Implications of German word formation processes for a Role and Reference Grammar approach to morphology

vorgelegt von

Robin Möllemann

robin.moellemann@hhu.de

Abstract

Word formation processes in German can be explained utilizing the layered structure of the word. The word-internal structure of complex words can thereby be analyzed as displaying various juncture-nexus types between free lexemes and bound affixes for derivation and multiple lexemes for compounding. This thesis puts forward several projections displaying the interfaces between morphology and other fields of linguistics exhibited during word formation, in order to analyze semantic or phonological processes involved in or instigated by word formation. Derivational affixes are thereby seen as carrying incomplete meanings, which rely on the semantics of their host to be interpretable. The conclusion drawn from the analyses is that the information encoded in the different layers of the word is less specific in its root node, encoding bare predicates without argument structure, and increases in specificity in the nuclear and core layer, adding aa argument structure and satisfying the arguments within it respectively.

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1 Introduction

The goal of this thesis is to reanalyze German word formation processes utilizing the layered structure of the word (henceforth LSW), the Role and Reference Grammar (henceforth RRG) approach to morphology, in order to answer the following question: What theoretical implications, if any, do German word formation processes have for the morphological aspect of RRG?

The main aspect considered in answering this question, is productive word formation patterns in Modern German. Complex words which have been lexicalized, which might even have undergone a semantic shift since their inception, or where a change in meaning or loss of use happened to single morphemes of a complex word, creating cranberry morphemes or highly lexicalized readings, are mostly interesting from an etymological point of view. The conclusions that can be drawn from lexicalized and semantically changed morphemes with respect to the inner workings of word-formation are out-dated from the point when a word was lexicalized in the worst case and for a shorter duration, whose exact length is difficult to determine, in any other.

Chapter 2 will give a concise explanation of the features of RRG necessary for understanding the structure of the LSW and an overview of the LSW, including a brief comparison of previous approaches to word-formation with it. A discussion about the role of morphology within linguistics and its interfaces with other linguistic fields follows in chapter 3, developing a way of formally representing morphological processes simultaneously with semantic, syntactic and/or phonological processes.

Chapter 4 is descriptive, containing analyses of different word formation patterns in German, mainly focusing on morphologically compositional word-formations like derivation and compounding. Many of the examples used and meanings given for derivational affixes, as well as judgements about well-formedness are thereby based on the author's native intuition. The process of conversion will be addressed only briefly as it is not a morphologically compositional process. The theoretical implications of these analyzes for the morphological branch of RRG and the applicability of it to other languages, as well as suggestions for future research based on these implications will be discussed in chapter 5, followed by a summary of the results produced in chapter 6.

2 Theoretical preliminaries

2.1 Introduction

The LSW, as introduced by Everett (2002), is the morphological equivalent to the layered structure of the clause (henceforth LSC), with which RRG displays the structure of sentences. Since the LSW mirrors the LSC, understanding the latter is crucial for understanding the morphological component, and the goal of this chapter is to give an introduction into the necessary aspects of clause-level analyses.

Section 2.2 consists of a concise explanation of the framework's most important tools for analyzing syntax and their equivalents in word formation, while section 2.3 recapitulates the framework's approach to complex sentences, needed for the representation of complex words. Section 2.4 contains a brief review of aktionsart and logical structures, as word formation processes may affect both, followed by a brief summary of this chapter in section 2.6..

2.2 The layered structure

The layered structure is the most fundamental aspect within the RRG framework. According to this assumption, linguistic units are organized in different layers, according both to their importance within the structure as a whole and in respect to a nuclear element (cf. Van Valin, 2005). It is of crucial importance not only to the framework's approach to syntactic structures, but also to word formation.[1]

This section features a brief introduction to the LSC in subsection 2.2.1, as well as a description of its importance for theoretical counterparts in the LSW in 2.2.2.

2.2.1 Clause

The LSC is the RRG's notion of a non-relational clause structure. It is based on two fundamental contrasts: predicates vs. non-predicates and amongst the non-predicates: arguments vs. non-arguments. These "structural elements" are organized into three layers: the nucleus, the core, and the clause, with the nucleus being the most crucial part of a clause. The structural elements differentiated by RRG have their respective places in these layers, also depending on their importance for the sentence and are formally displayed in these places in the constituent projection.

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[1]For the layered structure of phrases see Van Valin (2005, 21-30) and Van Valin (2008b)

Predicates, as the most important part of a clause, are nuclei. Predicates and their arguments are cores. Non-arguments, not necessary for a sentence to be grammatical, are displayed in peripheries. A Clause contains a core obligatorily and peripheries and/or Pre- and Post Core Slots for wh-expressions and other topical/focal elements optionally (cf. Van Valin, 2005, 3-8).

Figure 1 below displays the layered structure of a German sentence. As the Pre-Core Slot is the standard position for topical elements in German, it contains the topical temporal adverb. The verb is the predicate and since the English word "sleep", like its German counterpart, is (M-) intransitive, it takes one argument, realized as the core-internal referential phrase. The adjunct PP is realized in an ad-core periphery.
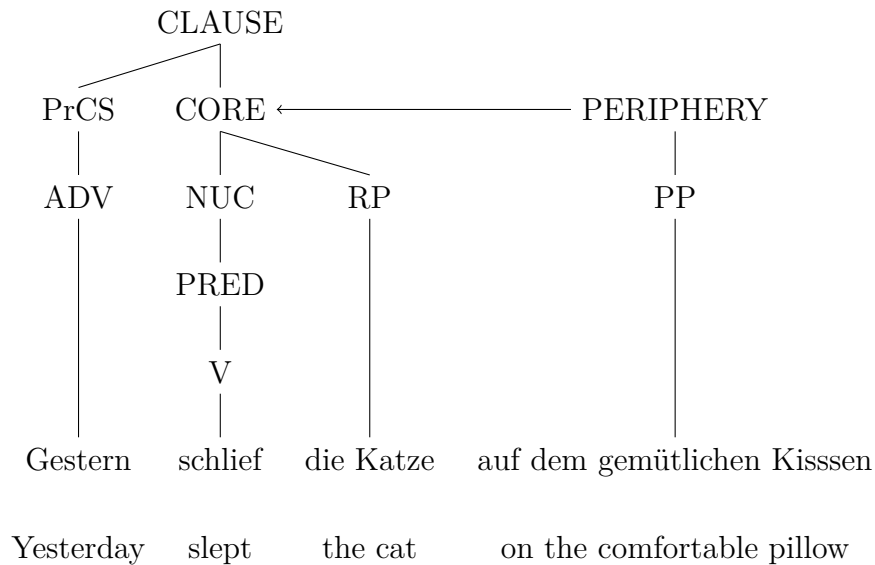
Figure 1: The layered structure of the clause

Furthermore, RRG assumes syntactic templates: underspecified schematics for constructing sentences, which are part of each language's syntactic inventory. A simple intransitive English sentence has two slots, the nucleus and the single core-argument, to be filled. Additionally, since English is a SVO language, the single core-argument precedes the nucleus. Figure 2 on the following page displays the core templates of English active declarative sentences (cf. Van Valin, 2005, 13-16).

```
                CORE                              CORE
              /    |                            /   |    \
           RP    NUC                        RP   NUC    RP
                  |                                |
                PRED                             PRED
                  |                                |
                  V                                V
```
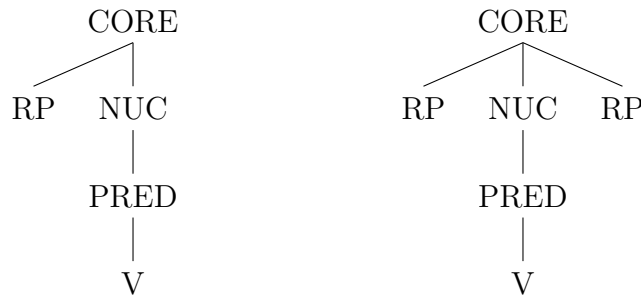
Figure 2: English core-templates for PP-less intransitives and transitives

2.2.2 Word

As mentioned above, the LSW mirrors the LSC on a lexemic/morphological level. The projection used to display the morphological side of word formation will be called the morphological projection within this work, and can be seen as the equivalent to the constituent projection on sentence-level diagrams.

Since the root is the most important part of a word, it can be found within the nucleus. It is also where derivation takes place, since inflectional marking appears after derivational suffixes and has scope over the whole proposition it modifies. Derivational affixes are written phonologically. Inflectional affixes, which are noted as the sum of the grammatical features they encode, are located in a word's core. Proclitics and enclitics are displayed in the LSW-equivalents of the LSC's left- and right detached positions respectively. Figure 3 on the following page displays the layered structure of the genitive of the deverbal German noun *Leser* 'reader, someone who reads'.

In traditional terms, the element in the nucleus could be considered the root, while the nucleus's output would be the stem and the core's output would be the word-form. The distinction itself does not yield a clear result, however. Since derivation can be used recursively (eg. *anti- dis- establish -ment -arian -ism*) nuclear elements could at one point be seen as being both a root and a stem. Also, defining only the lowest element as the root leads to another problem. Since both roots and stems can be the input for further word formation processes, all derivational affixes would need to be specified to allow for stems and roots alike.

4

```
                       N
                       │
                     CORE_N
                     ╱     ╲
                 NUC_N       AFF
                 ╱  ╲         │
            NUC_V    AFF      │
              │       │       │
              V       N       │
              │       │       │
             les     /ɐ/    {GEN}
```
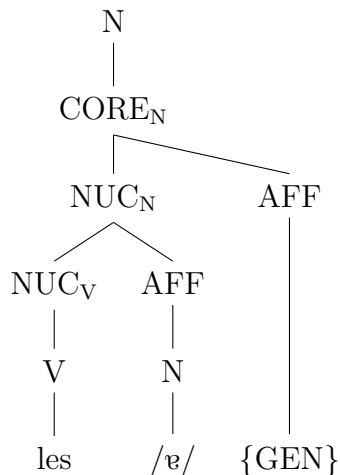
Figure 3: The layered structure of the word

To avoid this problem, a stem can be defined as any NUCw immediately dominated by a COREw. A root would then be any NUCw not immediately dominated by a COREw. Defining the stem like this leaves everything not identified as a stem as either a root or an affix. However, this approach leads to another problem, further specified in subsection 2.3.2. Furthermore, as long as there are no derivational affixes which are restricted either to roots or stems, a further theory internal distinction between the two concepts does not seem necessary.

In contrast to Arista (2008, 122-3), this work assumes that there are derivations. The first reason for doing so, is the structural difference between derivation and compounding, as derivational processes differ from compounding processes on both a semantic and morphological level, as will be demonstrated in chapter 4. Furthermore compounds are, with the rare exceptions of cranberry-morphemes, formed of free morphemes, while derivational affixes tend to be bound morphemes.

An additional merit of assuming a layered structure on the lexemic level is the possibility of a refined view of the principle of lexical integrity, according to which the syntax is incapable of accessing a word's morphological information (cf. Bresnan & Mchombo, 1995, 181), which may be of importance for phrasal compounds in German (which will however only be briefly mentioned) and the word formation process of conversion.

This principle's drawback is, that it hinders a differentiation between head- and dependent-marking languages, as described by (Nichols, 1986, 107-108), leading to a Eurocentric distortion (ib. 116). Not only can the arguments of head-marking languages be differentiated from the affixes of dependent-marking ones (cf. Van Valin, 2013, 115-117), the layered structure enables the drawing of a more detailed border up to which the principle of lexical integrity holds true (see section 3.4).

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In this work, the notion of syntactic template has a word-level counterpart as well, called the morphological template. Morphological templates can be applied recursively to account for derivational morphology's recursive nature. It will also be crucial for differentiating processes yielding verbs with separable particles from processes yielding verbs with inseparable ones within German word formation. The exact form of these templates will be determined in chapter 4.

2.3   Connecting linguistic units

This section introduces an abridged RRG analysis of complex sentences and its equivalent in the LSW in subsections 2.3.1 and 2.3.2 respectively. As will be demonstrated in chapter 4, the structural differences between the various word formation processes correlate with the respective linkage types.

2.3.1   Sentence level

RRG assumes three different types of clause linkage, called nexus types (cf. Van Valin, 2005, 183): Coordination, subordination and cosubordination. Coordination is the joining of at least two units of the same status. Coordinated clauses are independent main clauses. Subordination is the embedding of a unit in another. Subordinated clauses are dependent. Cosubordination differs from coordination in terms of operator dependence, as demonstrated by switch-reference constructions in Papuan languages, which display dependent coordination (cf. Van Valin, 2005, 187).

The second notion RRG uses to describe complex sentences is called juncture. Junctures represent "the nature of the units being linked" (cf. Van Valin, 2005, 188), displaying the layer in which a given nexus type appears. A core juncture for example is either a core coordination, a core cosubordination or a core or ad-core subordination. An ad-core subordination is a core realized as a periphery to a core, while a core subordination would be a core embedded in a core.
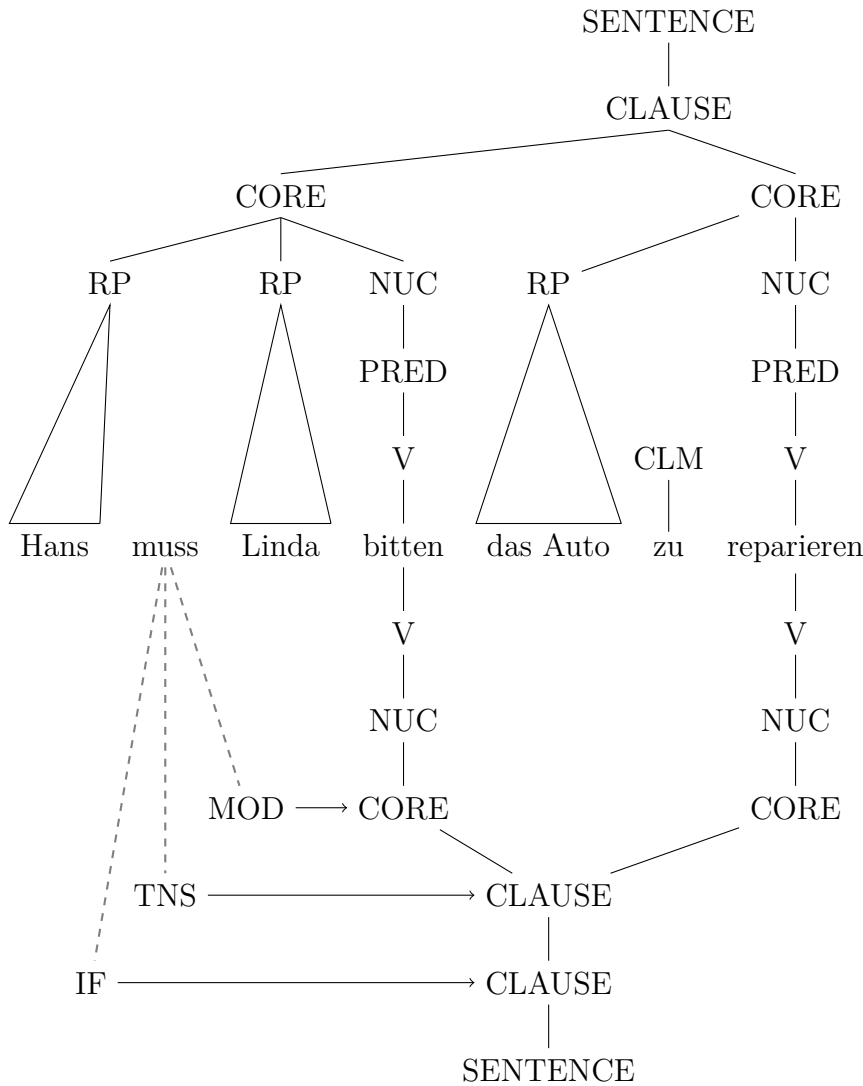
Figure 4: German core coordination

Figure 4 above illustrates the constituent and operator projections for the German sentence *Hans muss Linda bitten das Auto zu reparieren* 'Hans must ask Linda to repair the car'. As shown above, the modal operator only has scope over the first core, while the tense and illocutionary force operators have scope over the whole clause. The marker *zu*, signaling the augmented infinitive, is analyzed as a clause-linkage marker (CLM).

Clause-linkage markers are a class of grammatical markers, including - amongst others - conjunctions (cf. Van Valin, 2005, 205). However, it is unclear on which level in the constituent projection, if any, it occurs. Since it can appear word-internally with particle verbs, a position at the core level of a clause seems unlikely. In order to determine its precise location within the morphological projection, the analyses of word formation processes in chapter 4 will have to be taken into account.

In a core cosubordination, the modal operator has scope over all cores. Since there are no core cosubordinations in German, see Van Valin (2005, 203, Fig.6.15) for core cosubordination in English.

SENTENCE
|
CLAUSE

CORE   CLAUSE

RP   NUC   RP

Es   überraschte   niemanden   dass die Bahn zu spät kam

It   surprised   noone   that the train was late
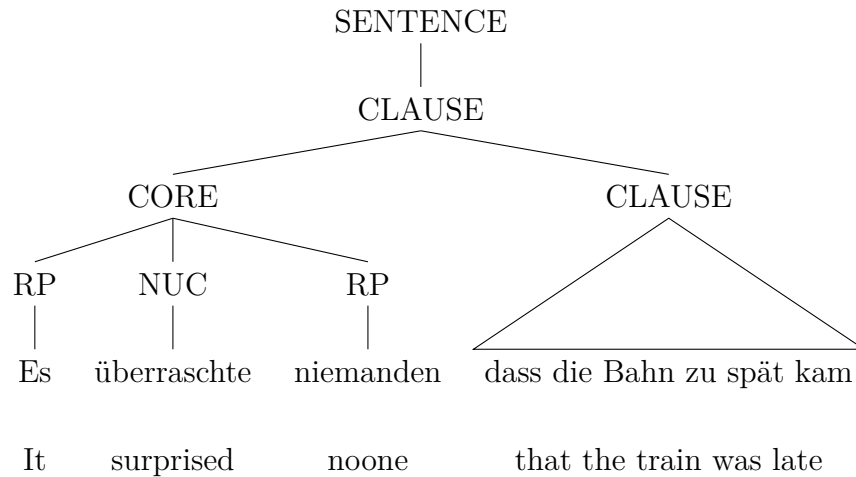
Figure 5: German symmetrical clausal subordination

Figure 5 above shows the constituent projection of the German complex sentence *Es überraschte niemanden, dass die Bahn zu spät kam* 'It surprised no one, that the train was late'. Linkage is called symmetrical, when the subordinated clause node is a direct daughter of the superordinated clause node. The subordinate clause *dass die Bahn zu spät kam* may also appear realized within the core of the sentence, replacing the RP *es*. If a large unit like a clause is subordinate to a smaller unit like a core, the linkage is called asymmetrical Van Valin (2005, 198-200).

2.3.2 Word level

Since the work into word formation processes using the LSW might be considered as being still in its infancy, it is yet to be determined, whether all or only a few of the nexus types can be utilized to describe their inner workings. Derivation for example has been analyzed as two different nexus types in three different ways by three authors.

According to Everett (2002) a derivation is a combination of nuclei. His notation makes it seem like a cosubordination, since the NUCw node has two equally displayed NUCw daughters. Arista (2008, 122-123) assumes that there are no derivations, and calls them subordinations, while changing their structure accordingly, as the diagram given by him for an agentive nominalization in Old English (ib. 139, fig. 15) shows. The analysis given above in figure 3 follows the notation used by Van Valin (2013, 112, Fig. 6).

```
       WORD           COMPLEX WORD_N                    N
        |                   |                            |
      CORE_W              CORE_N                       CORE_W
       / \                 / \                          / \
   NUC_W  AFFIX        NUC   ARG_N               NUC_W   AFFIX
    / \      |                 |                  / \       |
NUC_W NUC_W  |              WORD_N            NUC_W  AFF     |
  |     |    |                 |                |     |      |
                             CORE_N           PRED    N      |
                               |                |             |
                             NUC_N              V
                               |
/rifyuz-/ /-əl/  /-z/     toll    ere    /rifyuz-/  /-əl/   {PL}
```
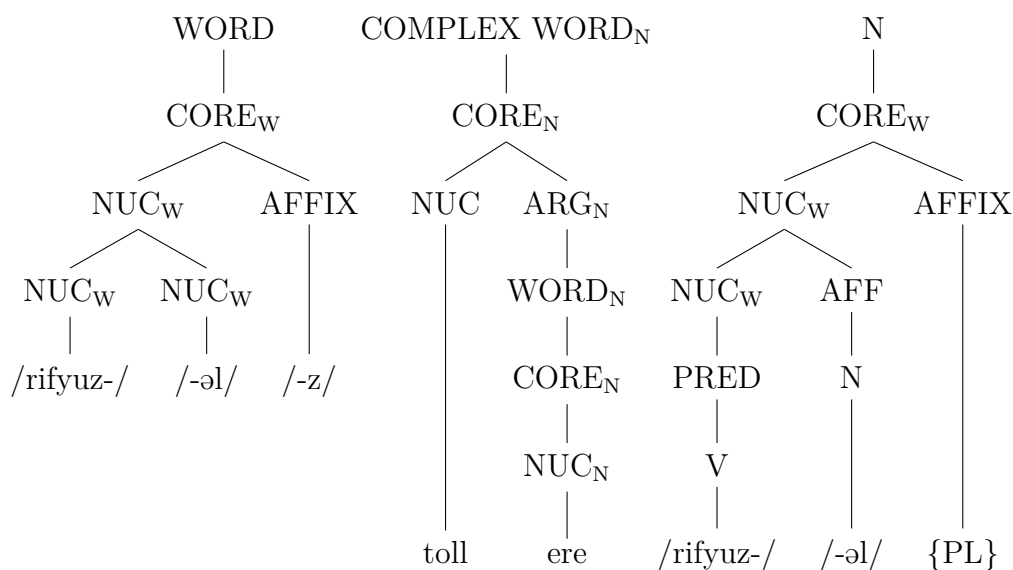
Figure 6: Everett's, Arista's and Van Valin's approaches to derivation

For ease of comparison, all three analyses are replicated in chronological order in figure 6 above. Arista's example means 'toll/tax gatherer' in Old English and the {-ere} is the agentive affix which became {-er} in Modern English and German. All three analyses combine nuclei, with the ones by Arista and Van Valin sharing the nexus type. The difference between these two approaches is, that Arista subordinates the suffix, which he analyzes as bound lexemes (cf. Arista, 2008, 122), to the stem, while Van Valin does it the other way round. Note that the ARG(ument) node is reserved for head-marked arguments in Van Valin's notation. This work will for the most part follow Van Valin's notation, although some alterations may be made to account for the complex words analyzed in chapter 4.

Compounding is represented for now as the cosubordination nexus type. The so called *Fugenelement* or *Fugenmorphem*, a linking element frequently found in German compounds, will be analyzed as a word-linkage marker (WLM), since its word level function is equivalent to the sentence level function of the clause-linkage marker. Figure 7 on the following page shows the LSW of the German word *Ableitungsregeln* 'derivational rules' with a revised notation for subscripts.

```
                                   N
                                   │
                                 COREN
                              ╱         ╲
                          NUCN            AFF
                       ╱       ╲            │
                   NUCN      WLM → NUCN      │
                 ╱     ╲        │      │     │
             NUCV      AFF      │      │     │
            ╱    ╲       │      │      │     │
         AFF    NUCV     │      │      │     │
          │       │      │      │      │     │
          │     PRED     │      │      │     │
          │       │      │      │      │     │
          V       V      N      │      N     │
          │       │      │      │      │     │
        /ab/    leit   /uŋ/    /s/   regel  {PL}
```
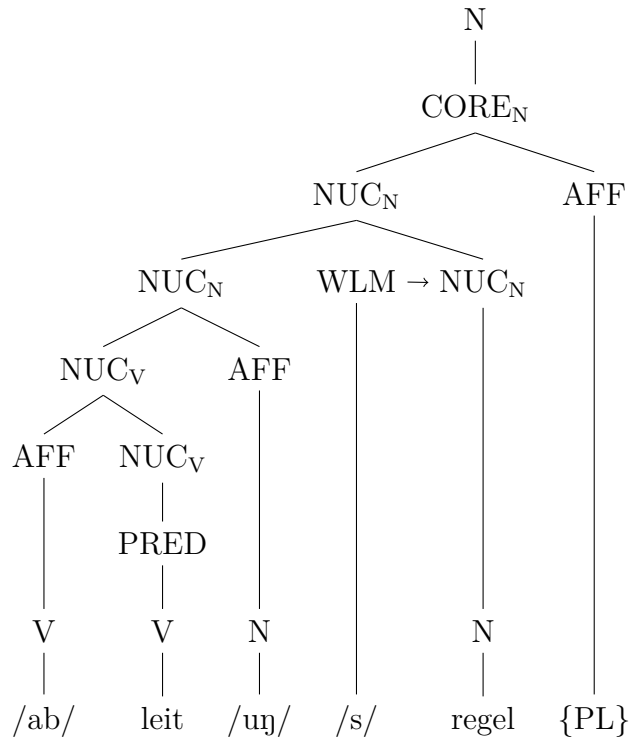
Figure 7: Morphological projection of a deverbal noun + noun compound

Subscripts now reflect the lexical category a given lexical element has at its current state within the word formation process. Thus the diagram displays that the stem/root *ableit* 'derive' is a verb until subordinated to the nominal affix {-ung}. This yields a nominal nucleus, which is joined with another nominal nucleus by a WLM. The joined elements have to be nuclei, since German does not allow the compounding of inflected forms.

Additionally, the two combined nuclei have to result in a nucleus, since the whole compound can undergo derivation (eg. A*bleitungsregelung,* 'regulation of derivation') and German does not permit derivation of inflected forms either. The plural morpheme for the whole complex word is situated in the nominal core.

Figure 7 also displays the problem with the definition of a root as a NUCw not immediately dominated by a COREw. The complex word *ableit* in German has already undergone derivation, therefore it is a stem. The root in this construction is *leit.* Since German does not permit derivation of inflected forms, there cannot be a COREv word-internally, which would be required to identify *ableit* as stem and *leit* as root.

Furthermore, since the second noun *Regel* has not undergone any word formation processes, it has to be considered a root as well, also indicating that is not immediately dominated by a CORE$_W$. However, defining a root as a NUC$_W$ not immediately dominated by a CORE$_W$ and not immediately dominating AFF would predict only the NUC$_V$ of *leit* and the NUC$_N$ of *Regel* to be roots, which is the desired outcome. Since German compounds are generally syntactically right-headed, the rightmost root can be seen as the base root in compounds.

2.4 Logical Structures and Qualia

This section briefly introduces logical structures and the aktionsart concept they are based on. In contrast to the previous sections, which presented sentence-to-word-level correspondences, this section translates the theory from word-level to affix level. Furthermore it introduces the concept of qualia, in order to find a mechanism which translates predicates' logical structures to the qualia structures referential expressions have, and back. This is necessary, since derivations can change a lexical category from verbs, which are predicative on their own) and encode an LS, to nouns, which needs a copula to function as predicates and encode QS.

2.4.1 In words

RRG uses two ways to describe semantic properties, depending on whether something is a predicate or not. Nouns, which usually aren't predicates, are defined by their Qualia, as introduced by Pustejovsky (1995, 426), describing nouns (referring expressions) by four roles. The constitutive role defines an entity's relation to its constituents. The formal role distinguishes entities from others within a larger domain. The telic role contains a logical structure to describe an entity's function or purpose. The agentive role describes the factors relevant to an entity's creation or origin (cf. Van Valin, 2005, 50-52).

Predicates are described by their logical structures. These are based on their aktionsart, as proposed by Vendler (1967), who distinguished four aktionsart-based verb classes: states, achievements, accomplishments and activities. RRG adds the two classes semelfactive and active accomplishment, as well as a causativized version of all classes. The difference of these aktionsart-classes is characterized by the four binary features: [± static], [± dynamic], [± telic] and [± punctual] (see Van Valin (2005, 31-42) for a more detailed introduction). Table 1 on the following page shows an incomplete list of possible logical structures for each aktionsart class. See Table 2.3 in Van Valin (2005, 45) for a complete list.

Aktionsart class	Logical structure
STATE	**predicate'** (x)
ACTIVITY	**do'** (x, [**predicate'** (y)])
ACHIEVEMENT	INGR **predicate'** (x)
SEMELFACTIVE	SEML **predicate'** (x)
ACCOMP	BECOME **predicate'** (x)
ACT ACCOMP	**do'** (x, [**predicate₁'** (x)]) & INGR **predicate₂'** (y)
CAUSATIVE	α CAUSE β

Table 1: Logical structures and aktionsart

The **do'** operator found in activities means that the predicate described by this logical structure is dynamic. The INGR operator signifies the predicate as punctual. The BECOME operator shows that it is telic. The Greek letters are to be read as variables for logical structures.

2.4.2 In affixes

This approach follows the view put forward by Cortés Rodríguez (2006), which states that the meaning of complex words (complex lexical units) is the "sum of the meanings of its components" (ibid. 43). The meaning of the components is thereby viewed as predictable and related to word formation rules.

The most important consideration when dealing with the semantics of affixes, is that the information encoded within them is incomplete. This can be seen on the morphological level, since they are bound morphemes and therefore need a host they can attach to. Furthermore, the semantics of isolated derivational affixes are hard to decipher and the semantics of derivations formed using the same affix can differ considerably.

This can result in the change of aktionsart during word formation. Changes of lexical category can be explained by word class changing affixes having an incomplete set of qualia, which, when combined with a lexeme, yield complete sets of qualia. Restrictions on input can be explained by semantic overlap due to incompatible qualia/LS between the involved elements.

Applying this line of reasoning leads to a method of measuring the predictability of a certain morpheme's semantics. Since the semantics of a complex word is a combination of the information encoded by both the lexeme and the affix, removing the lexeme's semantics should leave only the information encoded by the affix. The more possible meanings and exceptions to these meanings there are, the less predictable the semantics of a single affix is.

The semantics of any morpheme can be considered entirely predictable, if and only if there is exactly the same semantic component left after removing the host word's contribution to a complex word's semantics for each instance of derivation involving said morpheme and any word of the same language that can be combined with this morpheme to a well-formed complex word.

The leftover incomplete logical structures will be written as LS(μ(α)), where μ stands for a morpheme and α stands for the LS of the lexeme the morpheme is attached to. The reason for the morpheme being depicted as a function of α is that the meaning of a morpheme can change depending of the predicate used, potentially leading to a different LS. Figure 8 below shows an example of how to determine the LS of the German prefix {zer-} 'to pieces' applied to the verb *reißen* 'to tear'.

(1) reißen   (2) zerreißen

reiß -en   *zer-   reiß -en*
tear -INF   to.pieces tear -INF
'to tear'   'to tear sth. to pieces'

do' (x, **tear'** (x,y))   [**do'** (x, **tear'** (x,y))] CAUSE [BECOME **be.in.pieces'**(y)]
LS(zerreißen)-LS(reißen) = CAUSE [BECOME **be.in.pieces'**(y)]
LS({zer-}(α)) = α CAUSE BECOME **be.in.pieces'**(y)

Figure 8: Determining the LS of the prefix{zer-}

If the part of the LS of the predicate *reißen*, **do'** (x, **tear'** (x,y)), is removed from the LS of the predicate *zerreißen*, [**do'** (x, **tear'** (x,y))] CAUSE [BECOME **be.in.pieces'**(y)], what is left is the difference in meaning. Since there is only one morpheme different, the "leftover" incomplete logical structure CAUSE [BECOME **be.in.pieces'**(y)][2] has to be conveyed by this morpheme. Thus, if {zer-} is entirely predictable, the LS of a complex word using the prefix on any predicate with the LS α, will be α CAUSE [BECOME **be.in.pieces'**(y)].

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[2]which could also be written as α CAUSE [BECOME **be.in.pieces'**(x)], even though the single argument of **be.in.pieces'** has to be the undergoer and will transitivize agentive intransitives as in *Ich habe mir die Schuhe zerlaufen* 'I walked my shoes to pieces', since when applied to actorless intransitives like *fallen* 'to fall' it stays intransitive as in *Der Turm ist durch die Belagerung zerfallen* 'The tower has fallen to pieces due to the siege'.

For the notation of leftover qualia structures, it needs to be taken into account that qualia come in sets of four, meaning that specification is needed which part of the set is incomplete. The qualia structure of the agentive suffix {-er} mentioned above for example would be written as Q(μ(α)) = {C: **person'** (x); F: **human'** (x); T: α; A: [**do'** (x, α)] CAUSE [BECOME **be.x'** (x)]}, where α is the LS of the verb the suffix is attached to. The expression Q(μ(α)) is read as "the qualia structure of the morpheme μ when attached to a predicate with the LS α".

The logical structure of the verb fills the telic role, because the purpose of the agent x in agentivized constructions is doing what the LS α of the predicate it is being attached to encodes. Additionally, x comes about by doing α, since the whole reason for a speaker to use an agentivized deverbal noun is to express, that x is doing or has done or has learned to do what α encodes. One example for this is the English word *builder*. The purpose of a builder is to build something. And a person becomes a builder by building something (or learning to build something).

However, there is an exception to this pattern in the word *ruler*, as in the tool for measuring distances. In modern day English it seems quite odd to say the purpose of a ruler is to rule distances. Even though there is a possible reading of *rule* as determine, expressing a ruler's purpose as to measure distances seems more natural.

This not only shows us that the meaning of the suffix {-er} is not entirely predictable, it also exemplifies why the notation for the qualia structure of a morpheme is written as a function of a function. When the same morpheme μ, {-er}, is applied to a different LS α of the verb *rule* (with the reading of determine)[3], the constitutive and formal qualia in the qualia structure of {-er} when applied to **do'** (x, **measure'** (x,y)), are not **person'** (x) and **human'** (x), as with *build*, nor should it be, since a ruler (at least this reading of the word ruler) is a tool to measure distances and not a person measuring distances. So either the specification of a (sentient) agent is not a part of the {-er} suffix, or there at least two homonymous {-er} suffixes.

The third possibility is that there is only one suffix with a broad meaning and conventionalized preferred readings, which can be picked and altered by the person creating a word to fit the properties of what the created word is supposed to denote.

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[3]More specifically, by the way a ruler is used (or if invented by the intended purpose for which it was invented) it is implicit that it is distance which is determined (ruled). And a distance is determined (ruled) by measuring it. Furthermore, the reading as a person who rules over something is already taken.

This can be seen as similar to the word *climb* being conventionally interpreted as denoting an upward direction, although this is no inherent property of climbing, but is inferred from context (cf. Levin & Rappaport Hovav, 2011, 9ff). Since it is possible to climb into a car, in which one moves rarely in an upward direction, or climb into a space ship, which can't denote an upward direction since there is no up or down in zero gravity, and it is even possible to combine the word *climb* with an explicit downward directionality as in *to climb down from the table*, upward directionality can't be an inherent part of the meaning of the verb *to climb*. Yet, when someone is said to have climbed a mountain, without overt specification of directionality, an upward directionality is assumed. This is demonstrated by the sentence *Yesterday, she climbed the mountain* being able to be conjoined with *and she is still up there*, but not with *and she is still down here*.

The reason for the phenomenon described above being similar to the one described for affixes, is that in both cases the predicted meaning is a product of the decompositional approach to an expression's meaning. Just as the upward directionality of climb, which needs no explicit marking, can be seen as a conventionalized part of the meaning of climb for all instances where it does not conflict with tacit or conscious knowledge about the real world (eg. that cars are usually of a height less than a person so that when climbing into a car, usually there is upward direction involved), the **person'** (x) and **human'** (x) part of the {-er} morpheme could be seen as a conventionalized part of the meaning of the morpheme, which does not apply when contradicted by real world knowledge (ie. that a tool to measure distances is not a person).

2.5 Conclusion

This work assumes a layered structure of the word, the LSW. Within this work, the LSW is assumed to be the morphological, word-level equivalent to the syntactical, sentence level LSC; properties of the LSC like the differentiation into nucleus-, core- and clause/word-level layers, detached positions, argument positions, nexus combinations, interfaces, and the concept of templates are assumed to have a LSW counterpart.

Derivational morphemes are assumed to have a "partial" or "incomplete" meaning, which can be depicted in relation to the morpheme equivalent to the depiction of an LS or a qualia structure in relation to its lexeme. Furthermore, the interpretation or reading of a derivational morpheme's incomplete meaning can differ, depending on the word it is applied to and the context in which it is applied.

3 The morphology interfaces

3.1 Introduction

In order to thoroughly investigate word formation processes, and morphology in general, it is necessary to define the scope of morphology and its relative place within, and level of interaction with, the other linguistic branches. This chapter specifies the basic premises and theoretical views of what morphology is on which this work's analyses are based. Section 3.2 deals with the field of morphology as a whole and what its relationships with the other branches of linguistics are. Due to length constraints and the scope of this work being word-formation, the comparative analysis of different approaches to what morphology is will be held brief, in favor of the description of the interfaces morphology has with other parts of linguistics.

Possible solutions on how to display these interfaces will be included in sections 3.3, which explores the relation between morphology, specifically morphemes, and their semantic interaction during word formation, and 3.4, which is about the impact syntax has on morphology and vice-versa.

Section 3.5 discusses the morphology-phonology interface, briefly discussing a way to display phonological interference between morphemes and the impact of word-formation on lexical stress, as well as the morphology-pragmatics interface. The reason for not including intonation in the morphology-phonology interface and not giving the morphology-pragmatics interface its own chapter, is their relative scope. Both would need to be able to display interactions with suprasentential and sublexemic nodes within a diagram in order to display the interdependencies between the parts of speech they represent. Section 3.6 concludes these brief discussions.

3.2 The role of morphology

The goal of this section is to give a brief description of the theoretical model of morphology used within this work. This is achieved by comparing current approaches and their implications on how much morphology interacts with (or is independent from) the other linguistic fields.

Preliminarily, in respect to morphology's independence from any given branch, there are three logical possibilities, labeled here as: independent, dependent[4] and non-existent. While the independence from another field implies that the respective branch has no scope over or influence on morphological processes, dependent morphology can be affected by it. The implication of another branch having full scope over morphology is that there is no morphology: Assuming syntax (or phonetics, pragmatics, etc.) had full scope over morphology means assuming that there are no morphological rules or phenomena, but only syntactic ones. This implies that the rules guiding the formation of well-formed sentences are the same as the ones guiding the formation of well-formed words, rendering the field as a separate branch of linguistics obsolete.

One example for a framework assigning syntax full scope over morphology is "Distributed Morphology", a generative framework, as put forward by Halle & Marantz (1993). It leads to the assumption that morphological order is determined by a morpheme's hierarchical position in the syntactic structure, which generates sentences and words. However, using this approach would necessitate either a further separation of $CORE_W$ into several $CORE_W$ or the simultaneous display of the operator projection to account for the order of multiple inflectional morphemes.

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[4]If the dependency between branches is bilateral they could be seen as codependent
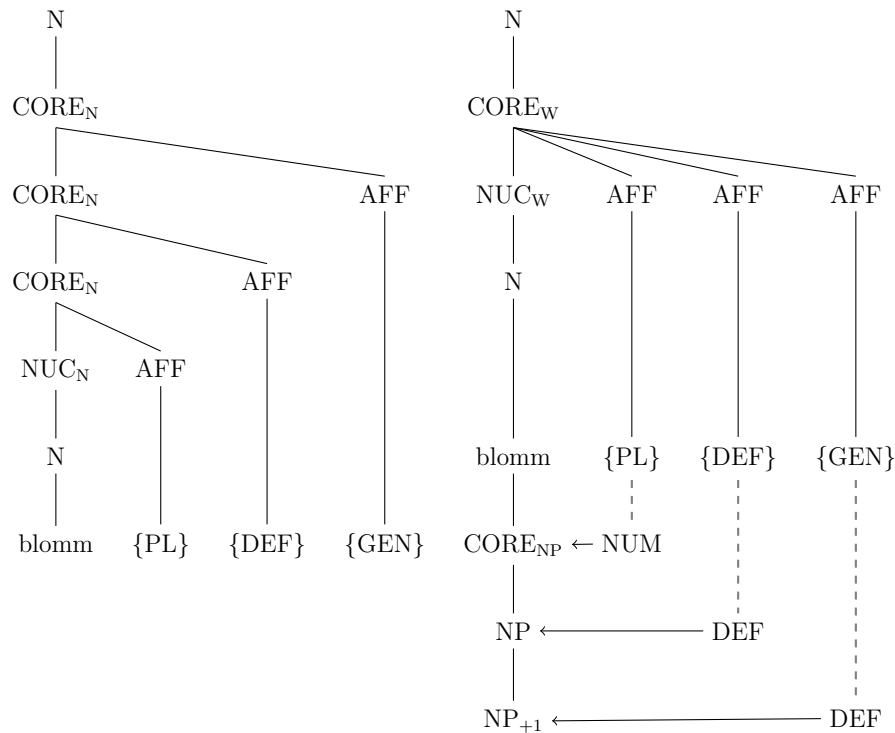
Figure 9: Multiple inflectional affixes is Swedish

Figure 9 above displays the Swedish word *blommornas* ' of the flowers' with split CORE_W on the left and simultaneous operator projection on the right. Three separate inflectional affixes, encoding plural {-or}, definiteness {-na} and genitive {s}, are realized on the noun. Number is a core operator of the NP, whereas definiteness is an NP operator. The suffix {-na} signifies the "nominal phrase" *blommor* to be definite. The genitive affix {-s} signifies the whole construction as being the definiteness operator of the NP in which it is located (cf. Van Valin, 2005, 24-26). This is evidenced by the fact that in Swedish nouns following genitive constructions cannot receive definiteness marking (cf. Holmes & Hinchcliffe, 2013, 53). The expression *blommornas doft* 'the flower's scent' is grammatical, whereas **blommornas doften* '*the the flower's scent' is not[5].

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[5]Although this is relevant neither for word-formation nor for German, the theoretical implications of adopting the view held by Distributed Morphology should be taken into account, since they may effect the applicability of the RRG framework for morphology to languages other than German.

Both ways of representation illustrated in figure 9 are flawed for different reasons. The diagram on the left abandons the mirrored structure to the LSC the LSW has been defined as in favor of a binary tree, solely motivated by displaying a hierarchy, which may or may not exist. The diagram on the right requires operator projections to be codisplayed with morphological projections, in order to display the hierarchy used to explain the order of the morphemes. However, the flaws in graphical representation are only a theory-internal argument against viewing morphology as entirely dependent on syntax and could be ignored in case of the right hand diagram. Operator projections could be left out of the diagram, under the assumption that they are still relevant for the order of morphemes and omitted for graphical reasons alone.

For inflectional morphology, this thesis adopts the view portrayed in the right hand side diagram in figure 9, omitting the operator projection. The reason behind this is that the approach taken towards inflectional morphology is inferential-realizational, as put forward by Everett (2002). In a realizational approach to inflectional morphology there are no inflectional morphemes. They are replaced by rules, which relate inflected word forms to their morphosyntactic representation (cf. Anderson, 1984, 190). This assumption is also the reason behind displaying inflectional morphology in the morphological projection as encoding grammatical features. Following the proposal put forward by Boutin (2011, 7), this approach is (in regard to inflectional morphology) inherently different from Distributed Morphology, which is a non-realizational approach and therefore morpheme based. In a non-realizational approach, "morphological rules/operations are defined in terms of morphemes", whereas in a realizational approach, they "are defined in terms of features" Boutin (2011, 31).

However, defining inflectional morphology by features alone, entailing the non-existence of inflectional morphemes, raises the question what the phonological exponent of a feature is, if not a morpheme. As Stump (2011) points out, the difference between a realizational and a lexical theory of morphology is the view of inflectional morphemes as belonging to the lexicon or not. He proposes a a Paradigm Function Morphology, where the paradigm of inflectional morphemes is the center of analysis. Assuming the existence of inflectional morphology is not contradictory to this approach, as long as inflectional morphemes are seen to be licensed by the operator projection and syntactic requirements, rather than as a part of the lexicon and the grammatical meaning encoded by them being interpretable by their paradigmatic relations.

An additional merit of a paradigmatic approach to morphology is that zero morphology can be excluded, since the information associated with the "zero morpheme" can be explained by speaker/perceivers inferring the information conveyed by unmarked forms in comparison to the paradigm of possible affix for a certain inflectional "slot" (cf. Zwicky, 1992, 350 - 354). The licensing of inflectional affixes by the operator projection is similar to the slot calculus proposed by (Zwicky, 1990, 226), whereby sets of affixes may appear in a perspective slot (reserved for these affixes). However, he proposes that a stipulation about which affixes may fill these slots is different from what governs their order. This view partially conflicts with the linking between operator projection and inflection described above, as the operator projection both instigates the order of slots by the operator ordering and restricts the affixes which may appear in these slots to exponents of their respective operators. Some inconsistencies in affix order may however be explained by operators sharing a level of operation (eg. aspect and negation can both be operations on the nuclear level, with language-specific preference for ordering).

The assumption of a "non-existent" derivational morphology governed by syntax leads to problems when analyzing word-formation processes. The order of derivational affixes cannot be determined by the operator projection, since operators apply to complete LSs and do not change a lexemes semantics. Even when assuming these word-internal rules were entirely instigated by syntax, they would still have to be different from the syntactic rules (or at least be a subset of them). If there was no difference between word-internal and sentential rules, every grammatical output of a syntactic rule would need a morphological counterpart. The term morphological rule can therefore still be applied to this subset of rules, irrespective of it being governed by syntax or not

Furthermore, given that bound morphology in head-marking languages is used to designate the arguments of predicates, while in strictly dependent-marking languages it is not, the answer, if any, on where the boundary between morphology and syntax is, if there is one, seems to be subject to the language analyzed rather than being universal. This is also underlined by a lack in morphological rules in isolating languages, in which many of the processes governed by morphology in more synthetic languages are to be explained syntactically, simply because there is no (or little to none) bound morphology. Therefore, a discussion about the interrelations between morphology and other parts of language has to be language specific.

The approach taken in this work presupposes the existence of morphology as a separate field of linguistics at least for word-internal processes, with varying degrees of (co)dependence to other parts of language. This can be exemplified by the order of morphemes within a word instigating phonological changes between the morphemes, meaning that phonology is dependent on morphology, as a different order of morphemes could trigger different phonological processes.

The same argument can be made in regard to morphology being dependent on syntax (via semantics), as agreement marking is in agreement to the privileged syntactic argument. Therefore, derivational morphemes are treated in this work as existent, encoding incomplete LSs or QSs corresponding to a certain string of phonemes.

The distinction made above can also be found in the traditional, non-relational view of the relation between inflectional and derivational morphemes. According to Pounder (2000, 36) and Plag (2003, 14), in the traditional view inflectional morphology is seen a part of grammar (syntax), while derivational morphology is not. Pounder (2000, 46-49) however does not concur and states, that inflectional and derivational morphology belong grouped together. These views aren't mutually exclusive. Since in the traditional view the morphemes in both, inflectional and derivational morphology, are bound-morphemes, which follow distinct sets of rules determining where they can appear as affixes, they build a separate class. A part of this class (inflectional morphology) is dependent on syntax (morphosyntax), while derivational morphology is not.

However, German and English (or Indo-European in general) comparative suffixation constitutes a problem for this binary distinction. The German comparative ending {-er] and the superlative ending {-st} form the paradigm of comparison endings in German. The possibility to classify them as a paradigm of morphemes in complementary distribution points toward them being inflectional. Additionally, the semantics of these morphemes is entirely predictable, which is not necessarily true for derivational morphology.

Contrarily, the comparative ending adds an argument to the logical structure of the adjective (i.e. predicate), which points towards derivation. Furthermore, Pounder (2000, 86) points out that derivational affixes may form paradigms as well[6], which negates one of the arguments for said morphemes to be considered inflectional. However, independent of taking this proposal into account, the comparative endings in German (and English, Swedish, Spanish etc.) display features of both inflection (predictability of meaning) and derivation (changing of the argument structure).

Because these morphemes exhibit features of both inflectional and derivational morphology, in this paper they are analyzed as a separate class of hybrid affixes, instead of being forced into a category they don't properly fit into. Given that the LSW assumes that the core level of a word is reserved for a word's arguments in head-marking languages (or their corresponding inflectional morphemes in dependent-marking languages) and inflectional marking is linked to the operator projection, it seems reasonable to assume, that argument-structure changing morphemes may occur on a word's core level as well, especially if they simultaneously encode operators.

3.3 The importance of the lexicon

The goal of this section is to explain the semantics-morphology interface, the interacting part between the lexicon and morphemes. For the scope of this work, no assumption is needed other than that there are only derivational morphemes, and each morpheme has a phonological representation and a (potentially incomplete) meaning. Exploring the nature of the relationship between free and bound morphemes in the lexicon, would not only exceed the scope of this work, but is also of little relevance to describing their interaction with another. Furthermore, as inflectional morphology is considered realizational, inflectional morphemes are replaced by rules linking word forms to morphosyntactic representations, they are not seen as a part of the lexicon.

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[6]She further states that suppletional affixes within word formation paradigms have prerequisites not shared by members of inflectional paradigms.

However, whether the meaning of a derivational morpheme, defined as an incomplete logical structure or qualia structure, is treated different from or in the same way as lexemes with respect to how the information encoded by them (and their phonological representation) is metaphorically stored in the mental lexicon, has no direct impact on the interface between the two. Where a morpheme's meaning originates is beyond the scope of the semantics-morphology interface, which is only concerned with the interaction between the morphemes and their meanings. This also pertains to the question of whether morphological templates are stored exactly as or similar to syntactic templates.

Furthermore, since any derivational morpheme's assumed meaning is deduced from the result of its morphosemantic interaction (because, using a different lexeme as the host for a derivational morpheme may change the meaning or the interpretation necessary to have a well-formed output of said morpheme), classifying it in respect to its metaphorical place within the mental lexicon as well would lead to a circular argument: A morpheme is derivational, because its meaning is incomplete. Since its meaning is incomplete, it must be stored differently than expressions encoding complete LSs or QSs. Assuming its mental place of origin decided what kind of meaning a morpheme encoded, would state that its meaning must be incomplete, since it is stored differently and therefore must be derivational.

This approach does not necessarily entail, that the only way to interpret a complex word is by deducing the incomplete meaning of the involved morphemes. Its sole purpose is to determine the meaning encoded by morphemes on a formal level. Any morpheme's (incomplete) meaning is still known by the speaker producing it and assumed to be known to the recipient by the speaker. Since derivational morphemes may form paradigms as well, on producing a complex word, the speaker chooses the derivational morpheme they want to use, which is possible since a speaker knows what the meaning of the complex word ought to be and which morphemes to use to receive the desired output.

Word formation processes where the semantic composition is unclear rely on the lexical redundancy rules put forward by Nunes (1993), "[...,] which express the relationship between the verb and related derived nominals [,...]" Van Valin & LaPolla (1997, 186). The applicability of these rules as seen by this work is extended beyond the scope of nominalizing derivation. The reason behind this assumption is the described capability of speaker/perceivers to interpret grammatical complex words, even if the semantic processes involved cannot be formally deciphered. The processes described may be seen as a specification of some lexical redundancy rules for German.

A description of how to formally represent the interaction between free and bound morphemes during word formation is necessary. This work utilizes the projectional nature of RRG to display these compositional processes. The projection used to display the semantic process, the composition, during word formation will be called the compositional projection in this work, displayed in figure 10 below.

N

|

$CORE_N$

|

NUC_N

NUC_V AFF

AFF NUC_V N

V   V   N

/t͡sɛɐ/   reiß   /ɐ/

α CB **be.in.pieces'**(y)   **do'**(x,**tear'**(x,y))

| Q_C **person'**(x) |
| Q_F **human'** (x) |
| Q_T β |
| Q_A **do'**(x,β) CB **be.x'**(x) |

α

do'(x,**tear'**(x,y)) CB **be.in.pieces'**(y)

|

β

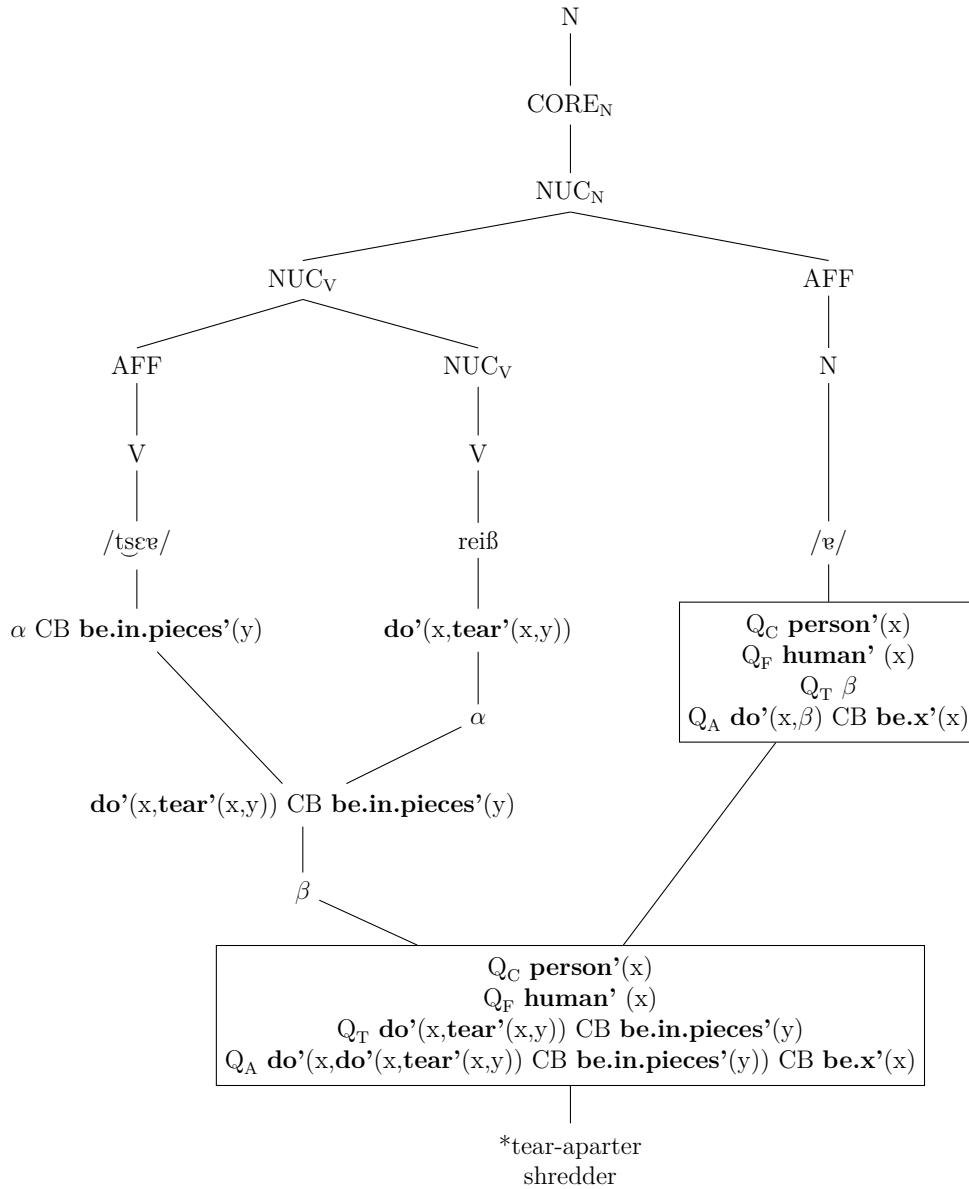| Q_C **person'**(x) |
| Q_F **human'** (x) |
| Q_T **do'**(x,**tear'**(x,y)) CB **be.in.pieces'**(y) |
| Q_A **do'**(x,**do'**(x,**tear'**(x,y)) CB **be.in.pieces'**(y)) CB **be.x'**(x) |

*tear-aparter
shredder

Figure 10: Morphological and compositional projection of *Zerreißer*

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Figure 10 on the last page displays both the morphological and compositional projections of the German complex noun *Zerreiße*r 'sb. who tears sth. apart, a shredder'.[7]

The first layer of the compositional projection displays the partial and complete meanings of all bound and free morphemes contributing to the LS or qualia structure of the complex word. This excludes agreement and other "purely" inflectional marking, since they usually do not alter the LS or QS of a complex word and the information encoded by them is already represented in the operator projection.

The incomplete meanings contain information as to what they need to complete them, logical or qualia structures, displayed as α or Qα respectively, in consecutive Greek letters for each derivation. The incomplete LS of {zer-} displayed in figure 8 is combined with the LS of *reiß* to form a felicitous LS β. β is needed as input for the incomplete qualia structure of the deverbal nominal agentivization suffix {-er}. The final LS or QS is then given as the direct translation of the German complex word into English. If the direct translation has no potential of being a grammatical word in English, the closest possible word or phrase is noted below.

Notice that for visual reasons CAUSE BECOME in logical structures has been shortened to CB within the compositional projection, since the long version caused the diagram to be stretched out of proportion. Due to their size it has also been necessary to frame sets of qualia in order to display them as a single node.

3.4   The influence of syntax

The goal of this section is to describe the limited influence syntax can have on morphological processes and, if necessary, devise a syntax-morphology interface suited both to formal, graphical representation and linguistic data. The three main aspects which need consideration are whether, and if so, how far, the principle of lexical integrity holds true, how to treat the word-formation process of conversion, and how to display the grammatical meaning added to a word by inflectional morphemes in relation to the compositional projection.

---

[7]which is close in meaning, and if not talking about a person but the machine, for the rare cases German speakers don't just use the English word, this is a proper translation. The other possible translation into German would be *Zerfetzer*, which sounds archaic has the additional problem, that usage of the root verb *fetzen* 'to tear, to shred, nowadays: to excite' has become rare apart from the third reading and is preferably used with {zer-} when referring to one of the first two. The semantic difference between *zerreißen* and *zerfetzen* seems to be constricted to manner, as *zerfetzen* is a more savage act than *zerreißen*.

The principle of lexical integrity, which states that syntax has no scope over morphology and has no information about the internal structure of a word, entails that there cannot be a syntax-morphology interface. However, assuming this to be entirely correct, leads to a disparity when analyzing head-marking languages, as described by Nichols (1986, 107-108) as "Eurocentric distortion", meaning that head-marking languages are treated the same as dependent-marking languages in terms of "agreement" marking. Even by calling it agreement marking rather than person marking, inflectional morphemes[8] encoding person in head-marking languages are misrepresented. They do not encode agreement as inflectional morphemes in dependent-marking languages do, they encode the LS's arguments itself.

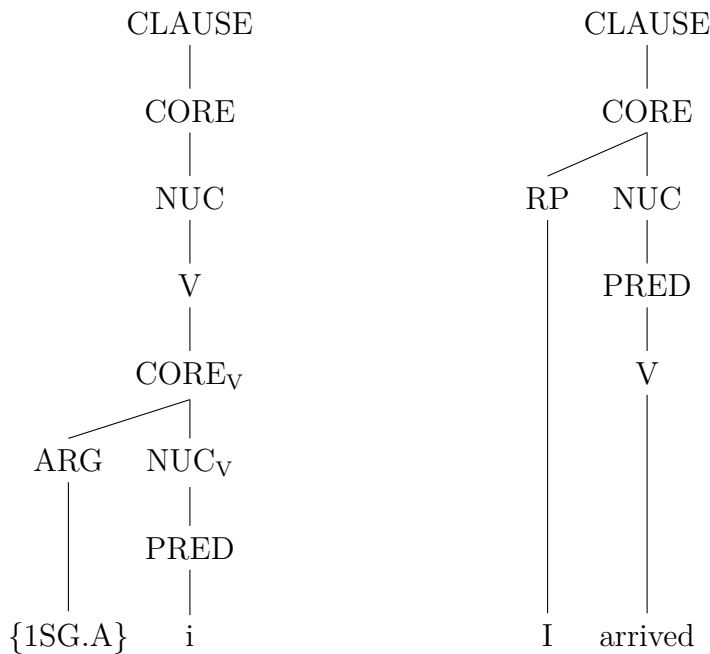Figure 11: 'I went(arrived.going)' in Lakhota and English

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[8]the principle of lexical integrity is based on morpheme based approaches, but the same problem arises when the morphological rules applying in head-marking and independent-marking languages are not treated differently. The points mentioned for inflectional morphemes in non-realizational approaches apply to realizational approaches as well.

This difference is the basis of how they are represented in the LSW, as illustrated in figure 11 on the previous page. Arguments are realized in the core of the clause in dependent-marking (eg. English) and in the core of the word in head-marking (eg. Lakhota) languages[9].

However, if syntax has no insight into morphology, nounless sentences in head-marking languages like the one exemplified in figure 11 do not satisfy the completeness constraint, as the arguments are encoded in the word's core, to which the syntax has no access. There are two methods of resolving this issue.

The first one is to assume, that syntax has information about a word's core (but not its nucleus) and therefore the completeness constrained can be satisfied. This assumption presupposes a refined principle of lexical integrity.

The second one is to assume that morphemes denoting arguments in head-marking languages will be part of the meaning of the word, so that an animate actor marked on a verb will be specified in the LS of the verb and therefore needs to be displayed in the compositional projection. In dependent-marking languages however, the arguments of a LS are specified in the core of the clause, and therefore will not be represented in the compositional projection. The methods are not mutually exclusive and compatible with the difference in formal representation of head-marking and dependent-marking languages based on a differing analysis of these two classes of languages, as portrayed in Van Valin (2013).

Given that both methods are equally able to differentiatingly describe head-marking and dependent-marking languages, abandoning the principle of lexical integrity does not seem necessary. However, sentential compounds in German (see subsection 4.3.3), which are nominal compounds that take an entire clause or sentence as a modifier, display agreement between pronouns within the compounded clause referring to the head noun and the head noun. This indicates that syntax can access morphological information from within a word-formation process, leading to the question whether this works from-the-outside-in as well as it seems to work from-the-inside-out.

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[9]Further analysis as for tense marking has been intentionally excluded in order to focus on the difference in argument marking, since argument marking differs from other inflectional marking in that it does not encode operators but is important in syntax-to-smenatics linking, giving information about how to link sentence-internal expressions to argument slots in the LS.

Note that this problem does not arise when using Distributed Morphology, since the differences between head-marking and dependent-marking argument encoding can be explained syntactically, because there are no morphological rules. However, using the realizational approach for inflectional morphology permits a differentiating analysis between dependent- and head-marking languages by seeing head-marked person marking as appearing in the compositional projection in contrast to dependent-marking agreement, which does not. Furthermore, dividing inflection and derivation by them being realizational and non-realizational respectively, mirrors the alteration proposed to the principle of lexical integrity for purely non-realizational approaches made above.

Further indications for syntactic influence over word-formation is the process of conversion. Aside from languages which overtly mark lexical categories with affixes, conversion does not involve morphemes which could indicate that a change of lexical category took place (short of zero derivation, which gives a cop-out explanation of how conversion happens, yet fails to elaborate on the how differences between different conversions are interpreted). The assumption within this work is, that the resulting lexical category in a conversion is determined by its position in the syntax. This is exemplified by the German noun *Schreiben* 'letter, something that has been written', which is a conversion of the German verb *schreiben* 'to write' in figure 12 below.

CORE
RP   NUC
RPIP   CORE$_{RP}$ PRED
RP   NUC$_{RP}$ V
PRO$_{POSS}$ N
Ihr   Schreiben   wurde   erhalten
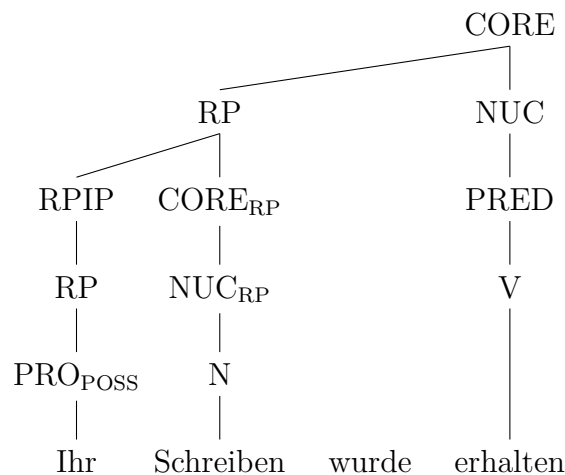
Figure 12: Conversion in German

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The sentence displayed translates to 'Your letter has been received'. *The noun Schreiben* can be discerned from the verb *schreiben* only in written German: there is no phonological difference between the two[10]. Yet when using what appears to be a verb in said way, it is clear to German native speakers that it is not a verb, but a referential expression. Since referential expressions (denoting qualia structures) are to be expected in a clause's core in order to fulfill the completeness constraint of the predicate, words not denoting qualia structures in a clause's core will be reinterpreted as nouns. Occurring within a clause's core forces logical structures to become qualia structures, in order to make the clause interpretable.

The semantic output of such a conversion process can vary widely, as is to be expected from the result of a process in which a lexical category is "forcefully" changed to fit syntactic expectations without additional morphology to stipulate change in lexical category or semantics. For a more detailed analysis of conversion, see section 4.4.

The last point remaining is the formal representation of "inflectional morphemes" neither involving agreement nor argument marking, namely affixes encoding tense, aspect or mood (or any other operator). As pointed out above, the approach taken to inflectional morphology is realizational. There are no inflectional morphemes, there are only features guiding the linking process between a word form and its morphosyntactic representation. There is no reason for these affixes to be displayed in the compositional projection. They do not contribute to a predicate's LS, they provide the information which operators apply to the given LS. They are already displayed in the operator projection, which can be easily displayed in combination with the compositional projection and/or the morphological projection (and is understood to stipulate the order of inflectional marking, even if omitted graphically). There are neither theoretical nor practical benefits from displaying them anywhere but in the operator projection.

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[10]There is however a morphological case to be made that the noun *Schreiben* contains the infinitive affix {-en}, leading to the question whether infinite forms are to be considered as nominals. However, this approach lacks explanation of the conversion process in languages which do not have infinitives.

3.5 Further interfaces

This section briefly explores further interfaces between morphology and other linguistic fields such as phonology, including lexical stress, and pragmatics. Furthermore, a formal way of presenting a morphology-phonology interface for RRG will be proposed, which needs to be able to display phonological rules based on morphemic/phonological context, as well as word-internal shifts in stress. This approach to the morphology-phonology interface is based on the proposal that RRG morphology is realizational, meaning that the pronunciation of words is determined by rules, as pointed out by Arista (2008, 122). The phonological representation of inflectional endings is inferred by a speaker depending on morphological context.

The formal display of phonological aspects of morphemes (and features) is called phonological projection in this work. Since phonological rules apply word-internally with both derivational and inflectional morphology, as well as between words within a clause, the phonological projection needs to be compatible both with the morphological and the constituent projections. It also needs to be able to display the difference between trivial changes of lexical stress, caused by adding one or several syllables to words in languages with fixed stress patterns, and shifts in lexical stress caused by differences in a word's internal structure. Homographous derived verbs in German, whose meaning is determined by a difference in stress, are an example of the latter (see subsection 4.2.2).

Allomorphy can be explained by the realizational approach to inflectional morphology used for this framework. Boutin (2011, 5) exemplifies this with the word *dogs*, which results from the morphosyntactic feature [**Number**:PL] being assigned to the lexeme DOG. The realization of {-s} as [z] is based in [z] being the appropriate exponent of the feature [**Number**:PL]. However, the exponent used for the phonological projection will be phonological rather than phonetic. The reason for this is that the choice of exponent is seen as based on phonological context[11], rather than as a part of lexemes.

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[11]at least for phonologically caused allomorphy. Morphologically caused allomorphy can be explained by a morpheme's position within the morphological projection.

Additionally, in order to account for phonological rules applying intersyllabically or at the end or beginning of syllables, the phonological projection needs to be able to display the allocation of morphs into syllables. There are some discussions in phonology as to how syllabic borders are drawn. One approach is the sonority sequencing principle, which Clements (1990, 289) proposes to govern syllabification in lexical phonology according to principles of core syllabification sensitive to sonority constraints. However, as Henke, Kaisse &Wright (2012, 97) point out, the SSP is problematic, as it makes wrong predictions and needs several additional constraints to prevent that and instead they argue for perceptual sequencing, based on "the maximization of perceptually recoverable strings" (ibid., 67).

Furthermore, van de Vijver & Baer-Henney (2012, 215) point out, that "knowledge of sonority can or may come from the lexicon [,...]". This means that the syllabification process (SP) displayed for a complex word needs to be able to account for general principles guiding syllabification as well as language specific phenomena. Since this work is mainly concerned with word-formation morphology, no further specifications of the exact inner workings of the syllabification process are made.

The phonological projection works as follows: The phonemes of the lexemes and affixes involved are combined in the same order as the affixation takes place in the morphological projection. The exponents of the features encoded in a word's core are chosen by morphological context. With each string of phonemes combined, a language's phonological rules can apply where a context is created. When all elements of a word have been combined to a single string of morphemes, the number of syllables σ is decided during the syllabification process. The output of the SP are one or several syllables, where the syllable carrying the main lexical stress is written as Greek upper case sigma Σ and all other syllables are written as lower case Greek σ. The phonology of each syllable is then repeated and remaining phonological rules dependent on the position of morphemes within syllables apply, resulting in a final phonetic notation.

Figure 13 on the followinjg page illustrates the phonological projection for the first and third person singular indicative present tense forms of the German verb *bleiben* 'to remain, to stay', which are *bleibe* and *bleibt* respectively.
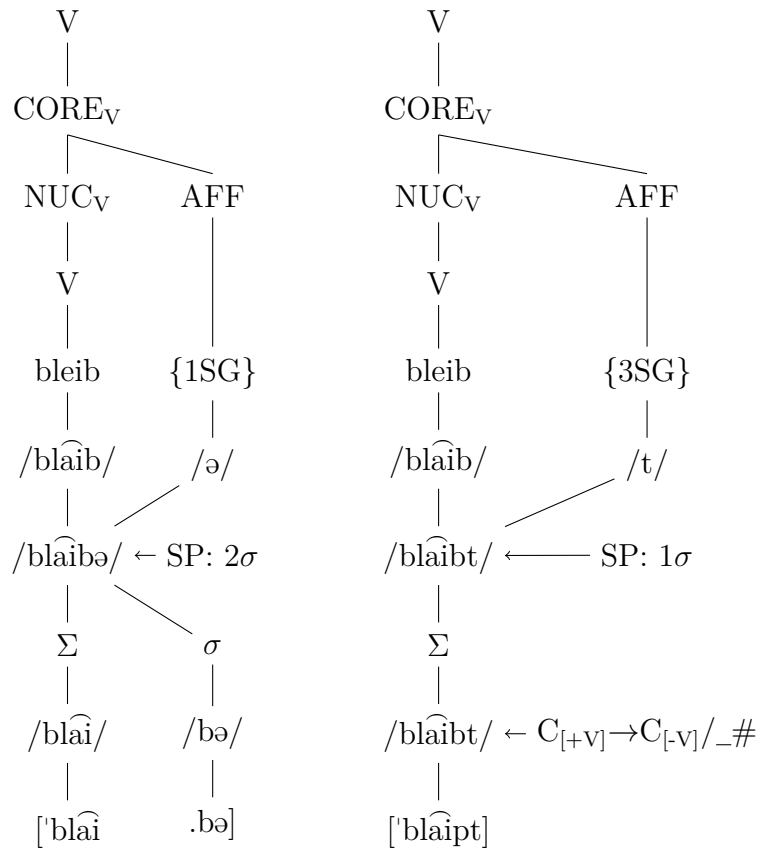
Figure 13: Morphological and phonological projection in German

The first step in the phonological projections illustrated above is the retrieval of the phonology of the lexeme *bleib* from the lexicon, as well as the exponents of [Person: 3SG] and [Person: 1SG] respectively. The second level displays the combined morphology of the word form, which is displayed as a single string of phonemes. Since they have not created a context to which phonological rule could apply, the individual phonemes remain unchanged so far.

The syllabification process uses the string shown on the second level of the phonological projection as input and puts out two syllables and one syllable for *bleibe* and *bleibt* respectively on the third level. On the fourth level each syllable's phonology is given. Neither of the two syllables of *bleibe* are a context for phonological rules, resulting in an unchanged phonetic output on the fifth level. The single syllable of *bleibt* however undergoes a phonological change, since final voiced obstruents are devoiced in German. The phonological rule $C_{[+V]} \rightarrow C_{[-V]}$ / _σ, which is read as "a voiced consonant becomes a voiceless consonant when at the end of the syllable[12]", is applied, displayed by an arrow from the phonological rule to the syllable to which it is applied. This results in the changed phonetic output on the fifth level.

The phonological projection will also be of relevance, when discussing what Plag (2003, 116 ff.) calls "prosodic morphology", on which word-formation processes like truncation or blending are based. Since this work is concerned with word-formation, the interaction between the constituent and the phonological projections will be left for future research. This includes a graphic representation of the relation between intonation and phonology, especially lexical stress.

The phonological projection can be used in conjuncture with the prosodic projection put forward by O'Connor (2008), whose scope is an entire sentence rather than a single word. The prosodic projection can be seen as the syntax-level mirror equivalent to the word-level phonological projection. His prosodic word node ω (ibid., 235) could be seen as the mirror position to a word-node in the morphological projection and to the phonetic node in the phonological projection. However, for lack of relevance to word-internal processes, no formal way of displaying the interaction between the two will be proposed in this work.

As for the relation between pragmatics and morphology, this works assumes the reason for interpreting the output of a word-formation process as having a certain reading to be stipulated by the Principle of Parsimony. It explains the choice of reading by the amount of unsatisfied yet consistent presuppositions, claiming that the reading with the least amount will be one chosen by the addressee (cf. Crain & Hamburger, 1992, 392).

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[12]Technically it is not a syllable's last consonant that is devoiced but every consonant in the syllable's coda.

This process is different from the reinterpretation of lexical category the conversion process has been described as above. The change in lexical category is stipulated by syntactic expectations about which lexical category can be used to form a grammatical sentence. The choice of reading by the principle of parsimony assumes that the expression in question is part of a grammatical statement, but has different possible meanings of which the least infelicitous one is chosen. This can be exemplified by the German subjugated clause *um ein Schreiben über das Schreiben zu schreiben* 'in order to write a paper (something written) about (the process of) writing'. *Schreiben* occurs three times, twice as a noun modified by an indefinite and definite article respectively, and once as a verb with infinitive marking. Both nominal uses are in a syntactic positions, where they'd need to be analyzed as nominals, in order to form a grammatical statement.

The reading chosen for both nominals however, is based on the amount of additional presuppositions the perceiver would have to assume to be true in order to interpret the statement. Assuming the second, definite "Schreiben" to refer to the process of writing is one presupposition less than assuming it refers to a letter to which a response is written, whose existence would need to be presupposed. This only holds true as long as "the letter" is brand-new unanchored information (cf. Lambrecht, 1994, 105-109). When the existence of a letter has been established in prior communication, the reading as "letter" does not produce the infelicitous statement it would otherwise.

The semantic output of conversion processes based on the number of presuppositions remains a vague description, dependent on contextual information, exacerbated by the potential non-existence of morphological information in regard to change of lexical category. Therefore proposing a graphical representation of the morphology-pragmatics interface or a contextual/presuppositional projection would exceed the scope of this work. It would need to be compatible with a graphical representation of supra-sentential discourse structures or at least which presuppositions have been invoked in previous statements.

3.6 Conclusion

All morphemes (bound and free) are assumed to have both a phonological and a semantic (derivational morphology) and/or syntactic (inflectional morphology) component, encoding incomplete logical or qualia structures and operators respectively, which interact during word-formation processes. Hybrid affixes like Indo-European comparative affixation encode both. This work makes no assumption about their metaphorically physical place within the mental lexicon (or morphicon), but offers a proposal of how to display the interactions happening during word-formation in relation to a morpheme's position within the LSW.

The LSW utilizes different projections to display the interactions between parts of a word similar to the LSC using various projections to display the interaction between parts of a sentence. The projections are the morphological projection, displaying the layered structure of the word itself, the compositional projection, displaying the semantical composition involved when combining morphemes, and the phonological projection, which displays lexical stress and the application of phonological rules.

The proposal of a syntax-morphology interface will be constricted by the principle of lexical integrity, which (to a certain extent) prohibits syntax to access information about word-internal processes.The existence of a contextual/presuppositional projection to account for interaction between pragmatics and word-formation has been assumed, although no graphical representation has been proposed.

4 German word formation processes

4.1 Introduction

The goal of this chapter is to construct formal analyses of different word-formation processes in German, which is achieved by utilizing the layered structure of the word and the projections defined in chapters 2 and 3. Furthermore, each subsection will contain a brief introduction to the German word-formation process discussed.

The main focus of analysis lies on the productive processes of derivation and compounding, contained in sections 4.2 and 4.3 respectively. The equally productive, yet morphologically and semantically vague process of conversion, will be addressed in section 4.4, alongside a discussion of non-finitely inflected verbs serving as selective inputs for conversion processes. Section 4.5 explores hybrid affix with regards to the adjective's comparative marking {-er}. Section 4.6 gives a brief conclusion.

A deeper discussion about processes such as truncation, blending and acronymization, which are morphologically (and in part phonologically) unpredictable, have been left out, due to their low relevance to an analysis of morphological processes under the premise of every morpheme encoding both semantic and phonological information.

4.2 Derivation

4.2.1 A brief introduction to derivation in German

Derivation in German is similar to derivation in English in a lot of respects. It is mostly right-headed, which means that the rightmost morpheme (the last suffix) determines the lexical category of the complex word. Prefix verbs are the exception to this, as they are left-headed. This is reflected in the morphological projection, as can be seen in figure 7, the relevant part of which is repeated in figure 14 on the following page. The verbal nucleus *ableit* 'to derive' is inside of the nominal nucleus encoded by the derivational suffix {-ung}. There is further semantic motivation for displaying derivational processes this way. Since the nominal affix is seen as an incomplete qualia structure, the information needed to complete it is the LS of the already derived verb *ableit*.

Similarly the verbal nucleus containing the predicate *leit* is contained in the verbal nucleus of the particle {ab-}. Since there is no change of lexical category, the motivation for displaying it this way is entirely semantical, with the same line of reasoning as applied to {-ung}. The prefix encodes an incomplete LS which needs another LS (the one encoded by *leit*) to be completed. The display of particle verbs like *ableiten* and how it differs from prefix verbs like *verleiten* 'to tempt, seduce' will be revised the discussion of particle verbs.

$$
\begin{array}{c}
\text{NUC}_\text{N}
\end{array}
$$
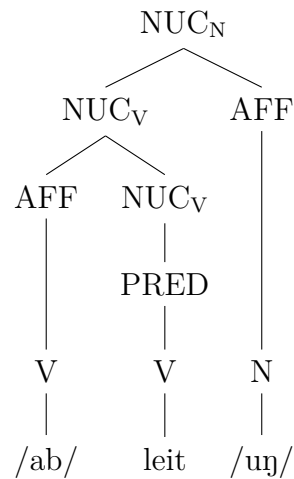
Figure 14: Nucleus of the word *Ableitung* 'derivation'

Derivational suffixation in German rarely changes a word phonologically in the way it does in English (as exemplified by *curious* ['kjʊəriəs] vs. *curiousity* [kjʊəri'ɒsəti]). This relieves the phonological projection (at least for German) of the necessity to formally represent phonological changes apart from those taking place between phonemes and syllables and shifts in lexical stress.

The range of lexical categories to which and from which lexemes can be changed in German is almost equivalent to English derivation, with the exception of German permitting V→V derivation in restricted contexts. Nominal and adjectival derivations are more productive than verbal ones (cf. Kaupp, 2009, 9).

Additionally, there are constraints on derivation in German, as some nominal suffixes prohibit further suffixation. These are similar to {-ee} and {-ess} in English (cf.Aronoff & Fuhrhop (2002, 455;469)) and it is necessary to formally differentiate between derivational suffixes permitting further derivation and suffixes that don't, either in the morphological or the compositional projection. Verbal prefixes may also restrict further prefixation.

Alternatively, said phenomenon could be a result of a lack of suffixes, whose incomplete QS/LS is compatible with the output of such a derivation. This approach abandons the proposal of a morphological constraint in favor of a semantically motivated explanation. Until a case is found, in which a suffix's incomplete QS/LS should be able to be combined with the output of a derivation but actually is not, there is no reason to assume a morphological constraint, since there would be no morphemes to which the constraint would apply.

However, the phenomenon could be caused neither by a morphological constraint nor by QS/LS incompatibility. The third possible cause could be a stem/root incompatibility, which would necessitate a theory internal differentiation of stem and root.

With a few exceptions, most derivational prefixation in German is either verbal or results in verbs. There are three different classes of prefixed verbs in German: prefix verbs, particle prefix verbs, and particle verbs (cf. Römer & Matzke (2005, 85 - 88) & Altmann & Kemmerling (2005, 77 ff.)). Prefix verbs are derived with "regular" prefixes, for which there is no homophonous preposition, and are stressed on the verbal root/stem. Particle verbs are derived from particles. Particles have homophonous prepositional and/or adverbial counterparts, but may drastically differ from them in meaning. They behave like derivational prefixes in terms of their lack of predictability of meaning and the complex words they produce will always be stressed on the particle. They also differ in their syntactic behavior, as the position of the particle in relation to its base verb depends on the syntax of the sentence in which they occur, as illustrated in examples (3) to (8) below.

(3)   Sie können das Telefonbuch zerreißen

sie	*könn*	*-en*	*das*	*Telefonbuch*	*zer-*	*REIß*	*-en*
3PL	can	-3PL	DET.DEF	phone.book	to.pieces-	tear	-INF

'they can tear apart the phone book'

(4)   Sie zerreißen das Telefonbuch.

sie	*zer-*	*REIß*	*-en*	*das*	*Telefonbuch*
3PL	to.pieces-	tear	-INF	DET.DEF	phone.book

'they tear apart the phone book'

(5)   , um das Telefonbuch zu zerreißen

um	*das*	*Telefonbuch*	*zu*	*zer-*	*REIß*	*-en*
in.order.to	DET.DEF	phone.book	to	to.pieces-	tear	-INF

'in order to tear apart the phone book'

(6)   Die Firma muss das Gebäude abreißen.

Die	*Firma*	*muss*	*das*	*Gebäude*	*AB-*	*reiß*	*-en*
DET.DEF	company	must	DET.DEF	building	down-	tear	-INF

'the company must tear down the building'

(7)   Die Firma reißt das Gebäude ab

Die	*Firma*	*reiß*	*-t*	*das*	*Gebäude*	*AB*
DET.DEF	company	tear	-3SG	DET.DEF	building	down

'the company tears down the building (the company tears the building down??)'

(8)   , um das Gebäude abzureißen

um	*das*	*Gebäude*	*AB-*	*zu-*	*reiß*	*-en*
in.order.to	DET.DEF	building	down-	to-	tear	-INF

'in order to tear down the building (in order to the building down to tear*)'

The prefix {zer-} of the prefix verb *zerreißen* 'to tear apart' in the examples (3) to (5) remains attached to its base lexeme, independent of the syntactic context. It will always be stressed on the root, never on the prefix. The particle {ab-} of the particle verb *abreißen* (to tear down), appears in different positions in different syntactic contexts. When the particle verb has infinitive (6) marking, the particle is prefixed to the base lexeme. In contrast to its prefix verb counterpart, it is always the particle that is stressed, never the root. When the particle verb is finite (7), the particle will appear in the final position of the clause. In subordinated constructions (8) it is prefixed to the augmented infinitive *zu*, which is prefixed to the root.[13]

Furthermore, particle verbs can form the past participle with {ge-}, while prefix verbs cannot, as illustrated in examples (9) and (10) below.

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[13]The augmented infinitive marker {zu} has also been analyzed as a clause linkage marker in subsection 2.3.1. The two analyses are not mutually exclusive, since the analysis as augmented infinitive defines its function in the morphological projection, and the analysis as a clause linkage marker defines its function in the constituent projection.

(9)   Sie haben das Telefonbuch zerrissen

sie	*hab*	*-en*	*das*	*Telefonbuch*	*zer-*	*riss*	*-en*
3PL	AUX	-INF	DET.DEF	phone.book	to.pieces-	tear(PAST)	-PRTCPL

'They tore apart the phone book'

(10)   Die Firma hat das Gebäude abgerissen

Die	*Firma*	*hat*	*das*	*Gebäude*	*AB-*	*ge-*
DET.DEF	company	AUX(3SG)	DET.DEF	building	down-	PRTCPL-

riss	*-en*
tear(PAST)	-PRTCPL

'The company tore down the building'

Particle prefix verbs are "derived" from particles, where the particles are synonymous with the preposition with which they are homophonous, and will be stressed on the base verb. Like regular prefixed verbs, they will always appear attached to their base lexeme, independent of syntax. Lexical stress minimal pairs of particle prefix verbs and particle verbs are very common.

(11)   Sie müssen das Hindernis umfahren

sie	*müss*	*-en*	*das*	*Hindernis*	*um-*	*FAHR*	*-en*
3PL	must	-3PL	DET.DEF	obstacle	around-	drive	-INF

'they must drive around the obstacle'

(12)   Sie umfahren das Hindernis.

sie	*um-*	*FAHR*	*-en*	*das*	*Hindernis*
3PL	around-	drive	-INF	DET.DEF	obstacle

'they drive around the obstacle'

(13)   , um das Hindernis zu umfahren

um	*das*	*Hindernis*	*zu*	*um-*	*FAHR*	*-en*
in.order.to	DET.DEF	obstacle	to	around-	drive	-INF

'in order to drive around the obstacle'

(14)   Sie haben das Hindernis umfahren

Sie	*haben*	*das*	*Hindernis*	*um-*	*FAHR*	*-en*
3PL	AUX(3PL)	DET.DEF	obstacle	around-	drive	-PRTCPL

'They drove around the obstacle'

(15) Sie haben das Hindernis umgefahren

Sie	*haben*	*die*	*Baustelle*	UM-	ge-	*fahr*	-en
3PL	AUX(3PL)	DET.DEF	obstacle	OVER-	PRTCPL-	drive	-PRTCPL

'They ran over the obstacle'

Since particle prefix verbs will be treated as preposition + verb compounds and not as the result of a derivational process, they will not be discussed in this section. A more thorough discussion on particle prefix verbs and particle verbs can be found in subsection 4.5.2.

A discussion about loan-word specific derivation will be held brief, due to the inherent problematic of defining the borders between affixes and their base lexeme for non-native lexemes as illustrated by Seiffert (2009, 21). The Latin root *inform* in *informieren* is not a word of the German language. It only appears in combination with loan suffixes as in *Information* 'information' and *informativ* 'imformative'. These morphemes are traditionally called confixes (cf. Donalies, 2011, 12-15). They differ from cranberry morphemes in regard to their semantic content. They encode some information known to speaker/perceivers, which can be exemplified by the confix {bio-}, which can be combined freely with native lexemes as in *Bioladen* 'whole foods store', *Biobauernhof* 'organic farm' and *Biogemüse* 'organic vegetables'. Hoppe & Link (1999, 4) group confixes like {bio-} and {audio-}, {video-} together, separating them from loan prefixes like {prä-}, {post-}, {inter-}, {mega-}, {ex-} and {neo-}.

A thorough analysis of the exact differences between these two classes would require a detailed analysis of diachronic processes involving loaning of affixes and affix-turned words (eg. {ex-} from the Latin preposition ex 'out (from), outside (of)' & {mega-} from the Greek adjective μεγα mega 'big'). As Hoppe & Link (ibid., 8) point out, many loan words have not been loaned directly, but have been formed using loan word formational processes, they call a "secondary German word formation system". It applies to all processes in which at least one loan element is involved and it follows regular word formation patterns and regularities partially.

Therefore a deeper discussion about confixes and loan word formation in German will be held brief. Some loan prefixes are confined to word-formation involving loan words, will be briefly mentioned. In cases where they fulfill the same role as native affixes do with native lexemes, with the only difference being their confinement to loan words, they will not receive separate analyses. Differences in their morphological behavior are mentioned where necessary, however a proper investigation into the patterns of loan word formation exceeds the scope of this work and requires its own investigation. Furthermore, much information concerning their semantic interaction during word-formation processes may be distorted by lexicalization.

4.2.2 Derivational Prefixes

This subsection contains analyses and formal representations of derivational prefixation in German. Some derivational prefixes in German change the lexical category of the word they attach to, indicating that they are left-headed structures, where as others cannot, indicating right-headedness.

It has been partitioned into four paragraphs, which focus on prefix verbs (4.2.2.1), particle verbs (4.2.2.2), and the differences between the two (4.2.2.3). Paragraph 4.2.2.4 focuses on right-headed prefixes which do not alter lexical categories.

4.2.2.1 Prefix verbs

This paragraph focuses on German prefix verbs, proposing an RRG analysis of the word-formation process involved in creating them. This is achieved in several steps. The first one is to determine the prefixes' place in the morphological projection and by comparison propose a morphological template. Then one or several common readings of a prefix with each lexical category will be analyzed in order to determine, whether it is entirely predictable and thus possible to deduce its incomplete meaning(s). Selected words will then be displayed in the compositional projection. Finally, a generalized phonological projection of verbal prefixation in German will be given, with the goal of displaying the lexical stress they regularly produce.

According to Donalies (2011, 24) the most productive native derivational prefixes in German are {zer-}, {er-}, {ver-} and {be-} and {ent-}. While most of them are semantically relatively consistent yet not entirely predictable, the meaning conveyed by{er-} is less transparent. Their morphological projections when prefixed to the word *legen* [**do**'(x, **put'**(x,y))] CAUSE [BECOME **be.LOC'** (y,z)], are represented in the figures 15 and 16 on the following page.

The resulting derivations are: *zerlegen* 'to put apart, dismember, colloquially: rip to shreds'; to decompose, analyze', *erlegen* 'to slay, bring down game', *verlegen* 'be embarrassed, shy; to fit carpet; to relocate, reschedule' and *belegen* 'to prove, verify; to enroll in, register for; to garnish'.
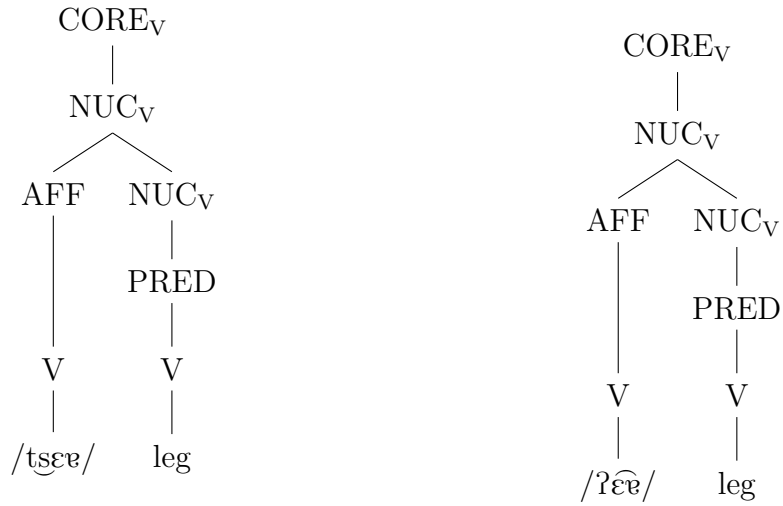
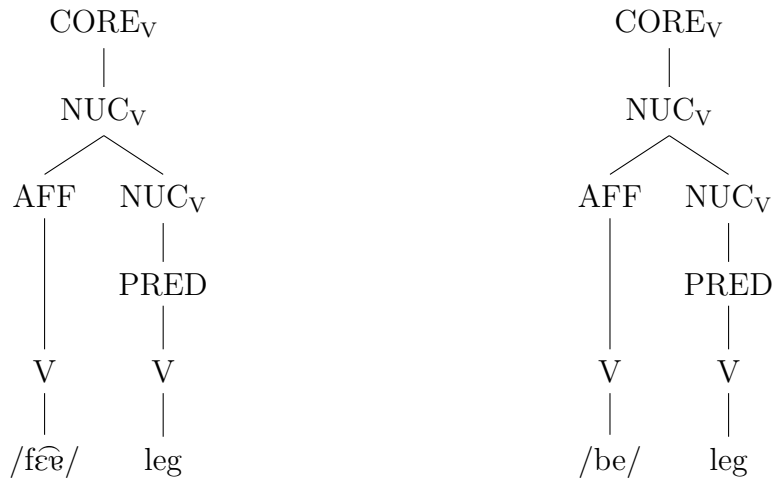Figure 15: Morphological and compositional projections of *zerlegen* and *erlegen*

Figure 16: Morphological and compositional projections of *verlegen* and *belegen*

As figures 15 & 16 show the morphological projection is the same for all four prefixes. This work follows the approach taken by Olsen (1991, 341), who argues for these structures to be left-headed. Indications for this are complex verbs such as *befreunden* 'befriend' and *begrünen* 'to plant greenery, to green' for {be-}, which turns the noun *Freund* 'friend' and the adjective *grün* 'green' to verbs. Examples for {-er} are *erstarken* 'become strong' from *stark* 'strong' and *erkunden* 'to scout' from *Kunde* 'archaic: information; modern: customer'.

{ent-} turns the noun *Fleisch* 'meat, flesh' into the verb *entfleischen* 'to deflesh' and the adjective *blöd* 'stupid' to *entblöden* 'to make not be stupid'. The noun *Glas* 'glas' and the adjective *arm* 'poor' when prefixed with {ver-} turn into the verbs ver*glasen* "to glaze, to vitrify' and *veramen* 'to impoverish' respectively. The prefix {zer-} changes *Beil* 'cleaver' to *zerbeilen* 'to cleave to pieces' and *klein* 'small' to *zerkleinern* 'make smaller (pieces)'.

The morphological template proposed for left-headed derivational prefixes in German is displayed in figure 17 below. Since verbal prefixes in German can attach to different lexical categories, the lexical category of the base is left general and displayed as W.

$$\begin{array}{c}
\text{CORE}_V \\
| \\
\text{NUC}_V \\
\diagup\diagdown \\
\text{AFF} \quad\quad \text{NUC}_W \\
| \quad\quad\quad\quad | \\
V \quad\quad\quad\quad W \\
| \quad\quad\quad\quad | \\
\text{affix} \quad\quad \text{word}
\end{array}$$
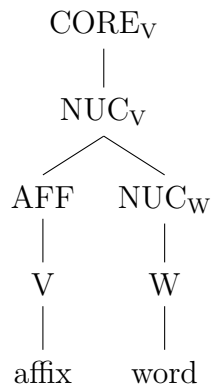
Figure 17: Morphological template for left-headed derivation

The prefixation of {be-} to nouns is highly productive. Löbner (2002, 14) also gives the examples *bebüchern* 'to fill with books' from *Buch* 'book', *bebildern* 'to illustrate' from *Bild* 'picture' and *beschriften* 'to label, annotate, inscribe' from *Schrift* 'writing'. The prefixation to adjectives is highly productive as well. Besides *begrünen* Donalies (2011, 89) names (amongst others) *befreien* 'to liberate' from *frei* 'free', *beruhigen* ' to soothe' from *ruhig* 'quiet, calm' and *befähigen* 'to enable' from *fähig* 'able'.

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The meaning of the prefix {be-} is highly dependent on the lexical category it is attached to. When prefixed to verbs, it generally functions as an applicative marker, turning an oblique argument into the undergoer. For intransitive verbs this means adding an argument. Examples for this are *belächeln* 'to deride, sneer at something' from *lächeln* 'to smile', *belügen* 'lie to someone' from *lügen* 'to lie' and *beleuchten* 'to illuminated' from *leuchten* 'to shine'. Colloquial examples include *betanzen* 'to dance with someone' from tanzen 'to dance', *beschlafen* 'sleep with someone' from *schlafen* 'to sleep' and *betrampeln* 'trample on something' from *trampeln* 'to trample'. This can also include a reflexivization, as exemplified by *sich betrinken* 'to get drunk' from *trinken* 'to drink', where actor and undergoer are the same argument ([**do'** (x, **drink'** (x))] CAUSE [BECOME **be.drunk'** (x)]).

For transitive verbs the undergoer argument is substituted by a previous non-argument. An example of this is given in the word *belegen* with the reading 'to garnish'. In the sentence *Sie legten Käse auf das Brot* 'They put cheese on the bread', *Käse* 'cheese' is the undergoer. When using the prefixed version as in *Sie belegten das Brot mit Käse* 'They garnished the bread with cheese' *Brot* 'bread' is the undergoer. [**do'** (they, **put'** (they, cheese))] CAUSE [BECOME **be.on'** (cheese, bread)] vs. [**do'** (they, **put'** (they, cheese))] CAUSE [BECOME **be.garnished'** (bread)]. This pattern can also be found with the ditransitive pair *schenken / beschenken* 'to gift' resulting in constructions similar to the dative shift in English. *Sie schenkten dem Hund einen Ball* 'They gifted a ball to the dog' and *Sie beschenkten den Hund mit einem Ball* 'they gifted the dog with a ball'. Since the applicative behaves like the passive in that both change a verb's valency by change of its argument structure rather than a (clear and consistent) change of its LS, displaying {be-} as an incomplete LS alone seems as unfitting as it does for the passive[14]. Given that the applicative changes argument linking within an LS instead of consistently adding the same semantic component to the argument structure, no incomplete LS will be proposed for {be-} when prefixed to verbs.

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[14]A point irrelevant for German, since passive is formed analytically, but relevant for languages with inflectional voice operators.

However, when prefixed to adjectives it consistently introduces an actor argument and causation to the adjective's LS. This is exemplified by the verbs *begrünen* and *befreien*, where their respective LSs **green'** (x) and **free'**(x) result in [**do'** (x)] CAUSE [BECOME **green'**(y)] and [**do'** (x)] CAUSE [BECOME **free'**(y)]. A generalized incomplete LS for {be-} when prefixed to adjectives can be deduced to be **do'** (x) CAUSE [BECOME α]. An example can be found for this in the verb *beengen* 'to restrict' from *eng* 'narrow'[15]. Figure 18 below displays the morphological and compositional projections of *begrünen* and *befreien*.
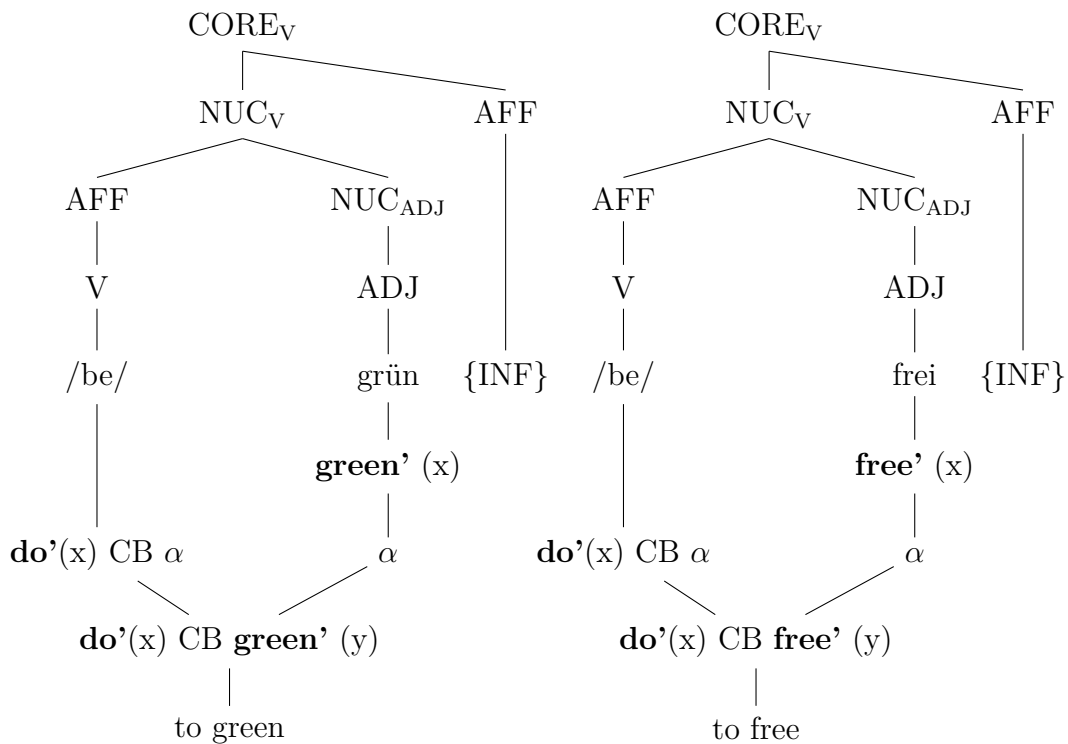
Figure 18: Morphological and compositional projections of *begrünen* and *befreien*

Verbs resulting from nouns prefixed with {be-} behave in a similar fashion. They are always transitive and introduce the entity the noun is referring to as a part of the logical structure of the complex word. The verb *befreunden* 'to befriend' can be displayed as [**do'** (x, Ø)] CAUSE [BECOME **be.friends'** (x, y)] and *bebüchern* can be displayed as [**do'** (x, Ø)] CAUSE [BECOME **books.be.on'** (y)].

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[15]This exception can be explained by lexicalization. There is a semantic connection between a restriction and something being metaphorically narrow, as restrictions narrow down the range of possible choices.

A further example of this is *bedachen* 'to roof' from *Dach* 'roof' with the LS [**do'** (x, Ø)] CAUSE [BECOME **be.roofed'** (y)]. Problematic for this approach is the LS of the verb *bewaffnen* 'to arm' from *Waffe* 'weapon'. Arming a soldier means causing the soldier to have a weapon with the LS [**do'** (x, Ø)] CAUSE [BECOME **have'** (soldier, weapon)].

However, a problem for this approach is the possibility to further specify the argument contributed by the head noun. Both *Sie bebücherten das Regal mit Linguistikbüchern* 'they filled the shelve with linguistics books' and *Das Volk bewaffnete sich mit Fackeln und Mistgabeln* 'the people armed themselves with torches and pitchforks' are grammatical sentences in German. In the first sentence *Linguistikbücher* specifies the books involved in the process of filling the shelve with books. Any argument not fitting into the category BOOK produces a semantically strange result, as exemplified by *?Sie bebücherten das Regal mit Tassen* 'they book-filled the shelve with cups'[16]. The LS of *bebüchern* when specified by *Linguistikbücher* is [**do'** (x, Ø)] CAUSE [BECOME **books$_i$.be.on'** (y, z$_i$)]. The oblique argument encoding which kind of books are placed into the shelve is coindexed with the **books** part of the LS, to signify coreference.

In the second sentence the weapons involved in arming someone are not only specified to be torches and pitchforks, it involves an implied weaponization of the objects specifying the process. Not only are torches and pitchforks not usually used as weapons (at least it is not their main purpose), *bewaffnen* can be specified by almost anything as in *Sie bewaffneten sich mit Stöcken und Steinen* 'they armed themselves with sticks and stones'. The LS of a specified *bewaffnen* is [**do'**(x, Ø)] CAUSE [BECOME **have.weapons$_i$'** (y, z$_i$)].

This points towards the readings of {be-} when used with nouns as the LS of [**do'**(x, Ø)] CAUSE [BECOME **α$_i$.be(α)'**(y, z$_i$). **be** is displayed as a function over α because the particular instance of **be'** (**be'**, **be.on'**, etc.) is dependent on the base noun.

---

[16]This sentence is syntactically ambiguous, as the shelve being filled with books could have cups on them, in which case the sentence is grammatical

The prefix {er-} has several meanings when used with verbs. In complex verbs like *erwürgen* 'to strangle to death' from *würgen* 'to strangle' and *erschießen* 'to shoot dead' from *schießen* 'to shoot' it adds the semantic information that an action has been done to completion. The LSs of *würgen* and *erwürgen* are **do'** (x, **strangle'** (x,y) and **do.to.completion'** (x, **strangle'** (x, y)). However, .strangling someone to completion means causing them to be dead, therefore this reading of {er-} can also be analyzed as causativizing activities, resulting in the LS [**do'** (x, **strangle'** (x,y))] CAUSE [BECOME **dead'** (y)] for *erwürgen*. Since doing something to completion entails a change of state, the generalized incomplete LS for this reading can be given as α CAUSE [BECOME **state(α)'** (y),] where.the resulting state is dependent on the semantics of the base verb.

Donalies (2011, 92) names a reading of {er-} encoding an upward or outward direction with verbs, originating from its historic origin {ur-}. Two examples she gives is *sich ergießen* 'to gush' from *gießen* 'to pour' and *errichten* 'to erect, to build' from *richten* 'to adjust', where the directionality is relatively clear. However, her examples *erspüren* 'to sense, feel out' and *erlösen* 'to redeem, to relase' from *spüren* 'to feel, to sense' and *lösen* 'to loosen, to detach' respectively, as well as *ergeben* 'to surrender, give up' from *geben* 'to give', encode a metaphorical directionality at best. Her example of *erbauen* 'to build, construct' from *bauen* 'to build construct' may involve upward directionality, which seems to be a conventionalized reading, since it is possible to use *erbauen* to describe the construction of a tunnel (which involves a downward an inward direction) as well. Since this reading requires diachronic analysis and may involve lexicalization or conventionalization of semantic components, no specific LS will be given for this reading.

The third reading of {er-} when prefixed to verbs is ingressive, denoting the starting point of an action. Examples for this use include *erscheinen* 'to (suddenly) appear, emerge, manifest' from *scheinen* 'to seem, appear (to be)' and *erblühen* 'to blossom' from *blühen* 'to bloom'. The LS of this reading is INGR α. Figure 19 on the following page displays the morphological and compositional projections of *erblühen*.

```
                          CORE_V
                         /      \
                    NUC_V        AFF
                   /     \         |
               AFF        NUC_V     |
                |           |       |
                V          PRED     |
                |           |       |
              /ʔɛ͡ɐ/         V     {INF}
                |           |
                |         blühen
                |           |
                |       bloom' (x)
                |           |
            INGR α         α
                  \       /
              INGR bloom' (x)
                     |
              to start blossoming
```
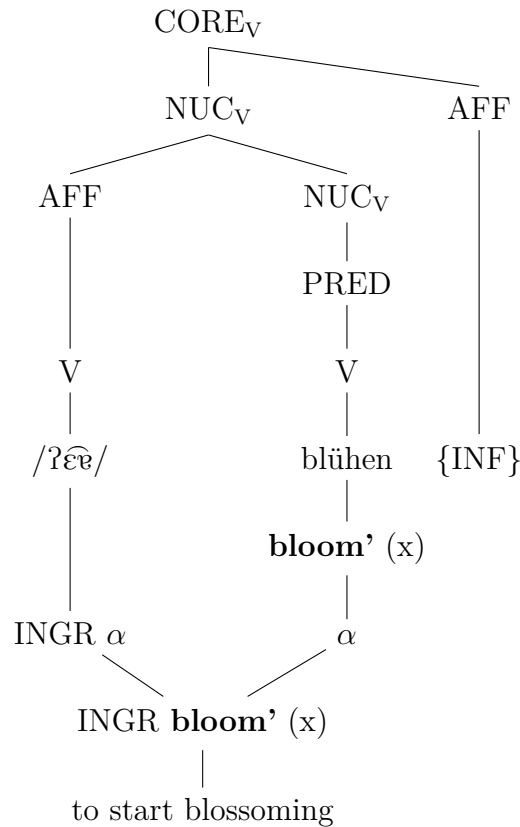
Figure 19: Morphological and compositional projections of *erblühen*

Additionally, there is a reflexive reading, denoting the achieving of something by the actor, as in *Der Stuntpilot hat sich den Pokal erflogen* 'the stunt pilot earned the trophy by flying' with the LS [**do'** (stunt pilot, (**fly'** (stunt pilot))] CAUSE [BE-COME **earn'** (stunt pilot, trophy)]. This use is highly restricted by compatibility between the LS of the base verb and the agentive qualia of the noun denoting the actor. A stunt pilot, whose Q_A is **do'**(x, **fly'**(x)) can only win a trophy by flying, not by any other action.

When prefixed to adjectives {er-} denotes a change of state towards the state encoded by the base adjective. The verbs *erfrischen* 'to freshen, refresh' from *frisch* 'fresh' and *ergrünen* 'to green' from *grün* 'green' encode that the undergoer becomes fresh and green respectively. The complex verbs may be S-transitive like *erfrischen* or S-intransitive like *ergrünen* (which is restricted to third person inanimates).

The use of {er-} with nouns is quite rare and can denote an instrumentalization of the base noun. The verb *erdolchen* 'to fatally stab someone with a dagger' from *Dolch* 'dagger' is an example for the first reading, which involves the change of state (due to completion) as well. Another reading is displayed in the partially lexicalized *ekunden* 'to scout' from *Kunde* 'archaic: information', which denotes the action of gathering information.

The prefix {-ent} can have several readings. When attached to verbs it commonly results in a privative reading. Examples for this are *entnehmen* 'to take from, to remove' from *nehmen* 'to take', *entreißen* 'to wrest (from)' from *reißen* 'to tear, to yank' and *entsperren* 'to unlock, to unblock' from *sperren* 'to lock, to block'. The generalized incomplete LS for this reading is α CAUSE [BECOME **be.removed'** (y, (z))]. Someone who takes something (y) from a place (z) causes it to be removed by taking it. Wresting something from someone causes it to be removed by yanking it forcefully. Unlocking a door means causing the lock to be removed [17]. Note that the z argument is optional, as *entsperren* is transitive whereas *entnehmen* involves three arguments: The person taking something, the thing taken and the place from which it is taken. Figure 20 on the following page displays the morphological and compositional projections of entnehmen.

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[17]Rather the state of being locked than the actual locking mechanism itself. The action performed during locking and unlocking a door is the same, usually turning a key in a lock, but the results are opposites of each other.
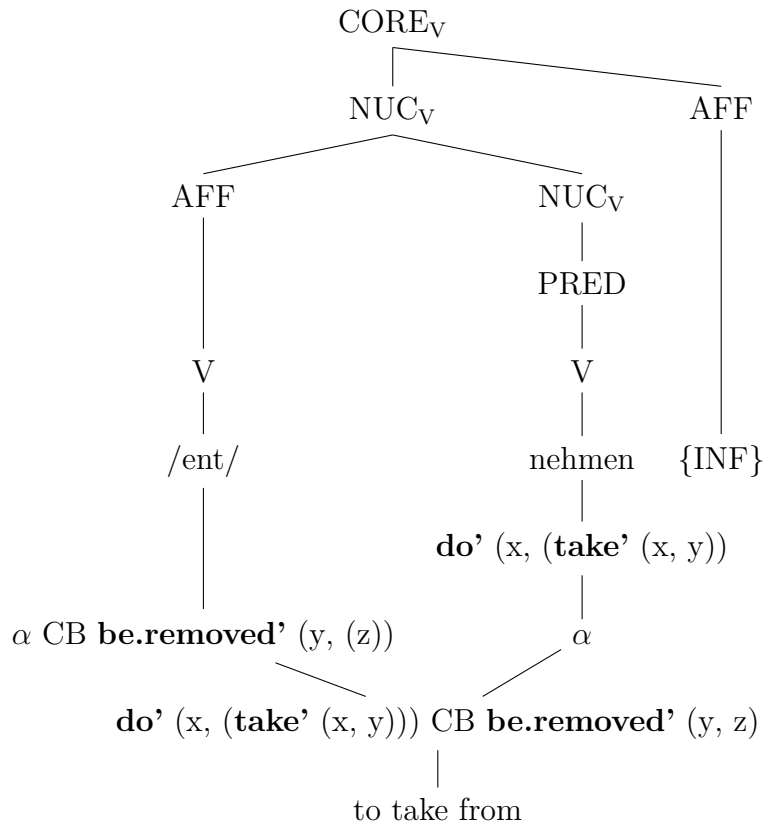
Figure 20: Morphological and compositional projections of *entnehmen*

The verb *entladen* constitutes a problem for this apporach, as it does not require the information what is being unloaded but encodes the argument from where something is unloaded. Its argument structure resembles the one of the applicativized *beladen* rather than the one of *laden*. This is unsurprising, as *entladen* is the opposite action of *beladen*. As Donalies (2011, 90) notes, this reading of {ent-} also expresses the cancellation of a previous action. The argument structure in this reading therefore seems to be instigated by the action canceled and not the base verb alone.

A similar reading to the one described above is the (physical or metaphorical) movement away from something. *Entführen* 'to abduct' from *führen* 'to lead' means to (forcefully) lead someone away from someone. This may involve an ingressive reading, as illustrated by *entschlummern* 'to fall asleep' from *schlummern* 'to slumber', where the moment of falling asleep is an instantaneous change of state from being awake, while slumbering is a process.[18]

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[18]As Donalies (2011, 90) notes for the similar *entschlafen* 'to fall asleep, to pass away' from *schlafen* 'to sleep', a person falling asleep is removing themself from the world, sleeping.

There are also many lexicalizations, where the semantics of either {ent-}, its base verb, or the lexeme as a whole has changed too much over time to induce a clear relation between its semantics and its components' semantics. Examples for this include *entsorgen* 'to dispose of' from *sorgen* 'to care for, cater to' and the second reading of *entgehen* 'to avoid, to miss out on'.

When prefixed to nouns the meaning of removing something arises. The difference is, that the resulting verbs will always be transitive. This is because the incomplete LS of {ent-} integrates a QS as an argument, rather than a whole LS with potentially more than one argument. Examples for use with nouns are the verbs *entgräten* 'to debone (a fish)', *enthaupten* 'to behead' and *entfleischen* 'to deflesh' from *Gräte* 'fishbone', *Haupt* 'archaic: head' and *Fleisch* 'meat, flesh'. The incomplete LS of denominal {ent-} is [**do'** (x, Ø)] CAUSE [BECOME **removed'** (Qα)].
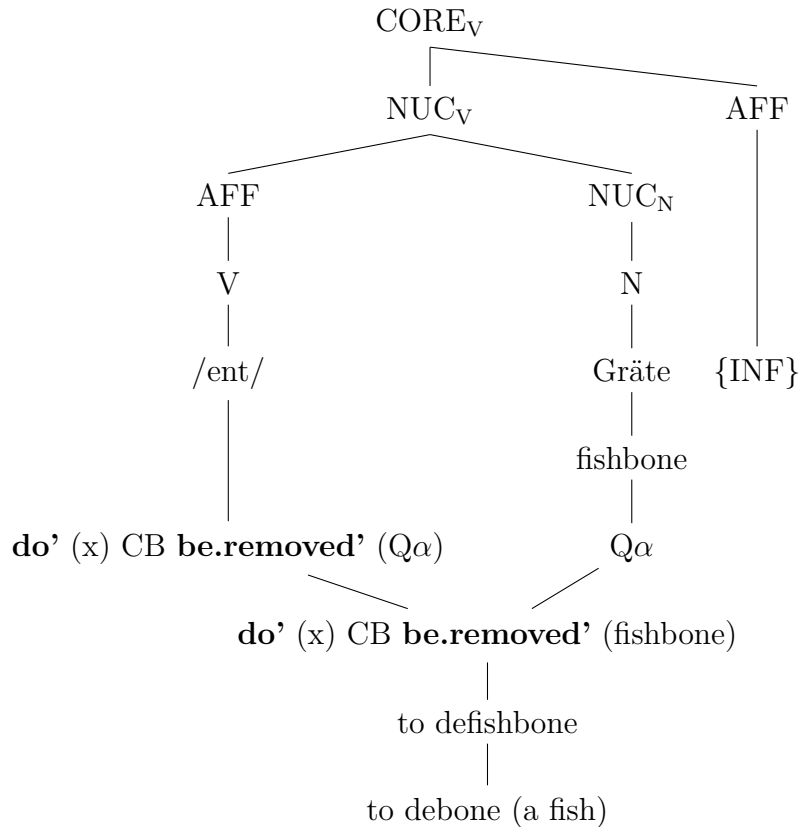
Figure 21: Morphological and compositional projections of *entgräten*

Figure 21 on the previous page displays the morphological and compositional projection of *entgräten*. Since the entire set of qualia of the base noun is integrated into the argument structure and no single qualia is changed, a representation of the whole qualia structure of *Gräte* has been omitted in favor of the English word with the same qualia structure.

When prefixed to adjectives, the resulting verb denotes the action of removing the quality described by the base adjective. *entstaatlichen* 'to denationalize' from *staatlich* 'national' refers to the process of causing something to be not national anymore. The incomplete LS of {ent-} when prefixed to adjectives is [**do'** (x, Ø)] CAUSE [BECOME ¬α]. Since the result of changes of states are states, it is unsurprising that this reading is restricted to adjectives, as their logical structures generally express states. The morphological and compositional projection of *entstaatlichen* is illustrated in figure 22 below.
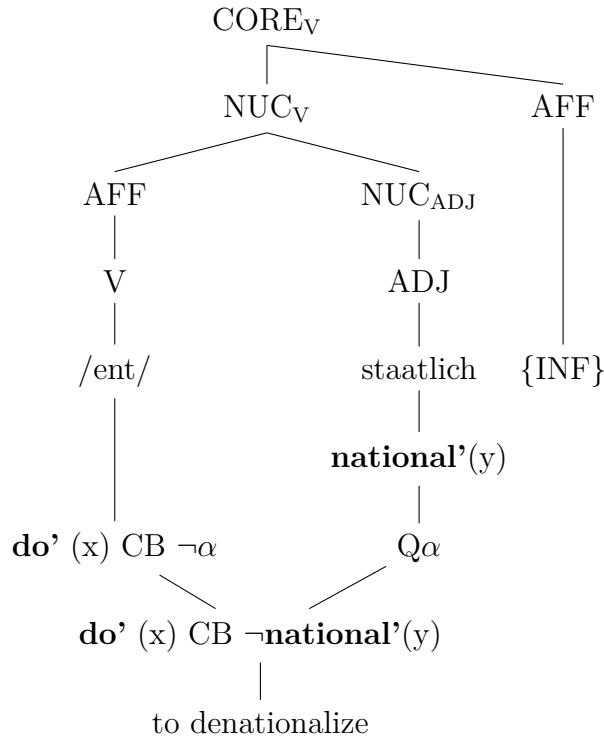

Figure 22: Morphological and compositional projections of *entstaatlichen*

53

The possible range of meanings of the prefix {ver-} when attached to verbs is extensive. It can have an ingressive meaning referring to the end point of a process, as in *verklingen* 'to fade (a sound)' from *klingen* 'to sound' (cf. Donalies (2011, 92)). It can be used to decrease a verbs valency, as exemplified by *verschenken* 'to give away (as a gift)' from *schenken* 'to gift', where the thing gifted is realized as the undergoer argument and it is not necessary to specify a recipient. An example for this is the sentence *Die Firma verschenkte Proben als Werbung* 'the company gave away samples as advertisement'.

With verbs like *verreiben* 'to levigate, to spread by rubbing' from *reiben* 'to rub' and *verschmieren* 'to blur, to spread by smearing' from *schmieren* 'to smear' {ver-} adds a result to the manner encoding base verbs. However, *verreiben* can also denote the process of rubbing something to a powder, synonymous with *zerreiben* 'to grind, to rub to pieces'. The word *vertreiben* 'to disperse, banish, drive out' from *treiben* 'to drive' displays another reading of {ver-} in which it contributes information about directionality away from the speaker.

Further there are examples, where the meaning contributed by {ver-} to its base verb is unclear, as in *versuchen* 'to try' from *suchen* 'to search' and *verschreiben* 'to prescribe' from *schreiben* 'to write'. A second reading of *vertreiben* as 'to sell, distribute goods' belongs to this category.

The most predictable meaning involves reflexivization of the base verb, as exemplified by *sich verfahren* 'to get lost driving' from *fahren* 'drive', and *sich verschreiben* 'to make a slip of the pen' from *schreiben* 'to write'. Both examples have non-reflexive counterparts, which denote something completely different[19]. Since the possible range of meanings of {ver-} prefixed to verbs is that broad, no generalized incomplete LS will be proposed here.

Deadjectival verbs derived with {ver-} are less inconsistent in meaning. They generally express a change of state towards the state denoted by the adjective. The verb *verarmen* 'to impoverish' from *arm* 'poor' means becoming poor and *vertiefen* 'to deepen' from *tief* 'deep', the structure of which is displayed in figure 23 on the following page, means to become deeper[20]. Its generalized LS is [**do'** (x, Ø)] CAUSE BECOME α.

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[19]*verfahren* 'to proceed' and *verschreiben* 'to prescribe'. Also, when the verb *verschreiben* is used reflexively and with a dative, it will mean 'to commit oneself to something'.

[20]The comparative used for *deep* is a result of entailment, since causing something to be deep entails that it is deeper than it was before. Verbs like *vergößern* 'to enlarge' from *groß* 'large' realize this entailment morphologically.

$$\text{CORE}_V$$

$$\text{NUC}_V \qquad \text{AFF}$$

$$\text{AFF} \qquad \text{NUC}_{\text{ADJ}}$$

$$\text{V} \qquad \text{ADJ}$$

$$/f\widehat{\epsilon\text{\textturnv}}/ \qquad \text{tief} \qquad \{\text{INF}\}$$

$$\textbf{deep'}(y)$$

$$\textbf{do'}\ (x)\ \text{CB}\ \alpha \qquad Q\alpha$$

$$\textbf{do'}\ (x)\ \text{CB}\ \textbf{deep'}(y)$$

to deepen
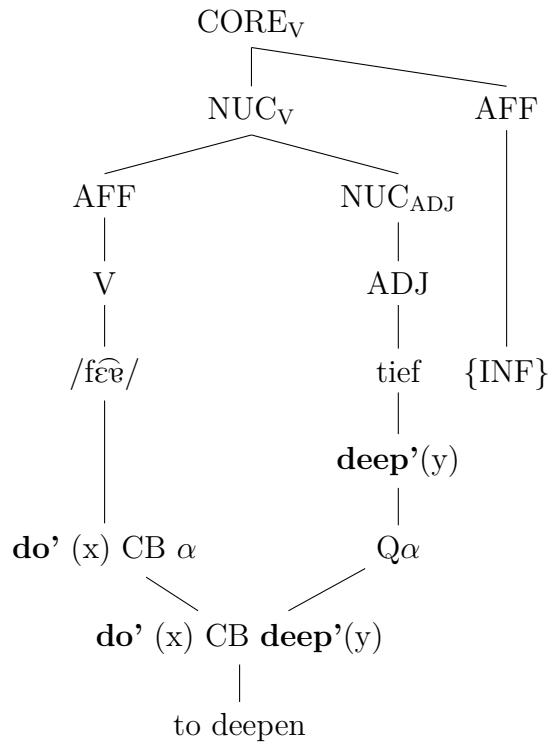
Figure 23: Morphological and compositional projections of *vertiefen*

When prefixed to nouns {ver-} can result in verbs denoting changes of state, where the base noun signifies to what something changes. Examples for this are *versumpfen* 'to turn into a swamp' and *verwüsten*[21] 'to desertify'. They generally are S-intransitive as the expression *Der Wald versumpft* 'The forest turns into a swamp' is a grammatical sentence in German. The explicit specification of causers is optional. This reading's incomplete LS is BECOME (x, Qα).

The second reading of {ver-} when prefixed to nouns resembles the one given for {be-}. *Verkabeln* 'to wire' from *Kabel* 'cable' means to fit something with cables. However, some base nouns like *Glas* 'glass' allow for both readings when prefixed with {ver-}, as *verglasen* can both mean to fit something (usually window frames) with glass and to turn something into glass.

Which reading is chosen depends on context and speaker/perceiver's knowledge of the world. *versumpfen* is always interpreted as something becoming a swamp and never as fitting something with swamps. Verbs like *verglasen* with the reading of vitrify and *versteinern* 'to petrify' from *Stein* 'stone' are usually restricted to mythological contexts which require the perceiver's suspension of disbelief towards supernatural processes.

---

[21]Not to be confused with deverbal verwüsten 'to devastate, wreak havok'

The prefix {zer-}, as mentioned above, is highly consistent in its semantic contribution. Its LS when prefixed to verbs is α CAUSE [BECOME **be.in.pieces'**(y)]. Its semantic consistency extends to prefixation to adjectives and nouns as well, as *zerbeilen* 'to cleave to pieces' from *Beil* 'cleaver' and *zerkleinern* 'to chop, grind, shred, mince, make into incrementally smaller pieces' from *klein* 'small' illustrate. Since there are barely examples of other adjectives being prefixed with {zer-}[22], a deeper discussion about {zer-} with adjectives has been omitted.

When prefixed to nouns {zer-} incorporates the qualia structure of its base noun into its LS either as the instrument used or as the thing torn apart, as exemplified by *zerbeilen* and *zerfleischen* 'to maul, lacerate'. *Zerbeilen* is the tearing to pieces by means of a cleaver. Its LS is [**do'** (x, **cleave'** (x))] CAUSE [BECOME **be.in.pieces'** (y)]. *Zerfleischen* means ripping a living organism's flesh into shreds.

All complex verbs involving these affixes have in common, that their lexical stress is on the stem and never on the affix. Figure 24 below displays a proposal for a phonological template for prefix verbs in German, based on the morphological template proposed above.

$$\text{CORE}_V$$
$$|$$
$$\text{NUC}_V$$

$$\text{AFF} \quad \text{NUC}_W$$
$$| \qquad \quad |$$
$$\sigma \qquad \quad \Sigma$$
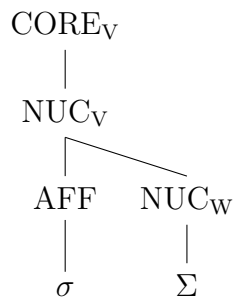
Figure 24: Phonological template for left-headed derivation

4.2.2.2 Particle Verbs

Particle verbs are a class of prefixed verbs in German, which are formed by prefixing particles. Particles are morphemes, which in many cases have homophonous prepositions and/or adverbials. They are right-headed and do not involve a change of lexical category. They are restricted to verbs and the meaning added by them to a verb is generally unpredictable.

---

[22]Which may be caused by semantic incompatibility. Causing something to be in pieces by making it green, big or strong (etc.) seems a strange concept to parse

The particle {ab-}, homophonous with the preposition *ab* 'from (temporal and local), off, away' and the adverbial *ab* 'away, to be unattached', for example can add a plethora of different contributions to its base verb. This is illustrated by the particle verbs *abmachen* 'to arrange, agree; to remove' from *machen* 'make', *ablösen* 'to replace (a sentry), to remove' from *lösen* 'to solve, dissolve; to loosen', *abschlagen* 'to refuse; to chip off' from *schlagen* 'to hit', *abwerten* 'to devalue, denigrate' from *werten* 'to judge, rate', *abfinden* 'to compensate' and the reflexive *sich abfinden* 'to accept' from *finden* 'to find', *abschließen* 'to lock; to conclude (a deal), to end; to sign a contract' from *schließen* 'to close', *absteigen* 'to descend, dismount' from *steigen* 'to rise, increase; to climb', *abfertigen* 'to ship, dispatch' from *fertigen* 'to craft, manufacture' and *abschreiben* 'to copy, plagiarize; to write off; to deny (that something has of a certain quality)' from *schreiben* 'to write'.

Some of the readings involving {ab-} contain the awayward directionality encoded by the preposition, but as *abschließen* with the reading of 'to lock' shows, this is not necessarily the case. The relation to the prepositional meaning can be semantically clear as in *abschlagen* with the reading 'to chip off', however often the relation is slim or metaphorical, as *abfinden* demonstrates[23]. Furthermore, the particle may encode a downward directionality, as illustrated by *absteigen* and *abwerten*, which the preposition does not.

Problematically for an analysis of the semantics of {ab-}, many of the examples given above involve a high amount of lexicalization, even if a slim resemblance of the prepositional meaning is retained, as with *abfinden* and *abfertigen*. The semantic composition for verbs such as *ablösen* with the reading 'to replace (someone when their shift is over)' and *abschließen* with the reading as 'to lock' has been lost to lexicalization to the degree of being indecipherable.

Figure 25 on the following page displays the revised morphological projection for *ableiten*. The revision has been necessary to properly differentiate between particle prefixation and left-headed derivational prefixation in German.

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[23] *to compensate someone* can in English also be expressed as *to pay someone off*

```
                         V
                       /   \
                    PRT    COREᵥ
                     |      /  \
                     |    NUCᵥ  AFF
                     |     |     |
                     |   PRED    |
                     |     |     |
                     |     V     |
                     |     |     |
                   /ab/   leit  {INF}
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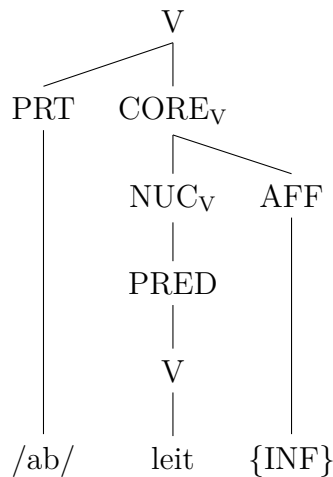
Figure 25: Morphological Projection of *ableiten* (revised)

The head of particle verbs is always the base, irrespective of the particle prefixed. The base verb does not have to be a simplex, but can be the output of any word-formation process resulting in verbs. An illustration of the compositional projection has been left out, due to the opaque nature of the particles' semantics.

Morphologically the particle is realized as a subordination of the particle to the word node, like clitics. The reasoning behind doing so is to account for their separability and syntactic behavior discussed in the following paragraph 4.2.2.3. In terms of stress and their position in a sentence they behave like reverse Wackernagel clitics: They will almost never appear in the second position of a sentence and are always stressed.

The problem described for {ab-} holds true for all particles in German. The tables 2 - 6 on the following pages display several particle verbs derived with a choice of different particles. The prepositions homophonous with the particles are *an* 'on, at, by (local)', *auf* 'on, onto, upon', *bei* 'by (local), with, at', *um* 'around, about' and *vor* 'before (temporal and local)'[24].

---

[24]Note that only the most common translations have been given for the prepositions. In certain contexts their translation into English may differ. Examples include *arbeiten bei* 'work for' and *beschützen vor* 'guard from'

base	meaning	derivate	meaning
backen	to bake	anbacken	to adhere; bake (for a short time)
baggern	to scoop, excavate	anbaggern	to flirt, hit on
binden	to bind, tie	anbinden	to tether
fangen	to catch	anfangen	to begin
geben	to give	angeben	to boast, brag; state
halten	to hold	anhalten	to halt; urge; persist
legen	to lie, lay	anlegen	to dock; invest; don; aim
schaffen	to create; succeed	anschaffen	to acquire; to prostitute[25]
sehen	to see	ansehen	to inspect, look at
werfen	to throw	anwerfen	to start, actuate (a machine)

Table 2: Particle verbs with {an-}

base	meaning	derivate	meaning
arbeiten	to work	aufarbeiten	to refurbish; review
backen	to bake	aufbacken	to warm up, crisp up
blicken	to glance	aufblicken	to look up to so.
erlegen	to slay, kill, cull	auferlegen	to impose
führen	to lead	aufführen	to perform, act
geben	to give	aufgeben	to surrender, give up
horchen	to eavesdrop, harken	aufhorchen	to listen attentively
legen	to lie, lay	auflegen	to publish; hang up; to DJ
schließen	to close	aufschließen	to unlock
schreien	to scream, yell	aufschreien	to exclaim, scream out

Table 3: Particle verbs with {auf-}

base	meaning	derivate	meaning
behalten	to keep	beibehalten	to conserve, maintain
biegen	to bend	beibiegen	to explain sth. repeatedly until understood
bringen	to bring	beibringen	to teach; to inflict
drehen	to turn	beidrehen	to heave to (nautical)
fallen	to fall	beifallen	to occur to so.
fügen	to place, fit	beifügen	to enclose; to append
füttern	to feed	beifüttern	to add sth. as fodder
kommen	to come	beikommen	to reach; to cope with
legen	to lie, lay	beilegen	to settle, resolve; to enclose (with a letter)
messen	to measure	beimessen	to attribute, ascribe

Table 4: Particle verbs with {bei-}

base	meaning	derivate	meaning
bauen	to build	umbauen	to restructure, rebuild
bringen	to bring	umbringen	to kill
denken	to think	umdenken	to rethink
fahren	to drive	umfahren	to run over, drive dead
nachten	to advesperate	umnachten	to benight
schlagen	to hit	umschlagen	to handle, transship; turn (sour); capsize
schmelzen	to melt sth	umschmelzen	ro remelt, refound
schulden	to owe	umschulden	to refinance, restructure (debts)
stürzen	to fall, plunge	umstürzen	to overthrow; keel over
werfen	to throw	umwerfen	to topple, throw over

Table 5: Particle verbs with {um-}

base	meaning	derivate	meaning
beugen	to bent, bow; inflect	vorbeugen	to prevent, obviate
enthalten	to contain	vorenthalten	to deny, withhold
gehen	to go	vorgehen	to proceed, advance; act; happen[26]
haben	to have	vorhaben	to plan, intend
machen	to make	vormachen	to demonstrate; lead sb. on
schreiben	to write	vorschreiben	to dictate, decree; prescribe
sehen	to see	vorsehen	to provide, budget; design
tragen	to carry, bear	vortragen	to perform, recite; state, express
treten	to kick	vortreten	to advance; step up
werfen	to throw	vorwerfen	to accuse

Table 6: Particle verbs with {vor-}

As the examples above illustrate, the semantics of a particle verb regularly differs from the meaning encoded by its base. Furthermore, as the semantics of neither the homophonous prepositions nor the respective adverbials is necessarily contained within the semantics of the complex verb, it is reasonable to assume that they only partially share semantic information with the particles, if at all. This is further indicated by the particles instigating directional readings not expressed by their prepositional "counterparts". Since the composition during word formation with particles is all but clear and would require a separate investigation involving diachronic processes, no generalized incomplete logical structures will be proposed for them. Instead the focus will be to analyze them morphologically.

As mentioned above, particles may be prefixed to simplex and complex verbs alike. Examples of particles prefixed to derived verbs include *vor-ent-halten*, *auf-er-legen* and *bei-be-halten*, as given in the tables above. A further example is the verb *umverteilen* 'to redistribute', with the stem *verteilen* 'to distribute' and the root *teilen* 'to divide; share'. Furthermore, particles can be prefixed to compounded verbs as well, as demonstrated by the verb *abstaubsaugen*[27] 'to use a vacuum-cleaner on something' from *staubsaugen* 'to vacuum-clean'. Figure 26 below and figure 27 on the following page display the morphological projections of these two particle verbs.
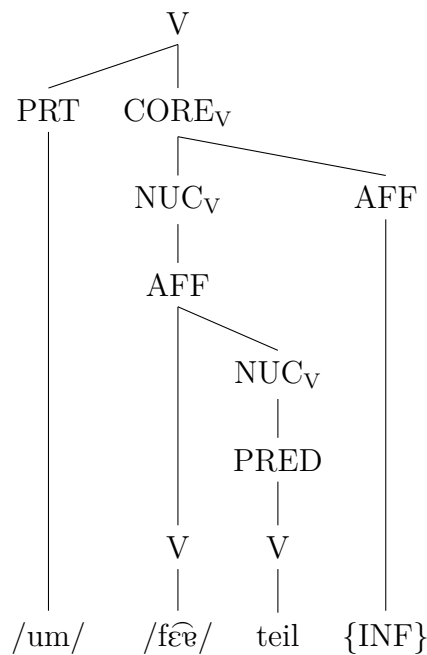
Figure 26: Morphological projection of *umverteilen*

[27]Forms like this are quite rare however, as the compounding of noun + verb is only marginally productive (see section 4.3). At least one use can be attested in the sentence "Könnt ihr eure Hunde abstaubsaugen [sic!]?", which can be found under http://www.polar-chat.de/hunde/topic/57540-was-lassen-eure-hunde-alles-mit-sich-machen/ . However, it is dubitable whether this form is acceptable to most native speakers, excacerbated by the fact that *staubsaugen* as single verb is not acceptable to all, as some speakers form the past participle as *staubgesaugt* and some as *gestaubsaugt*.
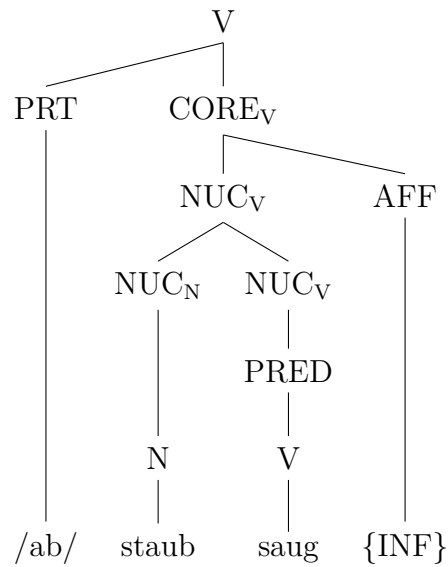
Figure 27: Morphological projection of *abstaubsaugen*

As mentioned above, the position of the particle within a sentence and whether it appears attached to or separated from its base, is dependent on the syntactic context. This needs to be taken into account, when proposing a morphological template, or rather morphological templates, for particle verbs. The template for the infinitive use is displayed in figure 28 below.

Figure 28: Morphological template for particle verbs (infinitive)

The morphological templates of particle verbs in different syntactic contexts will be discussed in the following paragraph, as it requires a comparison between the morphological projections of particle verbs and prefix verbs in the different contexts.

In contrast to prefix verbs, where it is always the base which carries the main lexical stress, with particle verbs it is always the particle to do so, independ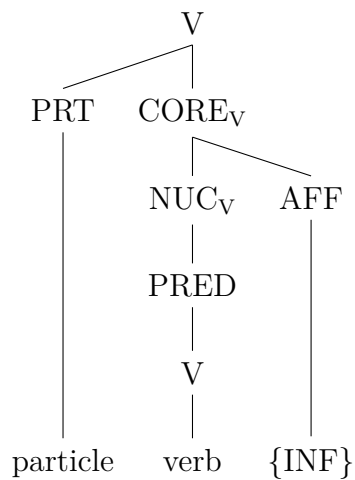ent of syntactic context. Figure 29 below illustrates the proposed phonological template for particle verbs (in infinitive construction).
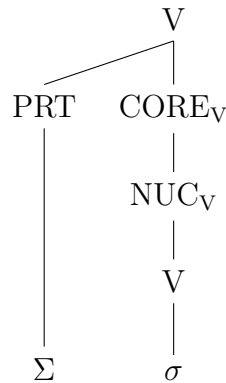
```
              V
            /  |
         PRT   CORE_V
          |      |
          |    NUC_V
          |      |
          |      V
          |      |
          Σ      σ
```

Figure 29: Phonological template of particle verbs (infinitive)

4.2.2.3 Differences between particle verbs and prefix verbs

There are several reasons to analyze particle verbs differently from prefix verbs. In contrast to prefix verbs, their semantics (and the semantic composition taking place during derivation) is rarely predictable. They are separated from their base verb, depending on the syntactic context and the particle always carries the lexical stress. Particles are restricted to verbs and cannot change their lexical category, whereas prefixes can be affixed to different lexical categories, changing them to verbs where the base is not already verbal. The goal of this paragraph is to display the morphological projections of particle verbs in different syntactic contexts compared with the morphological projection of prefix verbs.

The first syntactic context to be considered are (co)subordinated constructions, involving the clause linkage marker *zu*. As mentioned above, with prefix verbs *zu* appears separated from the verb and embedded between the base and the particle with particle verbs. Figure 30 on the following page displays the morphological projection of the prefix verb *zereißen* and of the particle verb *abreißen* with augmented infinitive.
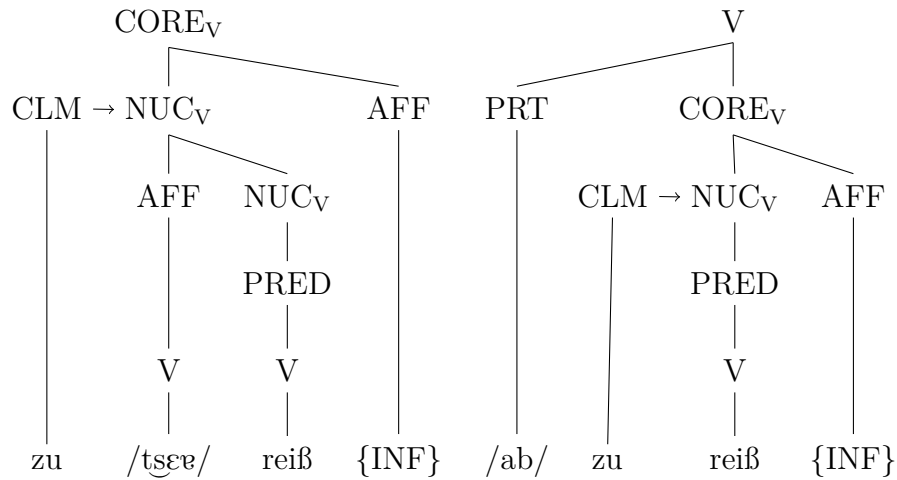
Figure 30: Morphological projection of particle and prefix verbs (with CLM)

The clause linkage marker will always appear immediately preceding the uppermost verbal nucleus. The reason behind this assumption is its function to mark predicates (with or without their arguments, depending on nexus type and juncture type) as dependent on another predicate. Since the prefix {zer-} constitutes a verbal nucleus on its own (as illustrated by its ability to verbalize other lexical categories), *zu* is realized preverbally. The particle {ab-} does not encode a lexical category and is immediately dominated by the uppermost NUC$_V$. Since *zu* always appears prenuclear, it is realized interverbally, between the particle and the verbal nucleus. Figure 31 below displays the morphological template for particle verbs with CLM. As prefix verbs do not behave differently from simplex verbs, a revision of their morphological template has been omitted.

Figure 31: Morphological template for particle verbs (augmented infinitive)

64

The second syntactic context to be considered is the past tense involving the past participle, usually formed by circumfixing {ge-} {-(e)t} to regular verbs and {ge-} {-en} to irregular verbs undergoing a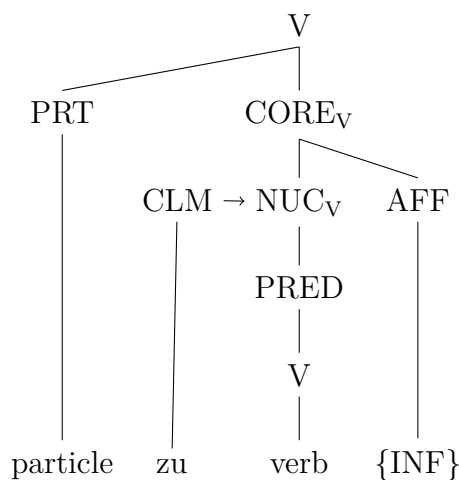blaut. Prefix verbs do not permit the prefix part {ge-} of the circumfix, while particle verbs embed the {ge-} between the particle and their base, as with the clause linkage marker. In order to explain this, it is necessary to elucidate what exactly a participle is: an inflectionally marked verb which can based on its aktionsart instigate a reinterpretation as an adjective in the corresponding syntactic contexts.

It is inflectional in that its use is syntactically determined. The LS encoded in its base verb is turned into a state during conversion, enabling it to be used as an adjectives, both predicatively and attributively. This is illustrated by the German expressions *Die Hose ist zerrissen* 'the pants are torn apart' and *Die zerrissene Hose* 'the torn-apart pants'. The realization of the circumfixial {ge-} appears to be blocked by the already present derivational prefix, indicating that the realization of {ge-} is restricted to a position immediately before roots.

However, this explanation only holds true for the adjectival use of participles. Its verbal use differs from the adjectival one, as it is used with auxiliaries to from the past tense, which is not permitted for adjectives. The sentence *Sie haben die Hose zerrissen* 'They tore apart the pants' is grammatical, while **Sie haben die Hose groß/klein/grün/stark* '*They big(ged)/small(ed)/green(ed)/strong(ed) the pants' is not only ungrammatical, but near uninterpretable.

A way to resolve this issue is to analyze participles as affixes which change a verbs logical structure, with some forms being valid inputs for conversion. The adjectival use described above is for example restricted to verbs neither encoding an activity nor a semelfactive. The reason behind this is semantic in nature, as speakers/perceivers are incapable of deriving a result state from these two aktionsart classes.

$$
\begin{array}{ccc}
& \text{CORE}_\text{V} & \\
\text{AFF} & \text{NUC}_\text{V} & \text{AFF} \\
& | & \\
& \text{PRED} & \\
& | & \\
& \text{V} & \\
/ge/ & \text{reiß\{PAST\}} & \text{\{PRTCPL\}}
\end{array}
$$
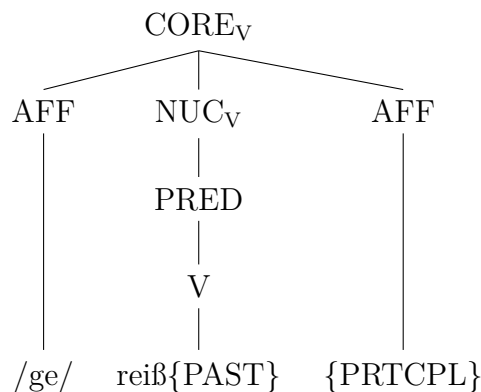
Figure 32: Morphological projection of *gerissen*

Figure 32 on the previous page displays the morphological projection of *gerissen*, the past participle of *reißen*. With prefix verbs, the {ge-} is blocked from appearing, whereas particle verbs will embed the {ge-} between themselves and their stems. The morphological projections of the past participles of *abreißen, abgerissen,* and *zerreißen, zerrissen,* are displayed in figures 33 and 34 below.
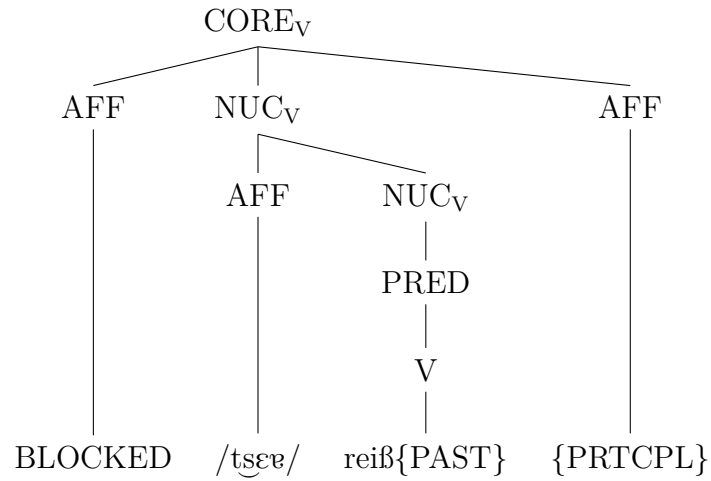
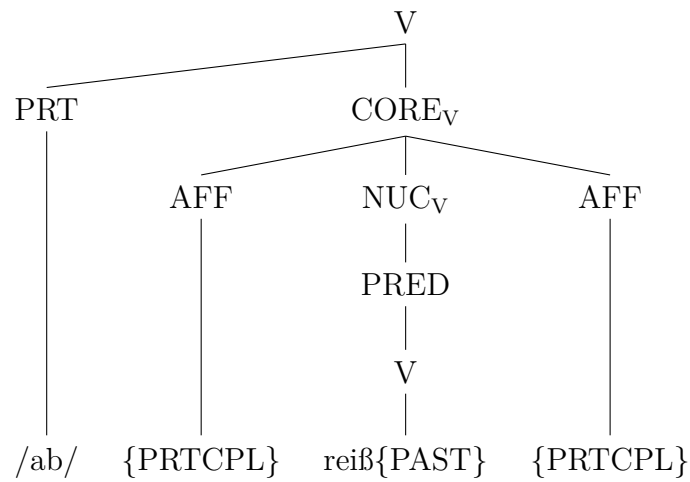Figure 33: Morphological projection of *zerrissen*

Figure 34: Morphological projection of *abgerissen*

The morphological templates for particle verbs under these syntactic conditions is similar the one proposed for augmented infinitive constructions involving a CLM. Both forms are infinite, as participles (in German) do not encode agreement when used verbally, which is outsourced to auxiliaries or modals. However, they differ in how the prenuclear element is realized, as the appearance of the CLM is entirely determined by syntax, whereas participle circumfixation is an inflectional morphological process.

This difference is displayed by the augmented infinitive and past participles forms of particle verbs with a prefix verb base like *abverlangen*. Since there is a prefix the host of {ge-} is no longer a root and realization of {ge-} is blocked, resulting in the correct form *abverlangt*. The CLM however will appear immediately before the uppermost verbal nucleus, correctly predicting *abzuverlangen*.

That the blocking of the participial {ge-} is caused by incompatibilities with stems and not due to a previous word-formation itself, can be proven with the respective word forms of particle verbs with a compounded base reanalyzed as a single lexeme. If the assumption is correct, the example *abstaubsaugen* mentioned above should result in *abgestaubsaugt* and *abzustaubsaugen*. Both forms can be attested.[28]

The morphological template for particle verb participles is given in figure 35 on the following page. {ge-} is written phonologically, as it will always be realized as /ge/. The suffix part of the circumfix is given as {PRTCPL}, since its realization as either of its allomorphic exponents /en/ or /et/ is lexically determined by the verb.

---

[28]"Zudem empfiehlt es sich, beide Seiten gründlich abzustaubsaugen." http://www.matratzen.org/flecken-entfernen/

"Du k[ö]nntest versuchen den Estrich mit einem feinen Besen abzufegen oder mit einem Bausauger abzustaubsaugen." https://groups.google.com/forum/#!msg/de.rec.heimwerken/u6nqrgbJ6Cw/-gKiUvtgAbIJ

"Ok, hab sie jetzt abgestaubsaugt und werde es jetzt nochmal probieren." http://forum.trophies-ps3.de/archive/index.php?t-137206.html

"Alles abgestaubsaugt und mit Indorex duo Pumpspray behandelt." http://www.katzen-links.de/forum/parasiten-aeussere/floehe-ausreichend-bekaempft-t157192.html

Existence of links last checked on May 11th, 2016

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                              V
                  _____/ \
                 /             \
               PRT            CORE_VA
                |           ____/ |  \____
                |          /      |       \
                |        AFF    NUC_V     AFF
                |         |       |         |
                |         |     PRED        |
                |         |       |         |
                |         |       V         |
                |         |       |         |
             particle   /ge/  verb{PAST}  {PRTCPL}
```
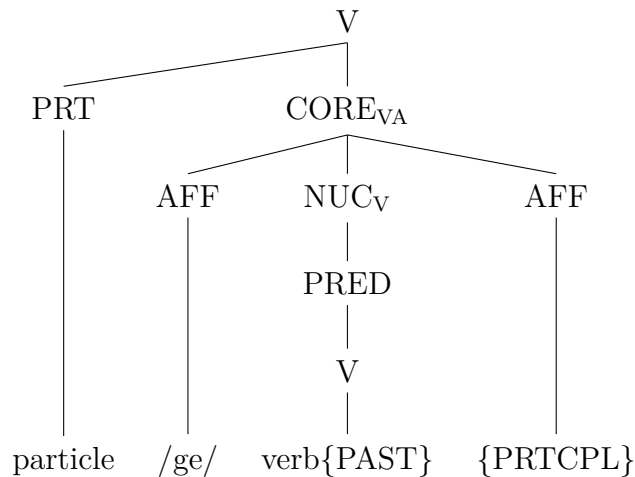
Figure 35: Morphological template for particle verbs (past participle)

The last syntactic context mentioned above are finite constructions for particle verbs. As prefix verbs behave like simplex verbs in this regard, there is no need to propose a separate morphological template for them under these syntactic conditions. Particle verbs, however, differ significantly when suffixed with finite marking. The particle is not only separated from its base, it will also appear at the end of the clause, after a clause's core arguments. This feature is the most differentiating aspect between regular prefixes and particles: Prefixes, as their name suggests, are always (and inseparably) attached to the beginning of a word, whereas particles are not restricted to a position before their base. Their morphological template would involve a combination with the constituent projection and has therefore been omitted.

4.2.2.4   Other derivational prefixes

This paragraph concentrates on derivational prefixes in German which cannot be prefixed exclusively to verbs (or cannot be prefixed to verbs at all). They do not change the lexical category of their base lexeme, indicating right-headedness, since they can attach to multiple categories. The native prefixes under inverstigation here are {miss-}, {ge-},{erz-}, {un-} and {ur-}, all of which can be prefixed to nouns and adjectives. Donalies (2011, 74) also names the loan affixes {mega-} and {hyper-} amongst the most common.

The German prefix {miss-} is equivalent to its English counterpart {mis-} on the semantic level, generally conveying a mistake being made during the action denoted by the verb to which it is attached. It can only be prefixed to verbs and this reading is constricted to predicates requiring animate actors. Another example is *missachten* 'neglect, disregard' from *achten* 'to regard sb. higly, to esteem", where {miss-} means that the actor is not performing the action denoted by the base verb. With this reading {miss} can also appear prefixed to nouns, indicating right-headedness, where **α.wrong'** and ¬**α** modify the telic and/or agentive qualia of the base noun. *Missgunst* 'disfavor, resentment' from *Gunst* 'favor, affection' can be seen as the set of qualia encoded by *Gunst* where either the agentive or telic quale encodes the negated predicate. Alternatively {miss-} could be interpreted as changing the whole qualia structure to ¬Qα. Further research into the interaction between incomplete LSs and single qualia and whole qualia structures is required to give a definite answer.

A third reading of {miss-} can be as the failure to do something, as in *misslingen* 'fail to achieve'. The uses of {miss-} evoking the second reading are restricted to a few verbs as *misslingen* and *missglücken* 'both: fail to achieve'. The first one can hardly be seen as a complex word anymore, since there is no base verb *lingen* in modern German, while *glücken* can hardly be found in present tense and is most commonly used as the past participle *geglückt* 'managed to achieve'. The first two readings are in complementary distribution with this one, since the first two can only appear with transitive verbs, while the second reading is reserved for M-intransitives ,where the animate argument receives the dative case.

A fourth reading can be found in the word *misshandeln* 'to mistreat', where the act denoted is the active commitment of a wrong against someone.Verbs like *missfallen* 'to displease' from *fallen* 'to fall' involve lexicalization and are seemingly unrelated to the semantics of its base verb. Given that the processes yielding the first two readings (do wrongly and do not) are the only productive ones in modern German, only they will receive a detailed analysis.

Figure 36 below displays the morphological and compositional projections of {miss-} with the simplex verb *achten* and the prefix verb *verstehen*. The internal compositional process during the prefixation of {ver-} has been omitted for two reasons. The first one is that the scope of the diagram is the display of the composition taking place when prefixing {miss-}. The second and more important reason is that the prefix verb *verstehen* appears to have been lexicalized, as the semantics added by {ver-} to *stehen* 'to stand' to result in *verstehen* 'to understand' is not clear[29].

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[29]As with its English counterpart, where *under* hardly expresses a position.
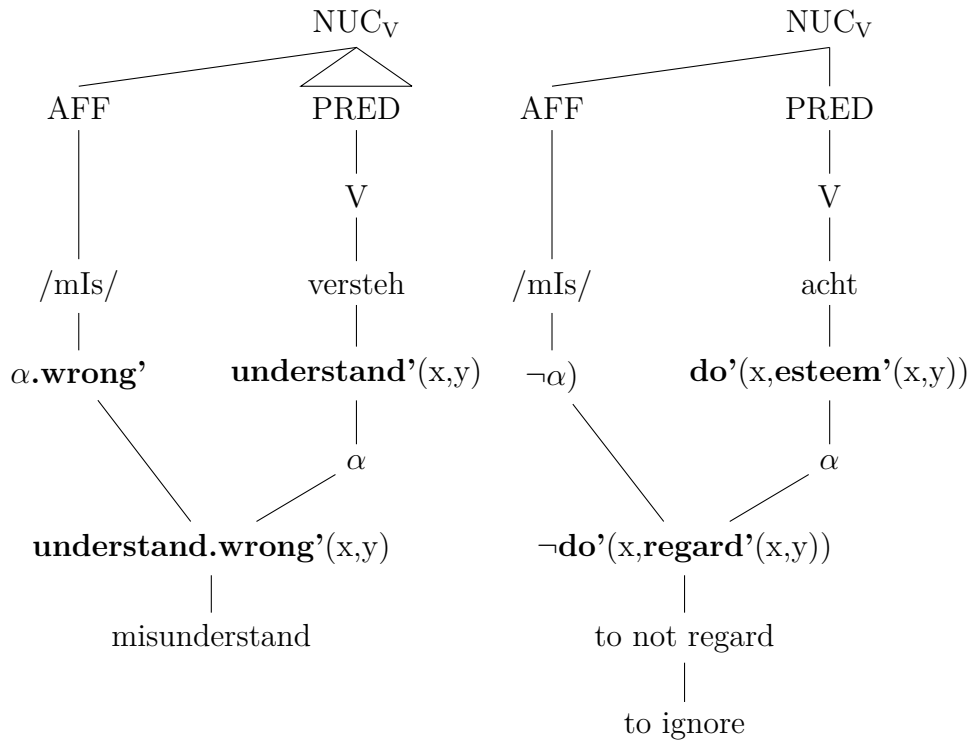
Figure 36: {miss-} with simplex and prefix verbs

{miss-} can be freely prefixed to many simplex verbs and prefix verbs, but its use with particle verbs seems to be prohibited. When used with simplex verbs it behaves like a prefix: The main lexical stress is carried by the base and the CLM appears before the complex verb. When used with prefix verbs it behaves like a particle: It carries the lexical stress and the CLM is embedded between {miss-} and the base. Both uses have in common, that the participial {ge-} is prohibited and that {miss-} has to remain prefixed to the word in finite constructions. In order to properly explain this behavior, its etymology has to be taken into account. The modern German prefix {miss-} stems from a Indo-European participle, which was still in use in Middle High German and whose remnants can be found in the verbs *missen* and *vermissen* (cognate to and synonymous with English *to miss*) (cf. Duden, 2007, 531).

The result of this origin is a morphological behavior partially similar to that of verb+verb compounds and and partially similar to the that of affixes. A deeper investigation into the exact behavior of {miss-} requires a diachronic approach and a theoretic base within RRG for lexicalization of free elements as bound elements. Since this approach exceeds the scope of this work, as with the loan affixes which (partially) used to be free lexemes before they were loaned, and therefore the brief proposal stated above has to suffice.

The prefixes {erz-} is augmentative. It can be equated to English {arch-} as in *Erzfeind* 'arch enemy', expressing the ultimate enemy. The same meaning is contributed to adjectives, as demonstrated by *erzböse* 'ultimately evil'. Donalies (2011, 75) points out, that the use of the prefix {erz-} is semantically restricted and is becoming archaic. It is being replaced with the loan prefixes {hyper-} and {mega-}. They differ in meaning in that {erz-} seems to encode the ultimate point of a scale where as {mega-} and {hyper-} encode that something is high up on that scale. Figure 37 below displays the derivation of *erzböse*.

$$\text{CORE}_A$$
$$|$$
$$\text{NUC}_A$$
$$\text{AFF} \qquad \text{PRED}$$
$$| \qquad \text{A}$$
$$/\text{ʔɛɐ̯ts}/ \qquad \text{böse}$$
$$\textbf{evil'} (x)$$
$$\textbf{ultimately.}\alpha \qquad \alpha$$
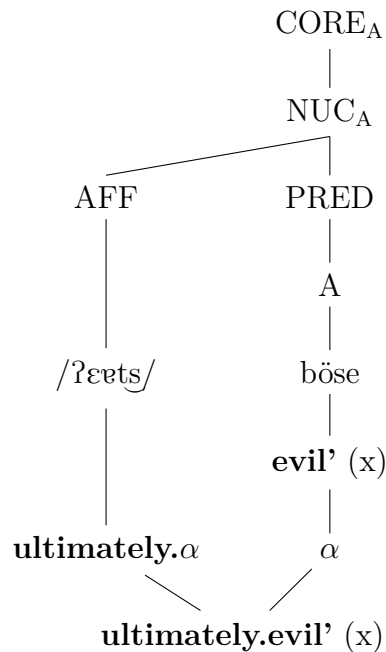$$\textbf{ultimately.evil'} (x)$$

Figure 37: Morphological and compositional projection of *erzböse*

The prefix {ur-} is similar to {erz-}, as it can be used augmentatively. However, the meaning contributed by them differs slightly. {ur-} as in *Urzeit* 'prehistoric ages' can also contribute the information that the base is ages old or has remained unchanged by mankind as in the third reading given for *Urwald* 'jungle, primeval forest, virgin forest'. The second reading is as a forest that is ages old and a jungle is generally both, ages old and untouched (by industrialized civilization). It can also be prefixed to adjectives as in *uralt* 'ancient' from *alt* 'old', although this use seems restricted to a few instances.

{ur-} can be prefixed repeatedly, as demonstrated by *Urururgroßmutter* 'grand grand grand grand mother' where each instance of {ur-} prefixed to *Großmutter* 'grandmother' adds another 'grand'. This kind of repeated prefixation is restricted to the right-headed prefixes described in this paragraph.

The prefix {un-} is privative, it negates the base it is modifying. The word *Unsitte* 'bad habit' is derived from *Sitte* 'custom'. A bad habit is a behavior which is not considered customary. It does not express that something is the opposite of the base lexeme, only that it is not a part of what is encoded by the base lexeme. This is true for adjectives as well. The state expressed by adjectives is always negated by the prefix {un-} as exemplified by *unschön* 'unbeautiful'. Its meaning is entirely predictable, since it consistently negates the adjectives it is prefixed to and expresses the lack of what is encoded by the noun when prefixed to nouns. Its incomplete LS / QS is $\neg\ \alpha$ or $\neg\ Q\alpha$ for adjectives and nouns respectively. In combination with confixes the loan prefix {a-} and its allomorphs {an-} and {ar-} are more frequent. It too can be prefixed to nouns and adjectives (cf. Klosa, 1996)

The morphological template for right-headed prefixes in German is illustrated in figure 38 below.

$$\text{CORE}_\text{W}$$
$$|$$
$$\text{NUC}_\text{W}$$

AFF   W
| |
affix   word
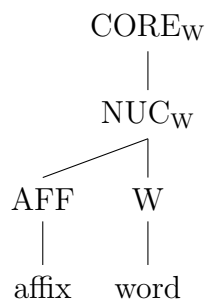
Figure 38: Morphological template for right-headed prefixation

4.2.3 Derivational suffixes

This subsection describes derivational suffixes in German. It is divided into several paragraphs, the first of which contains examples of each combination of base and resulting lexical category in German, represented as morphological and compositional projections, with an additional representation of the phonological projection where necessary. Even though the affixes displayed in this paragraph can be seen as adjectival, verbal or nominal, thus fitting the following paragraphs, they have been grouped together for semantic reasons. The following paragraphs are focused on verbal, adjectival, nominal and adverbial suffixes respectively.

4.2.3.1 Derivations leaving the lexical category unchanged

There are three different processes of derivational suffixation in German, in which the lexical category of the base lexeme remains unchanged, resulting in deadjectival adjectives, denominal nouns and deverbal verbs. These processes happen with varying degrees of productivity. While denominal nouns are very frequent, deverbal verbs are restricted to very few instances.

Figure 39: Morphological and compositional projection of *rötlich*

Figure 39 on the previous page shows the morphological and compositional projection of the deadjectival adjective *rötlich* 'slightly red, reddish'. The 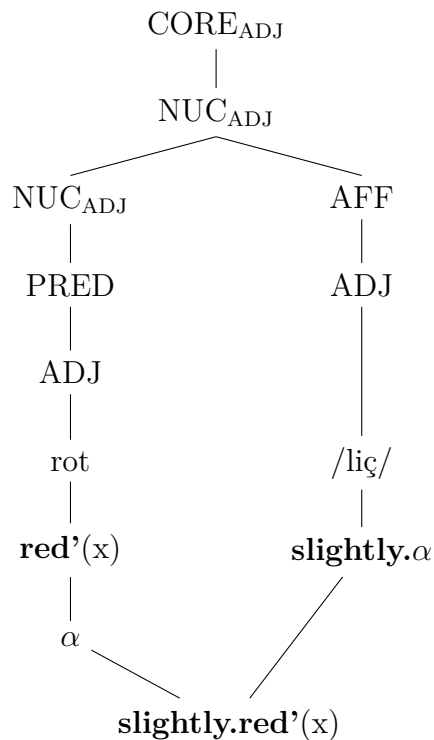reading as 'slightly' is almost consistently predictable (even when affixed to nouns and verbs). An exception can be found in *reinlich* 'neat, tidy', which is derived from *rein* 'clean, pure' ,where {-lich} means the opposite of slightly.

Other suffixes resulting in deadjectival adjectives are {-bar}, {-haft} and {-sam}, with varying degrees of productivity and predictability of meaning. {-bar} is relatively unpredictable when modifying adjectives, as exemplified by *offenbar* 'apparently', derived from *offen* 'open', where the semantic connection between the two is slim at best. The same argument can be made for {-sam}, where *lang* 'long' derives to *langsam* 'slow'.

The suffix {-haft} is partially predictable in meaning. When attached to the adjective *krank* 'sick, ill' to form *krankhaft* 'pathological' as the derived adjective, the LS **sick'** (x) of *krank* can be seen as the cause for either a behavior or a symptom. The expression *Ein krankhafter Lügner* 'a pathological liar' refers to a person whose lying is caused by sickness[30]. However, the same argument cannot be made for the adjective *wahrhaft* 'truly' derived from *wahr* 'true', as in the example *Dieses Bild ist wahrhaft schön* 'This picture is truly beautiful' the beauty ascribed to the picture is not caused by truth. Therefore, of the affixes discussed above, only {-lich} seems to be both semantically predictable and productive, when suffixed to adjectives.

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[30]This is closely related in meaning to *zwanghaft* 'compulsively' where the action done is because of a compulsive need to do it, but which is derived from the noun *Zwang* 'compulsion'
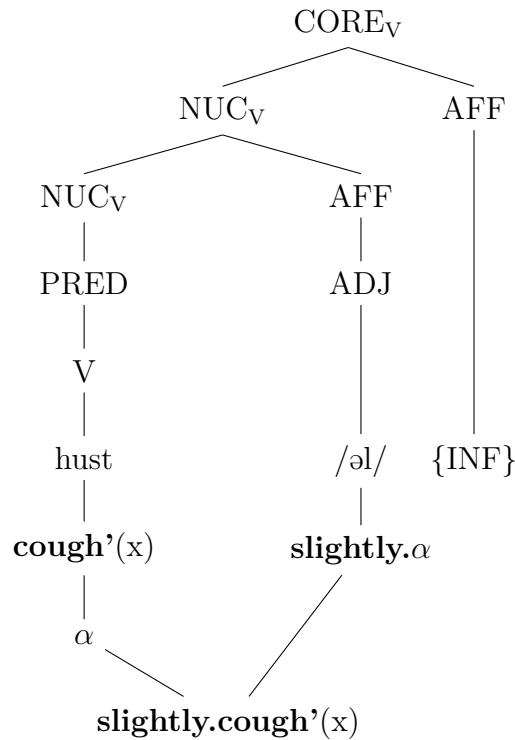
Figure 40: Morphological and phonological projection of *hüsteln*

Figure 40 above displays the suffixation of the complex verb *hüsteln*. The suffix {-el} is the only native suffix which can derive verbs from verbs. Its semantic component is consistently predictable as **slighly.α**'. Examples include *tröpfeln* 'to trickle, dribble', *tänzeln* 'to dance slightly/almost, bob and weave (like a boxer)' and *lächeln* 'smile, laugh slightly'. Suffixation with {-el} triggers the umlaut form of the verbal stem.

Figure 41 on the following displays the suffixation of the agentive suffix {-er} to the noun *Musik* 'music' to from the complex noun *Musiker* 'musician'. Its incomplete set of qualia is similar to the one given for verbal use, with the difference that it is a whole set of qualia which is integrated into the Q_T and Q_A of the affix's qualia structure. A musician is someone who performs music and someone becomes a musician by performing music.
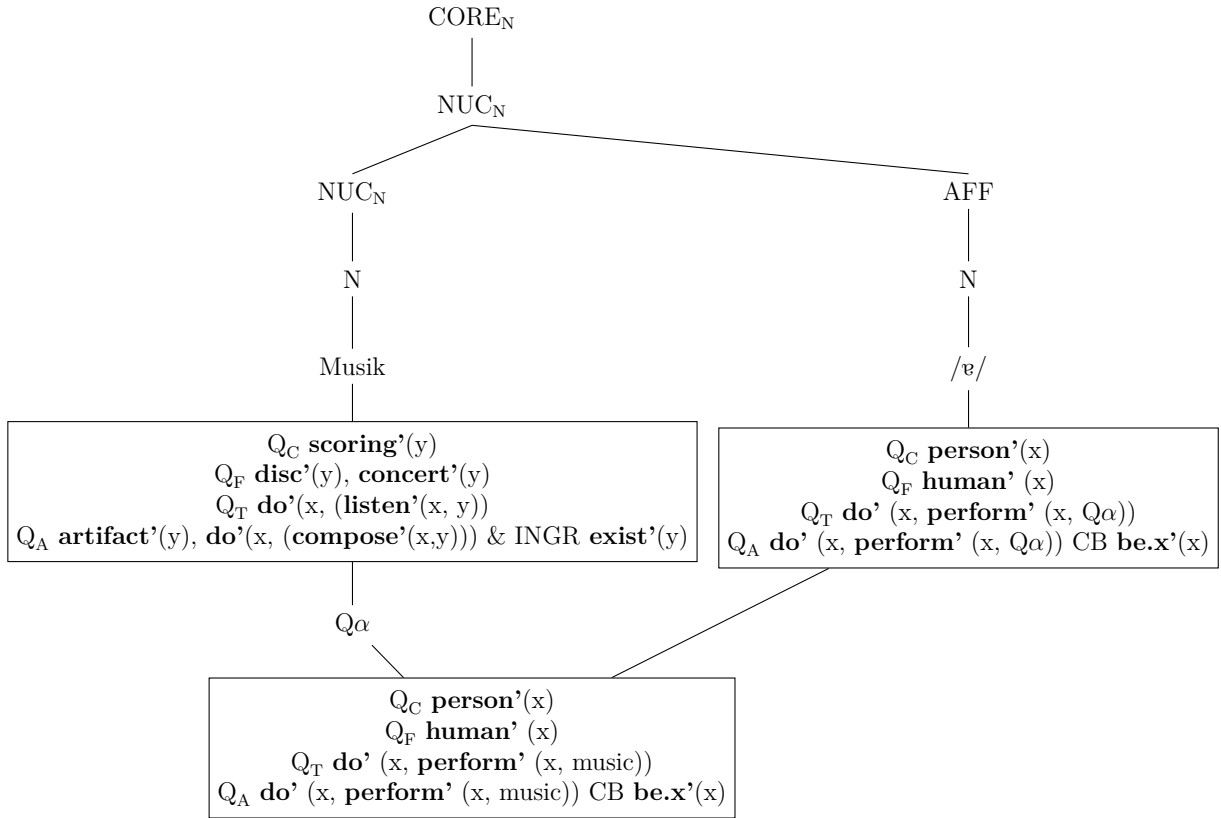
Figure 41: Morphological and compositional projection of *Musiker*

Alternate suffixes for {-er} are the loan suffixes {-ist} as seen in *Pianist* 'pianist', someone who plays the piano and {-ant} as in *Asylant* 'someone who seeks or has been granted (political) asylum'.

The suffixes {-lein} and {-chen} are diminutive when suffixed to nouns. They can be used interchangeably, as demonstrated by *Kindlein* and *Kindchen* both meaning 'little child'.Donalies (2011, 81-82) notes a tendency towards {-chen} in northern and towards {-lein} in southern dialects, but apart from that they are in free variation.

Their incomplete QS is Q_C: small.$Q_C(\alpha)$. The only qualia that is changed during suffixation is the constitutive qualia. The other qualia are empty and are filled with the base nouns respective qualia. The suffix {-heit} when suffixed to nouns expresses collectivity. The noun *Menschheit* 'humanity, mankind' from *Mensch* 'human' refers to all humans.

4.2.3.2 Verbal suffixes

Far more common than derivational suffixation during which the lexical category of the lexeme they are attached remains unaltered is suffixation that does change lexical category[31]. This paragraph is focused on derivational suffixes resulting in verbs. Beyond {-el} displayed for deverbal verbs above, these are: {-ier}, {-ifizier}, {-isier} and {-ig}. The only native suffix besides {-el} is {-ig}, the other three affixes are used most commonly with loan words and confixes, and only occasionally occur with native lexemes (cf. Donalies, 2011, 92). Motsch (2004, 44) notes, that both natove affixes are relatively unproductive and names prefixation as the preferred method of creating complex verbs.

The suffix{-el} can appear with nouns and adjectives as well. Its semantic component given above as **slightly.α** can be found in the denominal verbs *frösteln* 'to be slightly cold' from *Frost* 'frost, freeze' and the deadjectival verb *kränkeln* 'to ail' from *krank* 'sick'.

However, when used with nouns or adjectives the **slightly** part of the incomplete LS seems conventionalized rather than lexicalized. This is illustrated by the denominal verb *radeln* 'to bike' from *Rad*[32] 'wheel, bicycle' and the deadjectival *fremdeln* 'to feel anxiety caused by foreign surroundings' from *fremd* 'foreign'. In the case of radeln the incomplete LS of {-el} is $Q_T(\alpha)$, where the activity **do'**(x, **ride'** (x, bike)), encoded in the telic quale of the noun *Rad,* serves as the LS for the verb. The y argument is filled in with *bike,* since it is coreferential with the lexeme. The use of {-el} to derive verbs from either adjectives or nouns in only marginally productive. Conversion seems to be the preferred method of turning nouns and native adjectives into verbs.

The preferred derivational method of verbalizing native adjectives is use of the suffix {-ig}, which can also be suffixed to nouns. Examples for suffixation to adjectives use are *reinigen* 'to clean' from *rein* 'clean, pure' and *festigen* 'to strengthen, tighten' from *fest* 'firm, sturdy, tight'. Its incomplete LS is [**do'** (x, Ø)] CAUSE [BECOME α]. The loan affixes mentioned above have the same LS, but are mostly restricted to loaned adjectives. {-ier} is the exception to this, as it can be used relatively freely with native adjectives as in *halbieren* 'to half' from *halb* 'half'.

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[31]The ones that do not lack change in lexical category, because the input is already of the category in which the suffixations result.

[32]shortened from the V+N compound *Fahrrad* for the second reading

When suffixed to nouns, {-ig} expresses a causative change of state. The verb *ängstigen* 'to frighten' derived from *Angst* 'fear' and *zeitigen* 'to yield, result in' from *Zeit* 'time' exemplify this. The semantic relation between the base noun and the derived verb differs between examples. Verbs like *ängstigen* and *penigen* 'to torment' from archaic *Pein* 'pain, torment' realize the qualia structure encoded by their base nouns as the thing caused to someone. *ängstigen* means to cause someone to have fear and *peinigen* means to cause someone to have pain. The verb *steinigen* 'to stone sb. to death' from *Stein* 'stone' realizes the base noun as the instrument used for killing. The relation to time in *zeitigen* is implicit (something takes time to result in something).

The loan suffix {-ier} can appear postnominally with native nouns as well, as demonstrated by *hausieren* 'to peddle' from *Haus* 'house' and *gastieren* 'to guest in/at, to visit' from *Gast* 'guest'.

4.2.3.3 Nominal suffixes

The most productive native nominal suffixes are {e-}, {-er}, {-heit},{-ling}, {-tum} and {-ung}. The formation of nouns from other lexical categories is highly productive.

As mentioned above,{-er} derives agentive nouns. It can only be suffixed to nouns and verbs. This is to be expected, since it implicitly encodes agency, which is hard for speaker/perceivers to extract from adjectives, which encode state predicates. The entity encoded by complex words suffixed with {-er} need not necessarily be animate, as exemplified by the noun *Mähdrescher* 'combine harvester'. In rare examples {-er} expresses patienthood rather than agenthood, as in *Lutscher* 'lollipop' from *lutschen* 'to suck' (cf. Donalies, 2011, 78).

As argued above the reading as a person is conventionalized, further indicated by nouns such as *Sender* 'sender, transmitter', *Empfänger* 'addressee, receiver' and *Ordner* 'steward, folder', which can refer to both objects and persons. Which reading is chosen is determined by context.

The suffix {-ling} most commonly derives patient nouns when suffixed to verbs. Whereas *Lehrer* 'teacher' from *lehren* 'to teach' is someone who teaches, *Lehrling* 'apprentice' refers to someone who is being taught. Figures 42 and 43 on the following page display the compositional projections of *Lehrer* and *Lehrling* respectively.
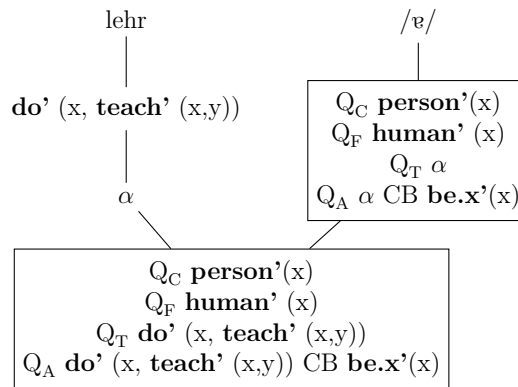
lehr   /ɐ/
  | |
do' (x, **teach'** (x,y))   ┌─────────────────────────┐
                                   │ Q_C **person'**(x)   │
                                   │ Q_F **human'** (x)   │
                                   │ Q_T α │
                     α │ Q_A α CB **be.x'**(x) │
                                   └─────────────────────────┘
         ┌──┐
         │ Q_C **person'**(x)   │
         │ Q_F **human'** (x)   │
         │ Q_T **do'** (x, **teach'** (x,y)) │
         │ Q_A **do'** (x, **teach'** (x,y)) CB **be.x'**(x) │
         └──┘

Figure 42: Compositional projection of *Lehrer*

lehr   /liŋ/
  | |
do' (x, **teach'** (x,y))   ┌─────────────────────────┐
                                   │ Q_C **person'**(y)   │
                                   │ Q_F **human'** (y)   │
                                   │ Q_T α │
                     α │ Q_A α CB **be.y'**(y) │
                                   └─────────────────────────┘
         ┌──┐
         │ Q_C **person'**(y)   │
         │ Q_F **human'** (y)   │
         │ Q_T **do'** (x, **teach'** (x,y)) │
         │ Q_A **do'** (x, **teach'** (x,y)) CB **be.y'**(y) │
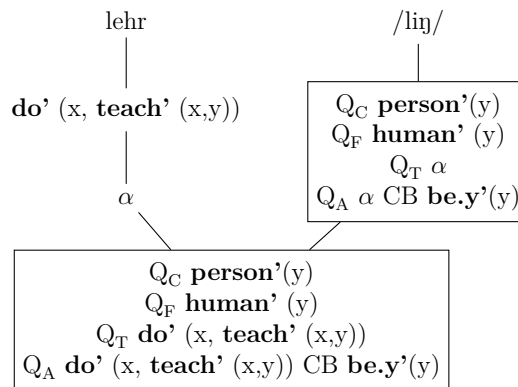   └──┘

Figure 43: Compositional projection of *Lehrling*

As figures 42 & 43 show, the main difference between {-er} and {-ling} is whether the entity denoted by the complex noun is coreferential with the actor {-er} or the undergoer {-ling} of the LS integrated as telic quale. The coming about of patient nouns is the same as with agent nouns, as someone becomes an apprentice by being taught something. In less common cases {-ling} derives agentive nouns like *Schädling* 'pest, vermin' from *schaden* 'to harm, hurt, damage'.

It can also be used to derive nouns from adjectives, as exemplified by *Dümmling* 'simpleton' from *dumm* 'stupid' and *Fiesling* 'creep, bully' from *fies* 'nasty, mean, obnoxious'. This deadjectival use can be counted towards patientive nouns, as someone who is stupid is the undergoer of stupidity. A further example is *Rohling* 'brute, ruffian; slug, steel blank, workpiece' from *roh* 'coarse, rude; raw, crude'. The incomplete QS when deriving adjectives is the same as with postverbal use.

The suffix {-e] can be used to derive nouns from adjectives, verbs and adverbials. When used with adjectives or verbs the resulting complex noun expresses quality. This is exemplified by the deadjectival nouns *Süße* 'sweetness' from *süß* 'sweet', *Stärke* 'strength' from *stark* 'strong', *Schwäche* 'weakness' from *schwach* 'weak' and *Schwärze* 'blackness' from *schwarz* 'black' and the deadverbial noun *Bälde* 'soonness' from *bald* 'soon'. This process is very productive and not to be confused with the word formation resulting in nouns referring to a person with the quality expressed by the base adjective, which results in a different output, as in *der/die Starke* 'the strong one' (see section 4.4). This use of {-e} competes with the suffix {-heit}. In rare cases adjectives can be affixed with either one, resulting in synonymous nouns. An example for this is *Schwachheit* 'weakness'.

When used with verbs {-e} results in nouns referring to actions. Examples are *Rede* 'speech' from *reden* 'talk', *Taufe* 'christening, baptism' from *taufen* 'to christen, baptize' and *Frage* 'question' from *fragen* 'to ask'. A speech is held by speaking, a baptism is carried out by baptizing and a question is something that is asked. In contrast to deverbal nouns with the suffix {-ung} (see below), nouns derived with {-e} can refer to entities whose purpose is performing the action denoted by the base verb. The noun *Leuchte* 'beacon, lamp' from *leuchten* 'to shine' is an example for this use. (Stern & Stern, 1965) note, that this use of {-e} is especially productive with children, giving the examples of *Rauche* 'cigarette' from *rauchen* 'to smoke' and *Summe* 'bee' from *summen* 'to hum, buzz'.

The suffix {-heit} when attached to adjectives expresses a quality. Examples for this are *Dummheit* 'stupidity' and *Rauheit* 'roughness' from *dumm* 'stupid' and *rauh* 'rough'. Stupidity is the quality of being stupid and roughness is quality of being rough. Figure 44 on the following page depicts the morphological and compopsitional projection of *Dummheit*.
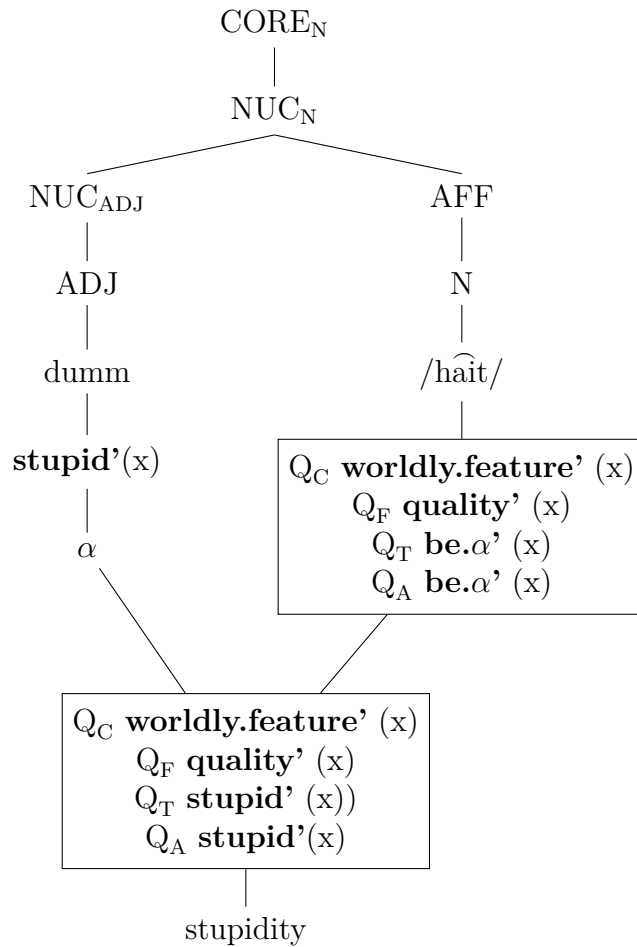
Figure 44: Morphological and compositonal projections of *Dummheit*

It has the allomorphs {-keit} and {-igkeit} (cf. Oberle, 1990). Examples are *Ewigkeit* 'eternity' from *ewig* 'eternal' and *Stimmigkeit* 'coherence' from *stimmig* 'coherent'. An example for {-igkeit} is *Frömmigkeit* 'piety' from *fromm* 'pious'. Figure 45 on the following page displays the morphological and phonological projections of *Ewigkeit*. The label COA stands for choice of allomorph.

CORE_N

NUC_N

NUC_ADJ   AFF

ADJ   N

ewig   /hai͡t/ ← COA: /kai͡t/

/g/→[ç] / /i/_ → /eːvig/   /kai͡t/

/eːviçkai͡t/ ⟵——— SP: 3 σ

Σ   σ   σ

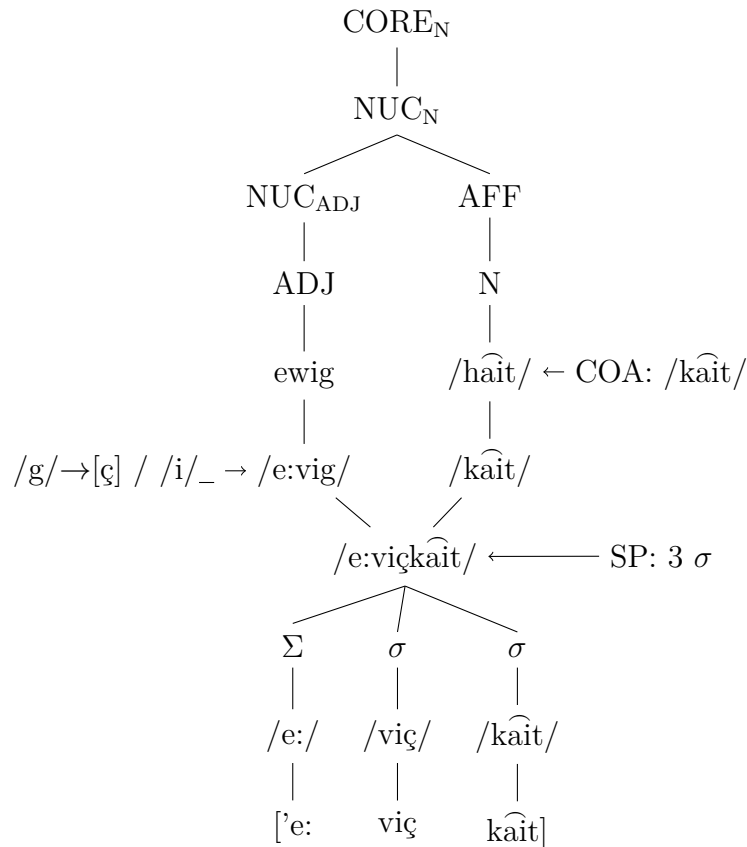/eː/   /viç/   /kai͡t/

[ˈeː   viç   kai͡t]

Figure 45: Morphological and phonological projections of *Ewigkeit*

The suffix {-nis}, another affix which results in qualitative nouns, is becoming obsolete. A few derivations involving it like *Ödnis* 'wasteland, barenness' and *Geheimnis* 'secret' remain (cf. Donalies, 2011, 82), some of which appear to have been lexicalized. The loan suffixes {-tät} and its allomorph {-ität} and {-ie} with its allomorph {-erie}, which all form qualitative nouns, are most commonly used with loaned adjectives (cf. Bannholzer, 2005)

The suffix {-ung} turns verbs into nouns referring to actions. It is highly productive and can be combined with almost all verbs. Examples for this use include *Erkundung* 'survey, reconnaissance' from *erkunden* 'to survey, to scout' and *Belagerung* 'siege' from *belagern* 'to siege'. Both nouns can be used in a sentence like *Die Erkundung / Belagerung des Feindgebietes verlief bisher problemlos* 'the survey / siege of the enemy territory has proceeded without problems so far', indicating that they encode the process as a whole. Further indication for this analysis is the sentence *Die Belagerung war kurz.* 'the siege was short', where the process of sieging lasted for a short duration.

In some instances the undergoer argument of the base verb is implied by the resulting noun. The deverbal noun *Schenkung* 'donation' from *schenken* 'to donate, to gift' encodes what has been donated as well as the the action of donating something. In the expression *eine großzügige Schenkung* ' a generous donation' it is not the process of donating which is generous, but the amount of what has been donated was generous. Deverbal nouns like *Sendung* 'transmission, (tv-)program' from *senden* 'transmit' however, display instances of both readings. *Sendung* can refer to a tv show, something which has been broadcast, and to the process of transmitting something.

4.2.3.4 Adjectival and adverbial suffixes

The derivational suffix {-bar} turns verbs into adjectives and adds the information that the action denoted by the base verb is achievable. Examples for this are the adjectives *säuberbar* 'cleanable' and *glaubbar* 'believable' from *säubern* 'to clean' and *glauben* 'to believe'. A table is cleanable when it is possible to clean it and a story is believable when it can be believed. The problem for propsing an incomplete LS for postverbal {-bar} is twofold: The aktionsart encoded by the verb is changed to a state and the number of arguments encoded is reduced to one. The potential LS possible'(α, y) only partially solves this problem, as the LS α may encode more than one argument.

Its suffixation to nouns is restricted to a few instances, not all of which display the meaning as being able to. The denominal adjective *fruchtbar* 'fertile' from *Frucht* 'fruit' means that it is possible to grow fruit in a place, but the adjective *furchtbar* 'awful, dreadful' from *Furcht* 'dread' means that something ought to be dreaded.

The derivational suffix {-sam} can be suffixed to verbs and nouns. When used with verbs it expresses that performing the action encoded by the base's LS is a (habitual) quality. Examples for this are *folgsam* 'tame, obedient' from *folgen* 'to follow, obey', *duldsam* 'tolerant' from *dulden* 'to tolerate' and *schweigsam* 'silent, taciturn' from *schweigen* 'to say nothing'. Someone obedient follows directions and someone tolerant tolerates. The suffix {-lich} when used postverbally generally expresses the same, as exemplified by *schädlich* 'harmful, detrimental' from *schaden* 'to harm' and *zögerlich* 'hesitant' from *zögern* 'to hesitate'.

When used postnominally {-sam} expresses the quality of having what is encoded by the base noun. The archaic adjective *tugendsam* 'virtuous' from *Tugend* 'virtue' means that someone's actions are guided by virtues. It can furthermore appear suffixed to the first two cardinal numbers resulting in *einsam* 'lonesome, solitary' and *zweisam* 'the state of being alone with a partner or friend' from *eins* 'one' and *zwei* 'two'.

The problematic for expressing them in terms of an LS encoding a single argument and a state, as described above for {-bar}, is relevant for all derived adjectives. An exact analysis of how the meaning encoded by derived adjectives comes about requires a deeper investigation into the compositional process specialized for adjectives and exceeds the scope of this thesis. It may involve interaction with lexical redundancy rules and has to be analyzed in its own right.

Furthermore, in German there are derivational suffixes which instigate a change in lexical category towards adverbials, expressing directionality or orientation. These include, but are not limited to, {-wärts} and {-lings}. They are usually suffixed to nouns, with some exceptions like *blindlings* 'slapdash, blindly' from *blind* 'blind'. The suffix {-wärts}, cognate to English {-wards} encodes a direction towards the base noun, as in *himmelwärts* 'skyward' from *Himmel* 'sky, heaven'. It may also appear suffixed to prepositions as in *auswärts* 'outward' and *aufwärts* 'upward' from *aus* 'out' and *auf* 'up, on'. The suffix {-lings} encodes orientation, usually to indicate which body part is facing towards something. Examples are *bäuchlings* 'prone, on one's stomach' from *Bauch* 'stomach' and *rücklings* 'facing backward' from *Rücken* 'back (body part)'. The analysis of the semantical composition taking place during derivations such as these will be left for future research.

4.2.3.5 Morphological template for suffixation

Even though the compositional processes taking place are inconsistent or indecipherable at times, all suffixation in German follows the same morphological pattern. Multiple suffixation is restricted to nominalization of derived adjectival and verbal bases. Derived nouns prohibit further suffixation. The underlying reasons for this restriction (within an RRG framework) is something to be investigated in future research and will for now be explained by differing morphological templates for nominal and other suffixation.

The template displayed in figure 46 below may be an overgeneralization, as some nominal suffixes as {-ung} cannot be suffixed to derived adjectives ending in {-bar} whereas the suffix {-keit} are permitted. It might be necessary to either give some suffixes their own template or to determine morphological or semantic reasons prohibiting further suffixation, in order to explain the grammaticality of some constructions.
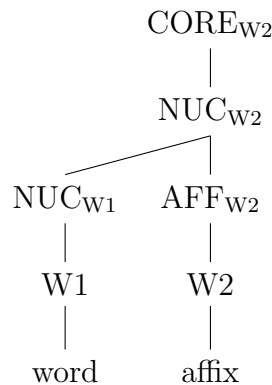
$$\text{CORE}_{W2}$$
$$|$$
$$\text{NUC}_{W2}$$

$$\text{NUC}_{W1} \quad \text{AFF}_{W2}$$
$$| \qquad\quad |$$
$$\text{W1} \qquad\quad \text{W2}$$
$$| \qquad\quad |$$
$$\text{word} \qquad \text{affix}$$

Figure 46: Morphological template for suffixation

4.3 Compounding

4.3.1 A brief introduction to compounding in German

Compounding is a very productive process in German across all lexical categories. Most German compounds are endocentric and right-headed. The lexeme compounded to the head will be called modifier where no lexical category is mentioned and modifying noun, verb, etc. when talking about lexemes in specific constructions. In German, there are little restrictions as to what can be used as a modifier. When compounded to a noun, any lexical category (even phrases and clauses) may serve as a modifier. Examples for this are noun + noun *Dampfschiff* 'steamship', adjective + noun *Großmaul* 'loudmouth', verb + noun *Fahrweise* 'driving style', preposition + noun *Aufzug* 'elevator, something that pulls one up', adverb + noun *Sofortmaß-nahme* 'immediate measure' (cf. Donalies (2011, 56)), phrase + noun *Durch-die-Tür-Geher* 'through-the-door goer' and clause + noun *Dreh-ihn$_i$-Dir-selbst-Stoff$_i$* 'Roll-it-yourself-substance'[33], where the pronoun inside the compounded clause seems to be dependent on the head noun, as it reflects the grammatical gender of the noun and the case the noun would take in the clause.

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[33]Even though phrasal- and clausal compounds are possible, they are relatively rare and seem to be used most often for articstic expression and advertisement. The phrase + nound compound is taken from the lyrics of a German hip-hop song, whereas the clausal compound is from a package of tobacco.

Compounds can serve as the modifier during further compounding. There is no inherent constraint on the possible length of compounds in German, as exemplified by the German law called *Rinderkennzeichnungs- und Rindfleischetiket-tierungsüberwachungsaufgabenübertragungsgesetz* 'law for the transfer of assignments for the supervision of the labelling of beef and the tagging of cattle'. The name of this law is actually made up of two compounds, where the *überwachungsaufgabenüber-tragungs* 'transfer of assignments for the supervision of' part has been replaced by a hyphen in the first word. It is one law, concerned with the transfer (...) for the supervision of two thing: labeling beef and tagging cattle.

The following analyses of German compounds will be constricted to endocentric and copulative compounds, as exocentric compounds raise additional problems for a semantic analysis, which are so complex that they merit an investigation on their own.

4.3.2 The Word Linkage Marker

This subsection deals with the word linkage marker, an element which regularly appears between compounded lexemes in German compounds, traditionally called *Fugenmorpheme* 'fugue morpheme, interfix'. It can have several phonological realizations, with the most regular one being {-s}, not only with native lexemes, but also the most common one in combining native lexemes with loan words (cf. Nübling & Szczepaniak (2009, 196)).

Furthermore, its appearance can be partially predicted, as the derivational suffixes {-heit}, {-ion}, {-ität}, {-keit}, {-schaft} and {-ung} always trigger the {-s} fugenmorpheme (cf.Donalies (2011, 32)). It is less predictable after lexemes, as the word *Schiff* 'ship' may or may not trigger its appearance, exemplified by the two compounds *Schiff-fahrt*[34] 'ship cruise' and *Schiff-**s**-schraube* 'ship propeller'. Furthermore Nübling & Szczepaniak (2009, 199) name an example of the same lexeme having either none or one of three different fugenmorphemes when used as the modifying noun in a compound. *Kind* 'child' compounds to *Kind-bett* 'puerperal', *Kind-**s**-kopf* 'child head, a childish person', *Kind-**es**-wohl* 'a child's well-being' and Kind-**er**-wagen 'perambulator'. These four forms (as a modifying noun) are called a noun's compositional stem forms.

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[34]Note that the hyphenation has been added for the reader's sake and does not reflect standard German orthography. However, some native speakers leave either a blank space between compounded lexemes or prefer hyphenation over writing them as one word, especially after word linkage markers Donalies (2011, 32).

Donalies (2011, 33) additionally names {-i} and {-o}, which appear rarely and only in combination with loan words. Many of the examples she gives, like *Plastinaut* 'a human shaped figure made from plastic, made to be send to space for test flights', *Filzokratie* 'corrupt bureaucracy' and *morphosyntaktisch* 'morphosyntactc' appear to be blended forms rather than compounds. *Plastinaut* is blended from *Plastik* 'plastic' and *Astronaut*[35]. *Filzokratie* is compounded from *Filz* 'felt, colloquialy: corruption' and a truncated form of *Bürokratie* 'bureaucray'. The word *morphosyntaktisch* is blended from *morphologisch* 'morphological' and *syntaktisch* 'syntactic'. However, all these compounds involve loaned stems (confixes), which as stated above partially follow their own sets of rules.

They also state, that fugenmorphemes originate from historic inflectional affixes and have lost their inflectional status in modern German (ibid. 197). Given that there are examples contradicting an inflectional nature of fugenmorphemes, this thesis agrees with that point of view. One example is the pair of words *Bücherkiste* 'book crate' and *Buchhandlung* 'book store' as given by Donalies (2011, 35). Both compounds imply the plurality of the modifying noun *Buch* 'book', but there is no affix indicating plurality in *Buchhandlung*. Nübling & Szczepaniak (2009, 197) also name *Hühnerei* 'chicken egg', where the modifying noun *Huhn* 'chicken' appears to be plural, even though a chicken egg clearly comes from a single hen alone.

This thesis follows the approach taken by (Lindner, 1998) and Nübling & Szczepaniak (2011, 55), which define fugenmorphemes as elements signaling borders within compounds. This approach implies, that the fugue element is used by speakers to ease interpretability of compounds for perceivers, where each form marked by a fugue element is interpreted as a single prosodic word within the construction, corresponding to ω in the prosodic projection put forward by O'Connor (2008). The function of the fugenmorpheme can thereby be seen as linking prosodic units, entailing its status as a word linkage marker.

4.3.3 Morphological analysis

As stated above, there are few restrictions on compounding in German. Therefore the analysis contained within this subsection concentrates on constructing a morphological template for compound forms in general. The analysis put forward here will be utilized in the following subsection, which will contain an analysis of verbal compounds, including particle prefix verbs, in different syntactic contexts.

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[35]This form could be analyzed as a derivation as well, since it is build analogously to *Astronaut*, *Kosmonaut*, *Taikonaut* and *Vyomanaut* 'American, Russian, Chinese and Indian space farers respectively', where the {-naut} suffix with the incomplete qualia structure {QF: person(x); QA: human(x); QT: explore(x,α); QC explore(x,α) CAUSE BECOME be.explorer(x,α).

The first step in generalizing the morphological structure of compounding in German is the comparison of both compounds of lexemes sharing their lexical category and lexemes which do not. A semantic analysis of compounds will be held brief, as it often involves the Principle of Parsimony and tacit knowledge about the world on the part of speaker/perceivers, even with endocentric compounds. This can be exemplified by the N+N compounds *Suppenlöffel* 'soup spoon', compounding *Suppe* 'soup' and *Löffel* 'spoon' and *Holzlöffel* 'wooden spoon', compounding *Holz* 'wood' and *Löffel*. The first compound refers to a spoon which is use to eat soup, the second compound refers to a spoon which is made from wood. The interpretation of these compounds as having these readings is clear to all speaker/perceivers, as their knowledge about the world dictates that wood is not something that can be eaten, but is something which is usually used as a material. Figure 47 below displays the morphological projection of *Suppenlöffel*, with the two compounded nouns displayed like a nuclear cosubordination.

N
|
CORE$_N$
|
NUC$_N$

NUC$_N$ ← WLM   NUC$_N$
| |
N   N
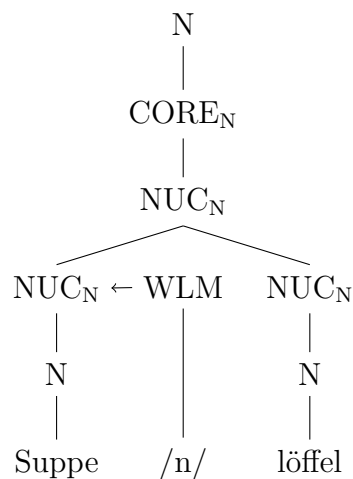| |
Suppe   /n/   löffel

Figure 47: Morphological projection of *Suppenlöffel*

In general, the morphological structure displayed above is the same for all endocentric, determinative compounds, regardless of which lexical categories are compounded, except vor verbal heads. This is demonstrated by V + N compounds like *Fahrweise* 'driving style' from *fahren* 'to drive' and *Weise* 'style', A+ N compounds like *Buntpapier* 'colored paper' from *bunt* 'colored, colorfull' and *Papier* 'paper', ADV + N compounds like *Sofortmaßnahme* from *sofort* 'immediate' and *Maßnahme* 'measure' and P + N compounds like *Aufzug*, from *auf* 'up' and *Zug* 'here: tug'.

Compunds resulting in other lexical categories also follow this pattern, as demonstrated by N + A *meerblau* 'sea blue' from *Meer* 'sea' and *blau* 'blue' and V + A *trinkfest* 'hard-drinking, able to hold one's liquor' from *trinken* 'to drink' and *fest* 'firm, tight'. Donalies (2011, 62) also names some examples of compounds of lexical categories, usually considered closed, such as P + P *gegenüber* 'opposite, across from' from *gegen* 'against, towards' and *über* 'over, about'. Such compounds are possible, however new formations towards forms like these is unlikely.

For the proposal of a morphological template for endocentric, determinative compounds in German, the possibility to use any lexical category as either the modifier or the head, needs to be taken into account. Furthermore, the template must display that the lexical category of the compound is always instigated by the rightmost lexeme. This holds true for exocentric compounds like A + N *Großmaul* 'loudmouth', where the semantic head of the construction is the person having a loud mouth, and compounds in which the first lexeme is the semantic head such as in *Sommersonnenwende* 'summer solstice' *Metallgardinenstange* 'metal cornice' vs *Tüllgardinenstange* 'tull cornice' (cf. Donalies (2011, 38)) from *Metall* 'metal', *Tüll* 'tull', *Gardine* 'curtain, drape' and *Stange* 'rod, pole bar'. Their morphological projections are displayed in figures 48 and 49 below and on the following page.
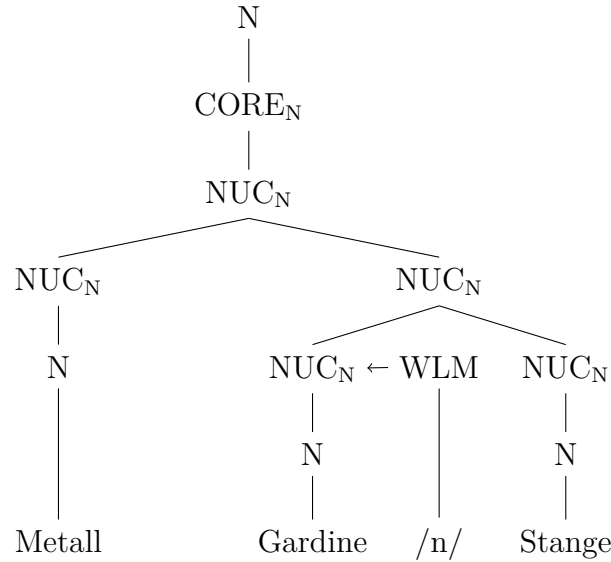

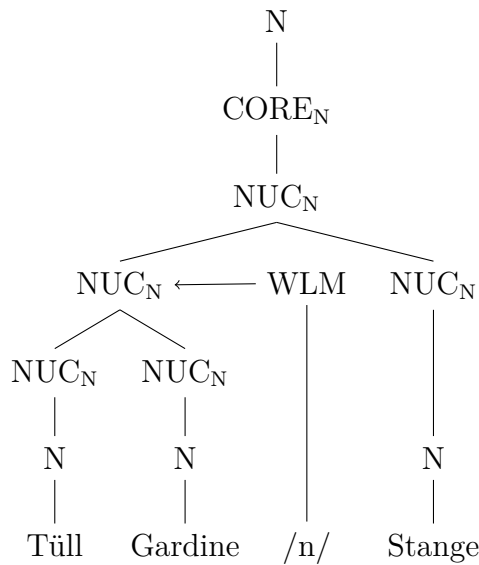Figure 48: Morphological composition of *Metallgardinenstange*

Figure 49: Morphological composition of *Tüllgardinenstange*

The first compound denotes a cornice made from metal, so *Metall* is semantically modifying the compound noun *Gardinenstange*. *Tüllgardinenstange* can be interpreted as a *Stange* for tull drapes, where the head *Gardine* is semantically specified by *Tüll*, with this entire compound semantically specifying *Stange*. It can also be interpreted semantically left-headed, like the compound above.

However, literally this would encode a cortice either for or made from tull with no specification towards tull drapes. For this analysis it would be necessary to define these either as a cosubordination of three NUC$_N$s or as the compound of the two compounds *Tüllgardine* and *Gardinenstange* with one instance of the word *Gardine* omitted. Both of these explanations would require additional assumptions in order to arrive at the same conclusion drawn for repeated binary cosubordination.

Figures 50 and 51 on the following page display the proposal of the morphological templates for compounding (excluding verbal heads) in German, one including the appearance of a WLM and one without. The two compounded lexemes are portrayed as a nuclear cosubordination. The lexical category of the uppermost nucleus will always be determined by it syntactic head, which in these depictions in the rightmost NUC immediately dominated by the uppermost NUC. W1 can be any lexical category, whereas compounds involving verbal heads form a different pattern of compounding.
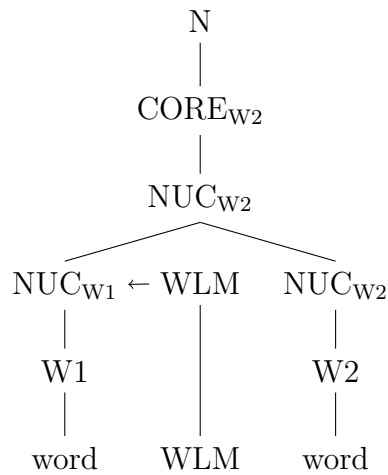
N
|
CORE$_{W2}$
|
NUC$_{W2}$

NUC$_{W1}$ ← WLM   NUC$_{W2}$
| | |
W1   W2
| | |
word   WLM   word

Figure 50: Morphological template for non-verbal compounds with WLM

N
|
CORE$_{W2}$
|
NUC$_{W2}$

NUC$_{W1}$ NUC$_{W2}$
| |
W1   W2
| |
word   word
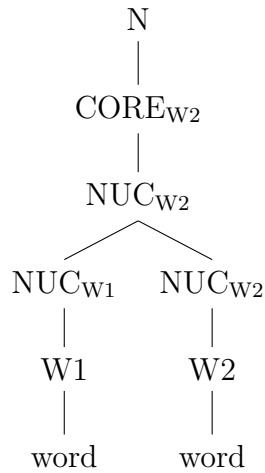
Figure 51: Morphological template for non-verbal compounds without WLM

4.3.4   Verbal compounds

This subsection contains the analysis of verbal compounds in German and their syntactic behavior. The goal is to show whether particle prefix verbs are P + V compounds as assumed above, by comparing their behavior under different syntactic conditions to the behavior of X + V compounds and particle verbs in the same syntactic contexts. The first step in doing this is the analysis of X + V compounds in different constructions, followed by the behavior of P + V compounds specifically. Finally, these will be compared to the analyses given above for particle verbs.

In German, there are several N + V compounds such as *staubsaugen* 'to vacuum, lit: to dustsuck', *bergsteigen* 'to mountaineer, lit.: to mountainclimb', *radfahren* 'to bike, lit.: to bikedrive' and *hammerwerfen* 'to throw hammers, lit.: to hammerthrow', aswell as A + V compounds such as *glattstreichen* 'to smoothen, lit.: to smoothstroke' and *schwarzmalen* 'to naysay, lit.: to blackpaint'.

As mentioned above, the relatively frequent word *staubsaugen* differs from the rest of the examples for some speakers, as it is in the process of being regrammatcilaized.This can be seen by some speakers forming the participle as *staubGEsaugt*, while some form the participle as *GEstaubsaugt*. The less frequent verbs like *bergsteigen* cannot be formed with initial {ge-}, but have to embed the {ge-} between the noun (or adjective) and the verb. A further difference can be seen by the separation of noun and verb in finite constructions, displayed by *radfahren* in sie fahren *Rad* 'they bike, lit.: they ride bike' but not necessarily happening with *staubsaugen*: *sie saugten Staub* vs. *sie staubsaugten*[36].

The seperabiulity of X+V compounds has lead to discussions, whether there is verbal compounding in German at all (compare Dalmas (2007) and Kauffer & Métrich (2007) for discussion) and to the assumption, that constructions like *radfahren* and *bergsteigen* aren't compounds (cf. Donalies, 2011, 61). However, the verbs *fahren* and *steigen* are intransitive. The assumption that verbs like *radfahren* and *bergsteigen* aren't compounds raises the question, how the additional argument realized in *sie stiegen Berg* and *sie fuhren Rad* is interpreted and how a transitive construction comes about. Therefore this approach will follow Fleischer & Barz (1992) in assuming the existence of verbal compounds in German.

---

[36]Günther (1997) assumes forms like *staubsaugen* and *bergsteigen* to be back formations from N+N compounds like *Staubsauger* and *Bergsteiger*. However, this does not explain the differing syntactic behaviour between reinterpreted *staubsaugen* with intial {ge-} and *bergsteigen*, which must never realize {ge-} word initially. See also Wurzel (1993) for a discussion of some N+V compounds like *ehebrechen* 'to commit adultery' and *gewährleisten* 'to warrant, guarantee' as incorporating constructions.

At first glance these constructions appear similar to *sie verschenken Blumen, sie trinken Bier* and *sie aßen Eier*. However, the syntactically realized undergoer arguments in these constructions would all require explicit definiteness marking when used as singular: *sie verschenken die/eine Blume, sie trinken ein Bier, sie aßen ein Ei*. In the compositional structures above however, definite marking results in ungrammaticality, as illustrated by *die Berge gestiegen* 'climbed the mountains' vs **die bergestiegen* '*the mountainsneered'. That inflectional marking with some of these constructions is either strange or ungrammatical, as further illustrated by **er fährt Räder, *sie räderfahren, *sie bergesteigen, *um bergezusteigen* and **sie hat olympisch hämmergeworfen,* is an additional indication for a compositional nature of these verbs.

Furthermore, the concept denoted by *schwarzmalen* (forming *schwarzgemalt* and *sie malten schwarz*) drastically differs from the semantics encoded by either of its components *schwarz* 'black' and *malen* 'to paint', indicating that lexicalization took place. Complex verbs like *schwarzfahren* 'to fare-dodge' from *fahren* 'to drive; to use public transport', *schwarzarbeiten* 'to work illicitly, to tax-dodge' from *arbeiten* 'to work' and *schwarzbrennen* 'to moonshine, illicitly distill' from *brennen* 'to burn; to distill' point towards the adjective *schwarz* coexisting with a homophonous particle-like counterpart expressing illicit activity. This may also apply to complex verbs involving the adjective *neu* 'new', which in some cases is closer in meaning to the English prefix {re-}, expressing that an action is repeated and other A+V compounds where the compounded adjective does not express the result state of the action denoted by the verb.

A similar argument can be made for *bergsteigen*, which encodes the concept of mountaineering (allthough this concept can still be seen as compositional, since *mountaineering* means to climb mountains). Therefore these constructions will be interpreted as compounds in this thesis. Morphologically, they are subordinations of a lexemic nucleus under a word-level node and on the same level as the core. The lack of possible inflections on the modifier points toward a NUC being coordinated to the word node during compounding. Figure 52 on the following page displays the morphological projection of *glattschleifen*.

```
                              N
                           ╱     │
                    NUC_A      CORE_V
                       │          │
                       A        NUC_V
                       │          │
                     glatt      PRED
                                  │
                                  V
                                  │
                                schleif
```
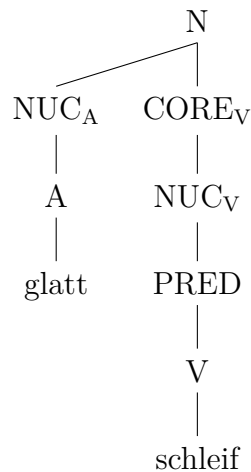
Figure 52: Morphological projection of *glattschleifen*

This structure resembles the one given for particle verbs above. The motivation for an analysis like this is the shared behavior under different syntactic conditions with the one described for particle verbs, illustrated by the following examples (16) - (27). Each block of three examples below shows the syntactic behavior of N+V and A+V compounds and particle verbs (in that order) with infinitive marking, finite marking, past participle and CLM respectively.

(16) Sie können RADfahren   (17) Sie können SCHWARZmalen

(18) Sie können ANmalen

(19) Sie fahren RAD   (20) Sie malen SCHWARZ

(21) Sie malen AN

(22) Sie sind RADgefahren   (23) Sie haben SCHWARZgemalt

(24) Sie haben ANgemalt

(25) , um RADzufahren   (26) ,um SCHWARZzumalen

(27) , um ANzumalen

Their similarity in syntactic behavior can be explained by a similarity in morphological structure. The modifiers in the N+V and A+V compounds are realized on the same level as clitics, just as particles are.

Considering this similarity in structure, particle verbs may also be analyzed as ADV + V compounds, at least partially. The loss of semantic predictability of particles due to lexicalization can be seen as a sign of these elements undergoing a process of grammaticalization, belonging to a category between lexemes and affixes, resembling the status of clitics.

Furthermore, the similarity in morphological template may explain the reinterpretation of adjectives like *schwarz* and *neu* as particles in cases where the state encoded by the adjective cannot be read as the result state caused by the action encoded in the verbal head.

A difference can be seen when comparing N + V and A + V compounds to V + V compounds as *spritzgießen* 'to injection-mold' and *brennhärten* 'to flame-harden', which will never appear separated. However, the V + V compounds will embed the {ge-}, as demonstrated by *spritzgegossen* and *brenngehärtet*. As with *staubsaugen*, some speakers may prefer {ge-} word-initially, as *gespritzgossen* and *gebrennhärtet* are possible constructions. The following examples will concentrate on the more common pattern with embedded {ge-} and the separation of modifier and head verb. The modifying verb must not receive inflectional marking, as forms like **ich spritzegieße, *sie spritztgießt, *du brennsthärtest and *sie sprengennieten* are all ungrammatical.

The examples (28)-(31) below display the syntactic behavior of V + V compounds in the same syntactic constructions exemplified for N+V and A+V compounds above.

(28) Sie können SPRITZgießen

(29) Sie SPRITZgießen

(30) Sie haben SPRITZgegossen

(31) , um SPRITZzugießen

As the examples above show, verbal compounds with modifying nouns, adjectives and verbs behave alike under equal syntactic conditions, with one exception: V + V compounds are not separated in finite constructions. Furthermore, they have in common, that it is always the modifier carrying the lexical stress and not the head.

V+V compounds differ from the aforementioned verbal compounds in terms of possible positions in which the modifier can be realized. This behavior can be explained by analyzing them as a morphological coordination of two verbal nuclei under a CORE$_V$. The morphological projection of *spritzgießen* is displayed in figure 53 on the following page.
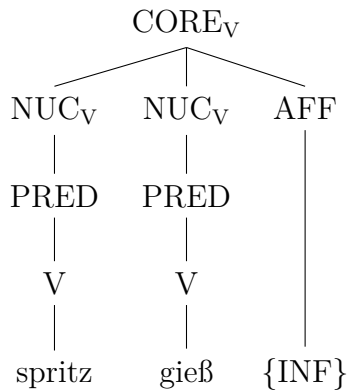
```
                           COREV
                    ╱        │        ╲
                 NUCV       NUCV      AFF
                  │          │         │
                 PRED       PRED       │
                  │          │         │
                  V          V         │
                  │          │         │
                spritz      gieß     {INF}
```

Figure 53: Morphological projection of *spritzgießen*

The realization of the participial {ge-} is restricted to the position immediately before the root. From the two roots, *spritz* and *gieß*, encoded in this compound, the root which serves as the head of the compound is the relevant one for participles embedding the {ge-}. Word-initial appearance of {ge-} can be explained either by lexicalization of the complex verbs, which appears unlikely due to the rarity of their occurrence mostly restricted to technical language, or by the {ge-} only being restricted to roots and not to roots of heads in compounds. Figure 54 below displays the morphological template for the past participle forms of V+V compounds.

```
                              COREV
                    ╱      ╱         ╲        ╲
                NUCV1    AFF       NUCV2      AFF
                  │       │          │         │
                 PRED     │         PRED        │
                  │       │          │          │
                  V       │          V          │
                  │       │          │          │
                verb    /ge-/      verb     {PRTCPL}
```
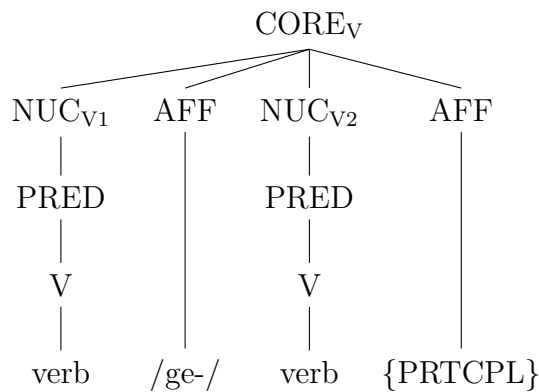
Figure 54: Morphological template for V+V past participles

Another type of syntactic behavior is displayed by prefix particle verbs, which will be analyzed as P+V compounds. The analysis as compounds is motivated by the semantic clarity of the resulting compound: particle prefix verbs generally clearly encode the predicate denoted by the head verb modified by the preposition as happening with respect to a certain direction. Examples for P+V compounds are *umfahren* 'to drive around', *durchkreuzen* 'to intersect' from *durch* 'through' and *kreuzen* 'to cross' and *überblicken* 'to oversee' from *über* 'over' and *blicken* 'to see, spot'

Another reason for analyzing them as compounds is their syntactic behavior, displayed in the examples (32) -(35) below.

(32) Sie können umFAHREN   (33) Sie umFAHREN

(34) Sie haben umFAHREN   (35) , um zu umFAHREN

They will not permit the preposition and the verb to be separated, similar to V+V compounds. They suppress the appearance of {ge-}, which points towards the position immediately before the root being taken and do not embed the CLM in augmented infinitive constructions. The main lexical stress will always be carried by the stem. Since these are all features shared by left-headed derivates, at first glance they appear similar in structure. However, the word-initial elements in the particle prefix verbs mentioned above will never change the lexical category of their host, which means that they are morphologically right-headed.

The syntactic behavior of particle prefix verbs while accounting for their right-headedness can explained by analyzing them as compounds with morphological nuclear cosubordinations, joining a NUC$_P$ and a NUC$_V$ under a NUC$_V$. Together they form a complex nucleus, which prohibits both prefixation with {ge-}, similar to complex nuclei resulting from derivational prefixation and further derivational prefixation. The CLM will appear immediately before the uppermost nucleus, which will yield the correct result for augmented infinitive constructions of P+V compounds with this juncture-nexus type. The morphological template proposed for P+V compounds is displayed in figure 55 on the following page.
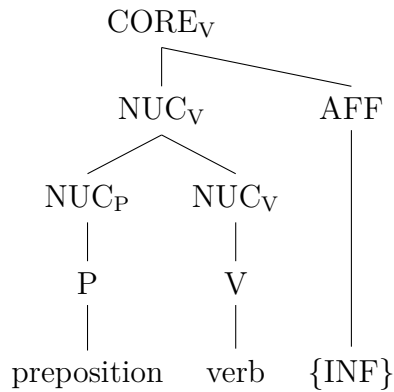
```
                        CORE_V
                       /      \
                    NUC_V      AFF
                   /    \        |
               NUC_P    NUC_V    |
                 |        |       |
                 P        V       |
                 |        |       |
             preposition verb   {INF}
```

Figure 55: Morphological template of P+V compounds

4.4 Hybrid affixes

This section contains a brief discussion about the class of affixes displaying both features of inflectional and derivational nature. The fist subsection will concentrate in valency altering affixes traditionally considered to be inflectional, such as the comparative ending {-er} for adjectives. A discussion about passive constructions will be foregone, as passive is realized analytically in German.

4.4.1 Valency operations and inflectional marking

The goal of this subsection is to show, that the comparative affix {-er} neither belongs inflectional or derivational morphology alone. The reason behind this assumption is that it displays features of both of these categories. It's appearance in a sentence is syntactically predictable, whereas the appearance of derivational morphemes is not, as speakers can freely choose a simple word over a complex one denoting the same thing, whereas the comparative ending cannot be omitted or changed freely. The same argument holds for their semantic predictability, as the comparative will always encode the same semantic components and derivational marking seldom is entirely predictable.

However, the comparative ending adds an argument to the state predicate denoted by its host adjective and changes the predicate accordingly from $\alpha'(x)$ to **more.**$\alpha'(x, y)$ or $> \alpha'(x, y)$. These alterations done to the host's LS are features also displayed by derivational affixation. Furthermore, derived verbs such as *vergrößen* 'to enlarge', *verkleinern* and *zerkleinern* 'to make smaller (pieces)' and *verschönern* 'to beautify' all use the comparative form of the adjective as a derivational base.

The need for a state of comparison for these causative changes of state is unsurprising: If something is caused to become bigger or smaller it is entailed that is bigger or smaller than it was before. The logical structure for such constructions could be seen as [**do'** (x, Ø)] CAUSE [BECOME **more.**α'(y, y)]. Since the derivational affixes are left-headed and immediately dominate the nucleus of their base, comparative marking seems to apply in the nucleus rather than in the core of an adjective.

This approach also obviates the need to define an operator order for adjectives, otherwise needed to account for the order of comparative marking and nominal agreement. Comparative marking will also be realized closer to the adjective than nominal agreement because inflection happens in the nucleus and nominal inflection happens in the core.

The analysis of forms such as the comparative {-er} as a hybrid affix at nucleus level is capable of explaining both its derivational and its inflectional features within the the proposed framework.

4.4.2   Non-finite marking as input condition for conversion

In German, conversion of verbs towards other lexical categories is restricted to their stem forms and non-finitely marked word forms, like the infinitive and participles. The same verb may have several converted forms, as der *Lauf*, converted from the present tense stem, and *das Laufen*, converted from the infinitive, demonstrate.

These forms will always differ in grammatical gender, as verbs converted into nouns using their present or past tense stem will result in masculine gender and converted infinitives will always receive neuter gender (with the notable exception of *das Verbot* 'the prohibition', neuter and converted from the past tense stem). They also differ semantically, as *das Laufen* 'the running' denotes a process (hence its translation with a gerund), and *der Lauf* 'the run' denotes something resulting from the process.

The general feature of the verbal infinitive as encoding a process when used as the base in a conversion could be a reason to identify it as a general marker for nominalization. Further indication supporting this analysis can be seen in some analyses of imperfective aspect in colloquial German, realized as the so called *Rheinische Verlaufsform*.

The expressions *ich bin gerade am Arbeiten* 'I am working right now' and *ich bin am Lesen* 'I am reading' are examples of imperfective sentences of colloquial German. The preposition *an* cooccuring with the infinitival form is inflected for gender and case, resulting in am and pointing towards the infinitive forms being nouns.

However, viewing the infinitive marker as a general derivational affix changing resulting in nouns, the instances of infintivily marked words as in *sie müssen suchen* and *um suchen zu können* would have to be analyzed as nouns, which they are not. Other than nouns, the infinitive forms used in these expressions cannot be specified by definiteness marking of any kind. Therefore the infinitive suffix {-en} will not be defined as a derivational affix, but rather as an inflectional marker conditioning the lexical categories to which its host verb can be converted. This condition is based on semantic interpretability of the base verb's changed LS.

To exemplify: Since the nouns converted from an infinitival form always denote processes, all verbs for which speaker/perceivers are able to parse a process should be able to be converted into infinitival nouns. Punctual aktionsarten like semelfactives and achievements are either reinterpreted as processes or the read as parts of a process. In the expression *das ständige/konstante/schnelle Flackern des Lichtes* 'the perpetual/constant/rapid flickering of the light', the deverbal noun *Flackern* can be modified with adjectives explicitly denoting duration like *konstant*. Achievements can also be reinterpreted as processes, specifically as the process taking place during the change of state. An example for this is the sentence *In der Zeitlupe war zu sehen, dass das Platzen des Wasserballons mit einem spontanen Herausspritzen einzelner Wassertropfen begann* 'In slow-motion it can be seen, that the popping of the balloon began with spontaneous bursts of single drops'.

This approach also predicts, that static verbs should not be able to convert to "resultative" nouns from their past tense stem, unless speaker/perceivers are able to infer a result. Applying this prediction to stative verbs in German, there should not exist deverbal nouns converted from past stems of stative verbs. The verbs *lieben, fühlen, glauben, wissen* and *verstehen* behave as predicted, as they only have nominal conversions with the infinitival base, none where any of their stem forms is used. The words *Liebe* and *Glaube* are derived from the verbs by suffixing {-e}.

The same argument can also be made for participial forms. Past participle forms in German can usually be used as adjectives denoting a result state. If host verb's LS expresses a semelfactive or an activity, the past participle form cannot be used as an adjective. The adjectival use of past participle forms is restricted by speaker/perceiver's inability to infer result states from semelfactives and activities.

Since the output of deverbal conversion appears to be dependent on their base verb's aktionsart. The appearance of the respective non-finite affixes is syntactically predictable and they are also consistently predictable in the semantic component they contribute. Motsch (2004, 54) states that the infinitive ending {-en} ought to be analyzed as inflectional, not as derivational.

It cannot be clearly concluded however, whether this excludes non-finiteness markers from being partially derivational. Their appearance in converts seems to point towards them being derivational, in the sense that they, in contrast to purely inflectional affixation, may serve as input for word-formation. However, it is uncertain whether this is caused by a possible derivational nature or the process of conversion permitting inflected input, whenever speaker/perceivers are capable of interpreting the result.

Adjectives with their coreferential nouns omitted being converted in spite of and including inflectional marking, points towards the latter, exemplified by *der/die/das Starke* 'the strong (one (M/F/N)), *ein Starker* 'a strong (one (M)) ', *ein Starkes* 'a strong (one (N)), *den Starken* 'to the strong (ones)'. V-INF+V compounds like *sitzenbleiben* 'to fail a grade, have to repat a class' Motsch (ibid.) point towards infinitive marking as permitted input in V+V compounds as well, implying that input to word formation processes is either not restricted to nuclear marking but may include affixation in a word's core, as long as this affixation neither conflicts with the satisfaction of arguments in the LS nor with affixes encoding operators. Or it implies that non-finite marking is partially derivational.

The answer to the question which position non-finite affixes take in this context has to be determined in future research, specifically dedicated to word formation processes involving (augmented) infinitives and participles with regards to their level of realization as either core or nuclear elements in morphology.

4.5   Conclusion

Word formation processes in German can be account for by displaying them as different juncture-nexus types, which either combine derivational affixes with lexemes or lexemes with each other. Distinct patterns displayed and shared by different kinds of complex verbs can be explained by a difference in their morphological structure. Both processes are at least partially semantically compositional, meaning they compose the meaning of the complex word resulting from the process from the meaning contributed by each part. The meaning may or may not be predictable, varying between affixes.

Derivation is analyzed as morphological subordination, where a base word is combined with an affix. Prefix verbs are analyzed as left-headed derivation, where the nucleus of the base word is subordinated into the nucleus of the affix. The ungrammaticality of multiple prefixes is explained by a restriction on left-headed affixes, which may not subordinate stems. Particle verbs are analyzed as word-level subordination, where the particle is subordinated to the word node (similar to clitics).

Compounds are defined either as morphological cosubordinations or peripheral subordinations, depending on their type. Compound nouns (and adjectives), irrespective of the modifier's lexical category, are nuclear cosubordinations, combining the nuclei of the two compounded lexemes. Particle prefix verbs are analyzed as verbal compounds with a preposition, belonging to this pattern of compounding. Compounds between two verbs are a morphological ad-nuclear subordination and verbal compounds with other lexical categories are ad-word subordinations.

The process of conversion, and limitations of of its possible bases, can be explained by a combination of syntactic requirements constituted by the sentence. and their preferred reading chosen according to the Principle of Parsimony.

Finally, the comparative {-er} affix is analyzed as a hybrid between derivational and inflectional affix to account for it displaying features of both.

5 Theoretical implications

5.1 Introduction

The goal of this chapter is to utilize the morphological analyses from the previous chapter on which to base possible consequences for the application of the LSW. The presented consequences have been ordered into several categories, each of which will receive its own section. Section 5.2 focuses on specifications regarding the definition of words, affixes and what the word-internal nodes within the LSW represent, beyond a depiction of morphology. Section 5.3 contains a brief discussion about the morphology interfaces and their potential applicability for future research. Section 5.4 focuses on examples where proposals put forward by this work could be used to explain similar phenomena in other languages.

5.2 The treatment of complex words

This sectioned is concerned with the treatment of complex words and the nodes they are represented by in the morphological projection. The first step in doing so is the definition of a root within the morphological projection as well as ist definitional difference to stems. Then the possible implications of the analyses for nodes within the layered structure of the word in terms of what they denote will be focused on.

The separation of roots from stems has been necessitated by the possibility of left-headed derivation being permitted. Left-headed derivation is thereby restricted to roots. To account for the right-headedness of compounds, the definition of a root determined in chapter 2 will need to be refined. The base root of a complex word is the lowest and rightmost instance of a NUC_W, which is not immediately dominated by a CORE_W. A compound may consist of two roots, but the rightmost one will be the base of the construction, determining the lexical category. Stems are all other instance of NUC. CORE is the word form, including inflection.

The word formations displayed in the previous chapter share some features. Processes on a sub-nuclear level, like right-headed prefixation always seem to involve a change to the predicate itself, rather than its argument structure. This points toward words being semantically underspecified at their lowermost nodes, with only the predicates without argument structures being encoded.

Processes talking place between nuclei always involve a direct change in argument structure or the integration of a qualia structure into the argument structure (as an argument). This could be seen as an indication for argument structure being added to a predicate on the nuclear level. Beyond explaining the different kinds of operations taking place between morphologically sub-nuclear and nuclear processes, this would mirror the constituent projection, where referring expressions are realized in the core level of a sentence, as daughters to a CORE and sisters to the NUCLEUS node.

Processes taking place on a word-level between a morphological core and nucleus, usually satisfy a core argument not already specified by inflection. The core of a word seems therefore reserved for satisfaction of arguments within a predicate's argument structure and inflectional marking, morphemes licensed by the operator projection and/or syntax.

This would have interesting results for the treatment of prepositions like German in, which can be used in two ways with different cases, dative or accusative (in or into). The information for in on the lowermost P node is just the predicate **in'** with no specification of argument structure. On the nuclear level the argument structure of in is added, deciding whether an accusative (undergoer) or a dative (non-actor macrorole) is encoded. For English a compounding process between *in* and *to* has taken place on either the nuclear level or below with *to* as the head of the compund. The core level of the prepostion may carry inflectional affixation (like German *im*) accordingly.

Further, this would concur with a partially derivational analysis of the adjective comparative {-er} in the morphological nucleus. The root node A would then encode the predicate without specification of its number of arguments, which is specified by choice of comparative form on the nuclear level and agreement marking in the core.

5.3 Utilization of the morphology interfaces

This section focuses on the interfaces between morphology and other fields of linguistics, mostly focused on a discussion about the morphology-syntax interface.

Although the morphology-semantics interface between the morphological and compositional projections can partially display semantic processes talking place during word-formation, it lacks the ability to properly display processes where either a combination of logical structures of single parts with clear meaning is not possible. The explanation for these interactions will have to remain in the domain of lexical redundancy rules.

An investigation into whether the interactions displayed in this thesis are part of the set of lexical redundancy rules or stand apart from them for reasons other than decipherability of semantic composition alone may be useful for further investigation into lexical redundancy rules and their interactions with word-formation.

The phonological template proposed, especially in combination with the prosodic projection and compounds involving one or several word linkage markers, may constitute a fruitful approach when investigating the influence of word-formation on sentential intonation patterns.

An approach to deciphering the morphology-syntax interface can utilize the proposals put forward regarding compounding and expand on them towards a morphological analysis of sentential compounds and internal agreement marking they display. This approach would need to be combined with a deeper investigation into the process of conversion, especially in regard to how syntax conditions its appearance.

5.4   Applicability to other languages

This section proposes examples of phenomena or features in languages other than German for which an approach applying the findings put forward might prove fruitful.

The underspecification on a word's root node regarding argument structure may find application when describing languages with open lexical borders, permitting the use of a lexeme as different lexical categories, depending on context. For analytic languages, lacking in affixes clearly categorizing a lexeme, an analysis based on the lack of specificity towards a lexical category on the node level seems to be an easier approach than assuming (repeated) underlying conversions.

The definition put forward for hybrid affixes can be utilized to display passive marking in languages with synthetic passive affixes. A similar case to the German comparative {-er} has been pointed out by Shibatani (1990, 220), who brings up three suffixes which he considers better to be treated syntactically (i.e. inflectional) rather than as lexical processes. These are the causative {-sa}, the desiderative {-tai} and the passive {-ra(re)} suffixes. On the one hand, their meaning is entirely predictable as with inflectional morphology. On the other hand, they change the argument structure (causative, passive) and/or the lexical category of the word they are attached to (causative, desiderative) as is exhibited by derivational morphology, as stated by Tsujimura (1996, 142), who considers them to be derivational. Allowing for a class of hybrid affixes would account for both kinds of features these affixes encode.

6 Conclusion

This thesis has shown that German word formation processes can be explained by the layered structure of the word and the morphological projection by which it is displayed. The morphological projection mirrors the constituent projection of a sentence in two ways: It represents a layered structure of a unit with the information encoded in these layers becoming more important for the interpretability of the unit the closer the layer is to the "bottom layer".

For clauses this means a separation into clause-, core- and nuclear layers. The nucleus encodes the predicate, without which no relation between participating arguments would be specified, making it the most important part for the interpretability of the sentence.

For words this means separation into a word-, a core-, a nuclear- and a root layer. The root layer is thereby seen to encode argumentless predicates, with the specification of argument structure encoded on the nuclear layer. The core layer of a word is reserved for inflectional marking. Inflectional affixation is thereby seen as licensed by the operator projection and person marking, either satisfying arguments within logical structures (in head-marking languages) or coindexing the PSA with the corresponding argument in the logical structure. Affixes like the adjectival comparative suffix are defined as hybrid affixes between derivation and inflection.

In order to explain German word formation processes several projections interacting with the morphological projection have been proposed. The compositional projection displays the semantic interactions taking place between lexemes and derivational affixes, which are seen as encoding incomplete logical structures or qualia structures. The phonological projection displays the interaction with phonology with regards to the application of phonological rules, the choice of allomorph and syllabification and lexical stress.

A formal display of interfaces between morphology and syntax, sentential intonation and pragmatics have been foregone due to the difference in scope between sentence-level and word-level interactions. The existence of a presuppositional projection to account for choice of reading for the output of conversion and compounding processes has been assumed.

With these projections German derivations and compounds have been differentiatingly analyzed, distinguishing between several morphological juncture-nexus types to account for differences in their syntactic behavior. Derivations are always morphological subordinations and derivational affixes in German can either be headed, meaning they encode a lexical category and change the lexical category of their base, or "unheaded", meaning they do not encode a lexical category.

Headed affixes subordinate the nucleus of their base into their own nucleus, resulting in either left-headed constructions with prefixes or right-headed constructions with suffixes. Unheaded affixes in German only exist in the form of prefixes, which are subordinated to the nucleus of their base if they alter only the predicate. The semantic changes during derivation involving particles to yield particle verbs are not restricted to the predicate, alterations of the argument structure and aktionsart might occur. Therefore, and to account for their separability under specific syntactic conditions, they are analyzed as subordinations to the word-node of their base verb.

For compounding, three patterns of word formation have been proposed. All compounds, with the exception N+V, A+V and V+V compounds, are cosubordinations of two nuclei under a nucleus. N+V and A+V compounds are analyzed as subordinations to the word-node. V+V compounds are nuclear coordinations under a core. These analyzes and the morphological templates induced from them are capable of explaining the syntactic behavior displayed by the complex words investigated.

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