well-known example is the creation of nicknames by shortening plus optional addition of the suffix *-y*, as in the following examples (Lappe 2007):

- (24) a. Alfreda Alf
 Camille Cam
 b. Alfreda Alfy
 Camille Cammie

The pragmatic meaning of endearment is expressed by the reduced nature of the name compared to its full counterpart. Therefore, “the question [is] how this complex meaning is recoverable from the truncated [= shortened] form, given that the truncated form has less phonological content than the base form” (Alber & Arndt-Lappe 2012, p. 315). They argue, following Steinhauer (2000), that truncation often has register specificity, it may be playful and presuppose familiarity with the referent or the addressee. That is, this kind of morphology manipulates pragmatic and discourse properties of words.

It is obvious that such processes cannot be accounted for in terms of concatenation of elements. Instead, we need second-order schemas in which the full form is related to the shortened form. The shortened form is defined by a prosodic output condition: one syllable (25a) or a two-syllable-foot that ends in the vowel [i] (25b):

- (25) a. $\langle [xCz]_{Nn} \leftrightarrow [\text{ProperName}]_n \rangle \approx \langle [(xC)_{\sigma}]_{Nm} \leftrightarrow [\text{Endearment of } n]_m \rangle$
 b. $\langle [xCz]_{Nn} \leftrightarrow [\text{ProperName}]_n \rangle \approx \langle [(x)_{\sigma} (Ci)_{\sigma}]_{Nm} \leftrightarrow [\text{Endearment of } n]_m \rangle$

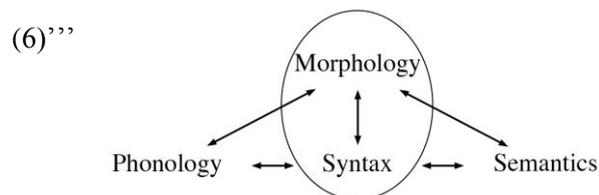
In these schemas, the variables x and z stand for one or more phonological segments of the full word form, C is the variable for the consonant that is preserved at the end of the shortened word or before the suffix $-y$ (phonetically [i]). The actual patterns are more complicated, witness the hypocoristic forms *Liz* and *Lizzy* of *Elizabeth*, but the examples analyzed here hopefully suffice to convey the general argument.

The pragmatic value of the shortened form only exists because there is a correspondence with a longer form. In a monosyllabic name like *John* there is no endearment involved, as there is (at least synchronically) no corresponding long form to which it is felt to be related. This correspondence prerequisite is expressed by a second-order schema.

The notion ‘second-order schema’ thus serves to spell out a view of the grammar as an intricate network of lexical relationships not only between morphological schemas and their instantiations - that is, complex words - but also among schemas. Complex words are not only related indirectly, by sharing a base word, but also directly, because they may entertain paradigmatic relationships. As we will see in section 4, such paradigmatic relationships also hold between morphological and phrasal constructs.

4. The interaction between morphology and syntax

The interaction between morphology and syntax is not a matter of correspondence between different types of information, as discussed in section 2. In the Parallel Architecture of grammar, morphological and syntactic information belong to the same level of information. Therefore, the relationship between morphological structure and syntactic structure is better qualified as an interaction: the use of syntactic constructions may be intertwined with that of morphological constructions. This is indicated by the circle in Figure 6’’’.



An example of this interaction is the use of infinitives and past participles in Dutch as commands, mentioned in section 2.3. This interaction can also be observed by the following observations to be worked out in detail in the next subsections:

- (i) Syntactic constructions may serve as building blocks of morphological constructions;
- (ii) The use of a morphological construction may depend on its occurrence in a syntactic construction;

- (iii) There may be systematic paradigmatic relationships between morphological and syntactic constructions.

These observations all imply that lexicon and grammar cannot be split in two separate components, as in traditional generative grammar, with its assumption of a pre-syntactic lexicon that provides lexical items for insertion into syntactic structure.

4.1. Syntax feeds morphology

It is a well-known observation about Germanic languages that in nominal compounds, the modifier constituent can be a phrase, or even a whole sentence. This is illustrated here by the following English examples:

- (26) All-you-can eat buffet

One-size-fits-all education (*Boston Globe*, 6 March 2010)

Stop-and-go traffic (*Boston Globe*, March 13, 2010)

Me-first driving attitude

Run-of-the-mill blockbuster (*Tufts Daily*, 7 April 2010)

Low cost, no frills cattle car flights (*New York Times*, 18 March 2010)

A get-it-done attitude

stay-at-home mother

a one-of-a-kind vacation

over-the-counter drugs

The eat-your-spinach approach to education (*Boston Globe* 13 March 2010)

I understand the whole 'live it up, you're only in college once' thing (*Tufts Daily*, April 7, 2010)

The use of phrases as the base for derivation is far more restricted, but not completely excluded in English:

- (27) short-term-ism ‘short term policy’ (David Cameron, press conference, May 12, 2010)
the know-it-all-ism of her (Philip Roth, *American pastoral*, p. 254)
no-brain-er ‘something so simple or easy as to require no thought’

More evidence for the use of phrases in derivation is given in Bauer et al. (2013, chapter 22). The implications of these observations for our view of the architecture of grammar is the following. It is not necessarily the case that we first build words in a pre-syntactic morphological component and then insert these words into syntactic slots in the syntactic component. Instead, syntactic constructions may form part of morphological constructions. In other words: in addition to morphological constructions (complex words) being unified with syntactic constructions (lexical insertion of words into syntactic slots), syntactic constructions can be unified with morphological constructions (hence we get syntactic constituents within complex words). This implies that syntactic and morphological information must be available simultaneously, a finding that will be confirmed by the data discussed in the next subsections.

4.2. Embedded productivity

The productivity of a word formation process may be boosted when its outputs form parts of a specific syntactic construction. A first example comes from the Dutch *op het A-e* construction. Adjectives that express an evaluation may be used in the construction *op het A-e af* ‘lit. on the A-e off, almost A’. They are suffixed with *-e* and are thus turned into nouns, as confirmed by their co-occurrence with the definite article *het*:

- (28) a. op het gemen-e af
on the mean-e off

‘almost mean’

- b. op het trivial-e af
on the trivial-*e* off
‘almost trivial’

This PP-construction is very productive, as a Google internet search reveals:

- (29) dun op het anorectisch-e af (Vonne van der Meer, *Zomeravond*, p. 58)

thin on the anorexic-NOM off
‘so thin that it is almost anorexic’

op het briljant-e af ‘almost brilliant’

op het gemen-e af ‘almost mean’

op het knapp-e af ‘almost handsome’

The meaning of this construction is a conventionalized abstract interpretation of the productive construction [*op* Det N *af*]_{PP} ‘towards the N’, as instantiated by the PP *op het doel af* meaning ‘towards the goal’ and *op de man af* ‘towards the man, straight to one’s face’. The nouns in this abstract construction with the meaning ‘almost A’ all have the form [A-*e*]. However, this type of nominalized adjective is not unique for this construction. Generally, it is possible to nominalize a Dutch adjective into a neuter noun (with def. sg article *het*) by means of this suffix:

- (30) a. Het gemen-e is dat ...
The mean-NOM is that ...
‘The mean thing is that ...’
- b. Ik waardeer het briljant-e van deze redenering
I appreciate the briljant-NOM of this reasoning
‘I appreciate the brilliance of this reasoning’.

These examples illustrate that the use of the nominalizing suffix *-e* for creating nouns from adjectives is not completely dependent on the occurrence of this adjective in the *op het A-e af*-construction. Yet, we have to specify the class of nouns in this PP-construction as having the form A-*e* because other deadjectival nouns or nominal phrases with a similar meaning cannot be used in this construction:

- (31) a. *op de [[smerig]_A-heid]_N af
 on the dirty-ness off
 ‘almost dirty’
- b. *op de smerige eigenschap af
 on the dirty property off
 ‘almost dirty’

This speaks against Anderson’s hypothesis of A-morphous Morphology (Anderson 1992), the idea that syntax has no access to the internal morphological structure of words. The syntactic construction of Dutch discussed here requires words of a particular morphological structure, and hence this morphological structure must be visible to the syntax. This kind of transparency of complex words in constructions has been observed for various other constructions of Dutch in Booij (2010, chapter 9). Additional evidence for this transparency of complex words in constructions is provided by (Scott 2014), who analyses the Dutch *x der y*-construction (as in *de taak der bestuurder-s* ‘the task of.the governors’, and *de taak der wetenschap* ‘the task of.the science’). Scott argues that the possibility of using the inflected article *der* ‘of.the’ in Dutch is made possible by the presence of a plural suffix or a specific nominalizing suffix. For instance, the presence of the deverbal suffix *-ing* in the noun *regering* ‘government’ makes it possible to use *der*, as in *het beleid der regering* ‘the policy of the government’. NPs such as **het beleid der koning* ‘the policy of.the king’, where such morphological structure is lacking, or **het beleid der bestuur-der* ‘the policy of.the governor, with the deverbal suffix *-der*, are ill formed.

In conclusion, the construction *op het A-e af* is the unification of two independent constructions, the syntactic construction [*op het N af*]_{PP} and the morphological construction [A-*e*]_N. This unified construction has acquired the meaning ‘almost A’, and has thus has acquired a life of its own. The use of this construction boosts the productive use of deadjectival nominalization with the suffix *-e*. This is therefore a case of *embedded productivity*: a word formation process that has become (more) productive within specific morphological or syntactic constructions (Booij 2010, p. 47-49).

A second example of this kind of interaction between morphology and syntax can be found in (Schönefeld 2013), the [*go* [*un*-[V_{PTCP}]_A]_A] construction, as exemplified by the following sentences:

(32) Many cases go un-reported

This went un-noticed

Adjectives consisting of the prefix *un-* and a past participle are nothing unusual in English. The prefix *un-* takes adjectives as bases, and past participles can be used as adjectives, as in *un-corrected*. As Schönefeld (2013) points out, the combination of *go* with such *un-*adjectives in participial form has acquired a second interpretation. It “communicates the absence of such a process, depicts the scenario as unexpected or being contrary to expectation” (Schönefeld 2013, p. 20). This pattern can be seen as the unification of four constructions, the syntactic construction [V A]_{VP}, and the morphological constructions [*un*-A]_A, [PTCP]_A, and [V-SUFF]_{PTCP} with the verb *go*. Hence, the structure of the VP *go unnoticed* is as follows:

(33) [[*go*]_V [*un* [[[*notic*]_{V-ed}]_{PTCP}]_A]_A]_{VP}

and the constructional schema involved is:

(34) <[[*go*]_V [*un* [[[x]_{Vi}-SUFFIX]_{PTCP}]_A]_A]_{VPj} ↔ [~∃x, x = Event of SEM_i]_j>

Pragmatics: not expected or contrary to expectation

As predicted by this schema, VPs like **go noticed*, **go unhappy*, and **go very unnoticed* are all ill formed. The construction is indeed restricted to exactly these components (Peter Culicover, pers. comm.). For our purposes here, the main point is that this interpretation requires the morphological structure of the *un*-adjective to be accessible.

The two examples above show how a specific morphological form may be required by a syntactic construction. They also show that word formation schemas not only have the function of enriching the lexicon, the set of available words of a language, but also to enable words to fit into a slot of a specific syntactic construction. The constructions discussed in this section therefore form evidence for ‘constructional continuity’ (Nenonen & Penttilä 2014), the absence of a sharp boundary between lexicon and syntax, even though it remains true that morphological constructs tend to be less compositional than syntactic ones, and have a greater propensity for unpredictable meaning aspects.

4.3 Paradigmatic relationships between morphological and syntactic constructions

The phenomena discussed in sections 4.1. and 4.2 illustrate that syntax and morphology may work in tandem in the construction of linguistic expressions. Another case of this working-in-tandem is the role that phrasal lexical expressions may play in the interpretation of corresponding complex words. For instance, in Modern Greek (Ralli 2013, p. 133ff., 247) the interpretation of complex adjectives is based on that of corresponding A + N sequences. These sequences are phrasal in nature (the adjective is inflected and agrees in number and gender with the noun), but they have the status of lexical items because their meaning is conventional and idiosyncratic. This holds, for instance, for the phrasal lexical item *psixrós polemós* and its English equivalent *cold war*. Similarly, *trítos kósmos* means ‘Third World’, an established political notion.

(35)	<i>psixrós pólemos</i>	<i>psixr-o-polem-ik-ós</i>
	‘cold war’	‘cold-war like’
	<i>trítos kósmos</i>	<i>trit-o-kosm-ik-ós</i>
	‘third world’	‘third world-like’

As shown in (35), the conventionalized meaning of the phrases *psixrós pólemos* ‘cold war’ and *trítos kósmos* ‘Third World’ recurs in the meaning of the corresponding adjective. Yet, the proper form of the adjective is not **psixrós-pólem-ik-ós* (with the stem form of the phrase *psixrós pólemos* as its base), but a compound with the structure *psixr-o-polem-ik-ós*. This compound has two stems, *psixr-* and *polem-*, which are connected by the standard linking element *-o-* of Greek compounds. Hence, for the proper semantic interpretation of these complex adjectives we have to refer to the meaning of corresponding lexical phrases. This correspondence is paradigmatic in nature, because the phrases are not building blocks of the corresponding adjectives, although their lexical stems do occur in the corresponding compounds. That is, we observe here a paradigmatic relation between a morphological construction and a phrasal construction.

A similar tension between a formal restriction on suffixation and the need to express a derived notion can be observed for Italian. Coining a personal noun in *-ista* ‘-ist’ based on a lexical item that is phrasal in nature creates a problem, as *-ista* attaches to nouns, not to adjectives. For instance, the phrase *violino classico* ends in an adjective, hence the derived word **violino-classic-ista* is ill-formed. Instead, the denominal suffix *-ista* is attached to the head noun of this phrase:

(36) *violino classico* ‘classical violin’ *violin-ista classico* ‘classical violinist’

Again, this creates an asymmetry between formal structure and meaning. This asymmetry reminds us of the well-known bracketing paradox⁸ in *nuclear physicist*, except that in Italian the relevant phrases are left-headed. The Italian case can be dealt with by assuming a paradigmatic relationship between the phrasal lexical item of the form N+A and the NP consisting of the *-ista*-derivative plus adjective (Booij & Masini 2015). What this shows is that - again - we need second-order schemas (i.e. metaschemas) that specify this systematic form-meaning relationship.

Within the framework of CxM we can account for the Italian data by resorting to two tools. The first is the notion of “phrasal lexemes” (Masini 2009), i.e. fixed phrases that are stored as lexical

items. The second is that of second order schemas, which - as was shown above - explicitly states a paradigmatic relationship between two constructions:

$$(37) \quad \langle [N_i A_j]_{\text{NPk}} \leftrightarrow [\text{SEM}_i \text{ with property } \text{SEM}_j]_{\text{SEMk}} \rangle \approx \\ \langle [[N_i \text{-ista}]_{\text{NW}} A_j]_{\text{NPz}} \leftrightarrow [\text{Person related to } \text{SEM}_k]_z \rangle$$

The nature of the predicate ‘related’ is not further specified, and is a matter of pragmatic interpretation. In the case of *violinista classico* this relation will be that of player.

The nominalization of Dutch particle verbs also provides evidence for a systematic paradigmatic relationship between phrasal constructions and morphological constructions. Particle verbs are lexical items but phrasal constructions, because the particle and the verb are separated in main clauses (Booij 2010; Los et al. 2012). Nominalizations of particle verbs should not be seen as derived words, but as nominal compounds consisting of a particle and a nominalized verb. For instance, the nominalization of the particle verb *aan-komen* ‘to arrive’ has the form *aankomst* ‘arrival’. This word should be seen as a nominal compound, with *komst* as its head: $[[\text{aan}]_{\text{Pt}} [[\text{kom}]_{\text{V-st}}]_{\text{N}}]_{\text{N}}$. (Note that this contradicts the structural analysis one might have expected from a semantic point of view, i.e. $[[\text{aan-kom}]_{\text{V-st}}]_{\text{N}}$, because *aankomst* means ‘event of arriving’.) The basic generalization is that the particle verbs mirror the nominalization type of their corresponding base verbs, whether the nominalization is productive or not. This is illustrated in (38), data from Booij (2015b):

- (38) a. default: suffixation with *-ing*
- | | |
|-------------------------|-----------------------------|
| zend ‘to send’ | zend-ing ‘sending, mission’ |
| uit-zend ‘to broadcast’ | uit-zending ‘broadcast’ |
- b. no formal change (conversion)
- | | |
|---------------------|---------------------|
| val ‘to fall’ | val ‘a fall’ |
| aan-val ‘to attack’ | aan-val ‘an attack’ |

c. with vowel change

grijp ‘to seize’	greep ‘grip’
in-grijp ‘to interfere’	in-greep ‘interference’

d. stem change and/or suffixation

gaan ‘to go’	gang ‘going’	af-gaan ‘to fail’	af-gang ‘failure’
kom ‘to come’	kom-st ‘coming’	aan-kom ‘to arrive’	aan-kom-st ‘arrival’
slaan ‘to hit’	slag ‘a hit’	aan-slaan ‘to touch’	aan-slag ‘a touch’
zien ‘to see’	zich-t ‘sight’	aan-zien ‘to view’	aan-zich-t ‘a view’

The compound analysis presented above predicts this pattern. Unproductive types of deverbal nouns must be listed in the lexicon, and hence, they can function as heads in compounds with a particle as modifier. Thus we get nominals for particle verbs with unproductive types of nominalization.

As pointed out in Booij (2010: 140-141), the analysis of these nominalizations as compounds is supported by nominalizations of particle verbs in Norwegian and Swedish. In these languages, the particle of a particle verb follows the verb. However, in nominalizations the particle precedes the deverbal noun. This has the effect that the attachment of a nominalizing suffix to phrases consisting of a verb and a particle is avoided:

(39)	Norwegian	kjøre opp ‘to take one’s driving test’	opp-kjør-ing ‘driving test’
	Swedish	stiga upp ‘to rise’	upp-stig-ning ‘rising’

The appearance of the particle before the deverbal noun follows from the status of these nominalizations as right-headed compounds. The same reversal effect can be observed in English compounds such as *out-look* and *by-pass*, related to the particle verbs *to look out* and *to pass by* respectively.

The implication of this structural analysis is that although semantically particle verbs contribute a portion of the semantic interpretation of particle compounds, the particle verbs themselves

are not formal subconstituents of these compounds. The correspondence between the semantic interpretation of a particle verb and the corresponding compound of the form [particle + deverbal noun] can be accounted for by a second order schema:

$$(40) \quad \langle [[\text{Part}_i] [y V_k z]_{N_j}]_{N_j} \leftrightarrow [\text{Event of SEM}_i]_{\text{SEM}_j} \rangle \approx \langle [\text{Part}_i V_k]_{V_i^0} \leftrightarrow [\text{MOD}_i \text{SEM}_k]_{\text{SEM}_i} \rangle$$

In the first schema, the head of the compound is a deverbal noun, consisting of a verbal stem, and optionally a prefix or suffix (if y and z are zero, we have conversion). The second schema specifies the general meaning of particle verbs: the particle is a semantic modifier of the meaning of the verb. The phrasal status of the particle verb is expressed by its being dominated by a syntactic V^0 node (Los et al. 2012). The correspondence in meaning between particle compounds and particle verb is thus stated in (40). For instance, given the idiosyncratic meaning of the particle verb *aan-vallen* ‘to attack’, this meaning will form part of the meaning of the corresponding compound *aan-val*.

Schema (40) is a second-order schema in which a morphological schema and a phrasal schema (for particle verbs) are linked to each other. This shows that morphological constructions and phrasal constructions can be related systematically in a paradigmatic fashion. We have discussed similar cases for Modern Greek, Italian, and Dutch. This provides further arguments against a split between lexicon and grammar.

5. Summary and conclusions

In this article we have seen that a proper account of the properties of morphological constructions requires a Parallel Architecture of grammar. In particular, the PA provides an adequate framework for a systematic analysis of interface phenomena. These interfaces are often tied to specific morphological constructions, where they show as holistic properties of complex words, as predicted by the theory of CxM

We have also seen that grammars have to allow for the representation of paradigmatic relationships between morphological constructions, as well as between morphological and syntactic constructions. Second order schemas fulfill this task.

Finally, we have observed that morphological and syntactic constructions may be intertwined, and that the use of morphological constructions may be dependent on specific syntactic constructions ('embedded productivity'). This finding underscores the idea of 'constructional continuity', the lack of a sharp boundary between lexicon and syntax.

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Notes

1. The semantics of derivations with *-hood* is partially obscured by lexicalized cases such as *neighbourhood* (place), *childhood* (time) or *brotherhood* (a collective). Moreover, a few nouns in *-hood* are derived from an adjective, for example *falsehood*, *likelihood*, and *livelihood*. How to deal with such exceptional behaviour is discussed in detail in Booij (2015a).
2. However, the actual facts are slightly more complex. We find periphrastic forms for monosyllabic adjectives such as *more brave*, and synthetic comparative forms of trisyllabic adjectives such as *sensibler* are attested (Bauer et al. 2013, p. 111-112).
3. Morpho-semantic features are features expressed by inherent inflection, and whose choice is not dictated by syntax (Kibort 2010).
4. This is what Bochner (1993, p. 79) refers to as 'cumulative patterns'.
5. This example also illustrates that the difference between English prefixes and suffixes as to their category-determining role is a matter of language history. Since each individual schema

for a prefix or a suffix specifies its output category, there is no need for a Righthand Head Rule.

6. This second-order schema should not be taken to imply that word formation can always take place in both directions. For instance, we cannot derive **linguism* from *linguist*. In the domain of sciences and their practitioners, there are other second-order schemas involved, with correlations of the types $X\text{-ics} \leftrightarrow X$, and $X\text{ic-s} \leftrightarrow X\text{c-ist}$. That is, there are several competing paradigmatic patterns involved in the interpretation of nouns in *-ist*.
7. Further motivation of second-order schemas is provided in Nessel (2008), Kapatsinski (2013), and Booij & Masini (2015).
8. The bracketing paradox involved is that for semantic reasons we would expect the structure $[[\textit{nuclear physics}] \textit{ist}]$, since the term denotes a person involved in nuclear physics, and hence *-ist* has semantic scope over *nuclear physics*. However, from a formal point of view, the structure $[[\textit{nuclear}] [\textit{physic-ist}]]$ is more appropriate since *physicist* is a lexicalized word, and the choice of the suffix *-ist* in *nuclear physicist* is then predictable (compare *generative grammarian*, where *-ian* as in *grammarian* is chosen).

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