

Syntactic and semantic constraints on the formation and interpretation of *-ung*-nouns

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1. Introduction

This paper is devoted to *-ung* nominalisation in German. German has many nouns that end on *-ung* and mostly these look like they are derived from *verbs*. Often the meanings of those nouns seem to be systematically related to the meanings of the underlying verbs, but there are also many cases where the semantic relation between noun and verb appears idiosyncratic and unpredictable. The task that these data present to the linguist is two-pronged: Separate the systematic from the idiosyncratic cases and explain why the systematic relations are the way they are. A second question is when *-ung*-nouns can be formed at all. On the one hand *-ung*-nominalisation has some of the features of a productive process: given a suitable verb we can form the corresponding *-ung*-noun and know what the word means, even though we have never seen or heard it before. But not all verbs are 'suitable'. When a verb is not suitable, then there just isn't any way you can form the corresponding *-ung*-noun; no matter how hard you try it will sound 'wrong'. And here too there is idiosyncrasy: sometimes an *-ung*-noun exists, although its formation doesn't appear to fit into any general pattern. So here too we are confronted with a two-pronged task: (i) separate the systematic from the idiosyncratic cases of *-ung*-formation and (ii) explain for the cases where *-ung*-nominalisation is systematic what is responsible for its possibility. The two tasks are not independent. Where *-ung*-noun formation is systematic and productive, the meaning of the resulting noun is also systematically determined. This strongly suggests that what accounts for the possibility of *-ung* noun formation should also provide the basis for explaining the resulting semantics. In this paper we will concentrate specifically on the possibility of *-ung* formation. More about the semantics of possible *-ung*-nouns can be found in Roßdeutscher (to appear).

Where *-ung*-nominalisation is productive, we said, the meaning of the resulting *-ung*-noun is predictable from that of the verb from which the

noun derives. But this dependency proves to be fairly complex. Many *-ung*-nouns are systematically ambiguous. A striking example is the noun *Absperrung* (from *absperren*, ‘to cordon off’, ‘to make inaccessible by erecting a fence or barricade’). *Absperrung* can denote (i) the event of cordoning off (a building or a street, say), (ii) the state resulting from such an event, and (iii) the fence or barricade erected during the event which is responsible for the state.¹ Other *-ung*-nouns are only two-ways ambiguous: *Mischung* (from *mischen*, ‘to mix’) can either denote the ‘event of mixing’ or the mixture that is produced in the course of such an event. *Schwächung* (from *schwächen*, ‘to weaken’) can denote either weakening events or the corresponding result states, which consists in the theme being in a weakened condition. Lastly, some *-ung*-nouns are unambiguous, (e.g. *Säuberung* (from *säubern*, ‘to clean’), which can only denote cleaning events). A theory of *-ung*-nominalisation should ideally be able to predict what denotations are possible for different *-ung*-nouns. That is, the rules which tell us when *-ung*-nominalisation is possible should tell us, as far as possible, also how the ‘input’ from which an *-ung*-noun can be derived determines what different readings it can have.

Whether a verb has a corresponding *-ung* noun depends on the properties of the verb. The first and foremost aim of this paper is to discover what these properties are. In the proposal that we are about to present these properties are defined in terms of internal structures that are assigned to the verbs. These internal structures are inspired by, and closely related to, those assumed within the DM (Distributed Morphology) literature, especially in the work of Marantz (1997, 2005). We should emphasise, however, that we do not see the proposals we make as standing or falling with the DM-program as a whole. As we understand that program, its aim is to build all well-formed linguistic structures, in particular sentences, from so-called roots. Roots can be used to build words and, through these words, larger syntactic structures, such as phrases, clauses and complete sentences. Furthermore, the system of formation principles that operates ‘below the word level’ is supposed to be the same one that operates ‘above’ it; and as a consequence the notion of a ‘word’ – and thus the concept of the lexicon of a language as it has been traditionally understood in linguistic theory – loses its central significance for the theory of grammar (compare Williams 2007). The proposals made here are, as far as we know, compatible with this program, and perhaps they can make some contributions to it. But even if the DM program would have to be abandoned because the principles of word formation cannot be made to coincide with those that govern the formation of phrases and clauses from words, that should not automatically

carry with it the downfall of the proposal we will make. The proposal could still be retained as an account of the internal structure of certain types of words (verbs and deverbal nouns) and thereby of distributional and semantic properties of certain types of word formation, but perhaps as part of a more traditional theory of the lexicon (and thus as part of a ‘lexicalist grammar’).

One respect in which the account presented here differs from all existing work within the DM framework with which we are familiar is that it comes with a formal semantics, which builds semantic representations compositionally from the ‘internal word structures’ we will propose. This component of the theory is essential to the predictions it makes about the possibility and the possible readings of *-ung-nouns*. But more generally it conforms to the intuition that, by and large, syntactic structure is the systematic guide to meaning. The semantic formalism we will be using is DRT. The choice of DRT is motivated by the general setting within which the present investigation was undertaken, that of developing a DRT-based lexicon which provides semantic representations for lexical items that can be used in building semantic representations of sentences (and larger discourse units) where these lexical items occur. For all we know, though, the use of DRT is not essential for the particular task that semantically interpreted word-structures are to serve here (that of accounting for the facts connected with *-ung-nominalisation*).²

One of the main difficulties in our present endeavour is to decide which cases should be treated as idiosyncratic and thus must be excluded from the scope of linguistic theory. At the still early stage of development of the theory that we present here it would be premature to make definitive commitments on this point. What we can and will offer in this paper is a set of principles that derive *-ung-nouns* from certain verb structures (and which explain why certain other verbal structures do not yield *-ung-nouns*.) Many existing *-ung-nouns* won’t be covered by these principles, but that should not be taken to mean that we consider them to be beyond systematic treatment. This is one respect in which the proposals of this paper are incomplete.³

Since the field of *-ung-nouns* is mined with potential counterexamples to any principles one might want to put forward, it is recommendable to proceed through that field with caution and to start at an end that is comparatively safe. Our explorations were inspired by an intuition where it is safe to start and how it would be best to proceed from there. The order in which we represent our deliberations in this paper by and large retraces this path. Some motivation for proceeding the way we do will be given in Section 2.3.

The leading hypothesis about the question when *-ung*-nominalisation is possible is presented and defended in Section 3. Section 4 illustrates these general principles by looking at the structure of some simple and complex verbs and the corresponding *-ung*-nouns in detail. Section 5 is devoted to the semantics of *-ung*-nouns.

2. Which verbs allow for *-ung*-nominalisation?

Our central task is to find out what property or properties of verbs are responsible of *-ung*-nominalisation. In this section we will provide examples of types of verbs which do allow for *-ung*-nominalisation (Section 2.1) and also of verbs that do not (Section 2.2). Our aim is twofold: (i) to persuade those for whom *-ung*-nominalisation is new that there *is* a problem here – both the classes of verbs for which there are *-ung*-nouns and those for which there aren't are essentially open-ended – and (ii) to edge towards a sense of what the relevant property or properties could be.

2.1 Verbs for which there are *-ung* nouns

We start with some groups of verbs for which *-ung*-nouns exist. These are verbs built from roots that denote properties of individuals. We will refer to such roots both as 'property' roots and as 'adjectival' roots.⁴ Among the verbs built from such roots are the ones listed in (1) and (2) below.

- (1) a. *bereiten* ('to prepare'; from *bereit*, 'ready'),
klären ('to clarify'; from *klar*, 'clear'),
säubern ('to clean'; from *sauber*, 'clean'),
schärfen ('to sharpen'; from *scharf*, 'sharp'),
töten ('to kill'; from *tot*, 'dead'),
trocknen ('to dry'; from *trocken*, 'dry'),
weiten ('to widen'; from *weit*, 'wide')
- b. *ändern* ('to change' from *ander*, 'other', 'different'),
bessern ('to improve'; from *besser*, 'better'),
fördern ('to support'; from *vor(ne)*, 'before'),
hindern ('to impede'; from *hint(en)*, 'behind'),
lindern ('to alleviate', 'to soothe'; from *lind*, [no longer used
as root of an adjective] 'gentle'),
mindern ('to reduce', from *mind(er)*, 'less', 'reduced'),
schmälern ('to narrow', from *schmal*, 'narrow', 'to belittle')

The ostensive morphological difference between the verbs in (1a) and (1b) is that the verbs from the latter involve a comparative element (the ‘r’ at the end of the verb stem). This suggests that these verbs should be analysed as describing *degree increases*: the result of the described event is that the theme satisfies the root property to a greater extent than at the start. However, while no such morphological element is present in the verbs in (1a), the properties denoted by some of their roots also admit degrees, (e.g. *scharf*, *schwach*, *stark*); the verbs formed from these roots invite the same kind of gloss as those in (1b). Whether there is nevertheless a principled difference between the internal structures and/or logical forms of the verbs in (1a) and (1b) is a matter we cannot say for certain at this point. The analysis we propose in this paper treats all property roots as denoting properties that an entity either has or doesn’t have. This leaves questions of gradation and comparatives to another occasion.

In addition to verbs like those in (1) there are many prefix and particle verbs with adjectival roots; some of these can be found in (2). (That these verbs are built from adjectival roots, and that these enter into some kind of ‘direct’ interaction with the particle or prefix is indicated by the fact that there are no corresponding ‘stem verbs’, e.g. there is no verb *hellen*, etc.).

- (2) *auffrischen* (‘to refresh’; from ‘up’+*frisch*, ‘fresh’),
aufhellen (‘to lighten up’; from ‘up’+*hell*, ‘light’),
aufmuntern (‘to cheer up’; from ‘up’+*munter*, ‘cheerful’),
ermüden (‘to become tired’; from ‘er’+*müde*, ‘tired’),
(sich) verengen (‘to narrow’; from ‘ver’+*eng*, ‘narrow’)

A second general type of verb allowing *-ung*-nominalisation is illustrated by the verbs in (3)–(5).

- (3) *bilden* (‘to form’, ‘to constitute’ (from *bild*, originally ‘example’, ‘paradigm’, nowadays rather ‘picture’),
(sich) formen, (‘to take shape’; from *form*, ‘form’, ‘shape’)
messen, (‘to measure’; from *maß*, ‘measure’),
schätzen, (‘to estimate’; from *schatz*, ‘value’, ‘treasure’),
werten (‘to estimate’; from *wert*, ‘value’),
zeichnen (‘to draw’; from *zeichen*, ‘sign’)
- (4) *(sich) häufen* (‘to accumulate’: from *hauf*, ‘heap’),
sammeln (‘to collect’; from *samm*, ‘together’),
teilen (‘to divide’; from *teil*, ‘part’),

würfeln ('to cut into cubes'; from *würfel*, 'cube')

- (5) *belasten* ('to burden', 'to put weight on sth.'; from *last*, 'load', 'burden'),
bemannen ('to equip with a crew' [said of a ship]; from *mann* 'man'),
benoten ('to assign a grade to'; from *note*, 'grade'),
bestuhlen ('to furnish', 'to equip with seats'; from *stuhl*, 'chair'),
bepflastern ('to pave'; from *pflaster*, 'pavement'),
(sich) kleiden, ('to dress'; from *kleid*, 'dress', 'garment'),
mustern ('to imprint a pattern'; from *muster*, 'pattern'⁵)
pflastern ('to pave'; from *pflaster*, 'pavement'),
würzen ('to spice'; from *würz*, 'spice')

The roots of these verbs are not adjectival roots, but *nominal* roots. We also call them *sortal* roots. These are roots that denote 'sorts' – ontological categories – of entities. Sortal roots differ from property roots in that they contribute an entity of the denoted sort to the event complex described by the verb, whereas property roots only contribute predicates, whose arguments are introduced by some other part of the verb's structure. We will discuss this in great detail in Section 3.

The semantically most transparent verbs are the *be*-verbs in (5). These verbs all describe processes in which something of the sort described by the root is added to something else. We assume that the prefix *be*- in these verbs is morphologically related to the preposition *bei* ('at', 'near'). (For the role that this prefix plays in the structure and the meaning of these verbs, see Section 4.4 below.) In the verbs in (3) the root contributes an entity that is produced as part of the process that the verb describes. (Note that here too the root contributes an entity rather than just serving as a predicate for an entity that is contributed by some other source.) *Werten*, for instance, is 'to assign a *Wert* (value)' to the verb's direct object; *sich formen* is, as the English translation indicates, 'to take shape'; the form, contributed by the root, is that which results from the process described by the verb. Something like this is also true for the verbs in (4). With *würfeln* (in the sense indicated here, that of 'cut into cubes'), the root denotes the sort that is instantiated by the pieces that result from the cutting process, thus the sort 'cube'.⁶ *Teilen* should be analysed in the same way. The root contributes the pieces (*Teile*) that are the result of the partitionary process described by the verb *teilen*. With the verbs in (5), this property of the root – that its contribution is something that can be seen as resulting from the process described by the event – is less salient.

2.2. Some verbs that do not allow for *-ung*-nominalisation

Simple verbal constructions from event-describing roots do not have *-ung*-nominals; this is the case irrespective of whether the verb is unergative (6a), unaccusative (6b) or non-core-transitive in the sense of Levin (1999).

- (6) a. *arbeiten* ('to work'; from *arbeit*, 'work'),
essen ('to eat'; from *ess*, 'eat'),
husten ('to cough'; from *hust*, 'cough'),
kochen ('to cook'; from *koch*, 'cook'),
malen ('to paint'; from *mal*, 'paint'),
wischen ('to wipe'; from *wisch*, 'wipe'),
schießen ('to shoot'; from *schieß*, 'shoot'),
schreiben ('to write'; from *schreib*, 'write')
- b. *fallen* ('to fall'; from *fall*, 'fall')
gleiten ('to slide'; from *gleit*, 'slide'),
modern ('to rot'; from *moder*, 'rot'),
rieseln ('to trickle'; from *riesel*, 'trickle'),
treiben ('to drift', 'to float'; from *treib*, 'drift')

A natural first pass reaction to the data in (6a,b) is that these verbs do not permit *-ung*-formation because they are intransitive. This reaction is not completely off the mark: By and large *-ung*-nouns are derived from transitive verbs; *-ung* nouns corresponding to intransitive verbs are comparatively rare. But the generalisation is far from perfect. There exist a fair number of intransitive verbs with corresponding *-ung* nouns. In fact, one such verb, *ergrauen*, was listed under (2); but there are many more, even if their number doesn't compare with that of the intransitive verbs without *-ung*-nouns. Much more important for us, however, is that there is a large number of transitive verbs for which there are no corresponding *-ung* nouns. This is true especially for the transitive verbs occurring in (6a). Note that with the exception of *arbeiten* and *husten*, all these verbs have transitive as well as intransitive uses. Whether these verbs are used transitively or intransitively does not have any impact on the derivation of *-ung*-nouns; *-ung*-nouns are unavailable in either case.⁷

Common to the intransitive verbs listed under (6a,b) is that they are naturally classified as activity verbs. This sets them apart from the intransitive verbs that do allow for *-ung*-nominalisation. For example, *ermüden* in (2) is a case in point. It is most naturally classified as a 'state changing verb' which is used to describe events as events that lead to a

certain change in the theme. (The theme, a person, changes from being not tired to being tired.) Other intransitive verbs with *-ung* nouns are like *ermüden* in this respect.

The status of activity verb is especially obvious for the verbs in (6a). These are typical cases of *unergative* verbs. The root-based analysis of such verbs that we will present below follows Levin, Marantz and others in assuming that the roots from which they are constructed are so-called ‘manner’ roots – roots which act as predicates of the events that the verbs describe. In this regard, the verbs in (6a) do not differ essentially from those in (6b). Those verbs too are built from roots that express properties of the events described by the verb. They differ only in not being ‘agentive’. As to the question whether a verb permits *-ung*-nominalisation, this distinction is not decisive. (See the discussion of *treiben* towards the end of Section 4; however, as we will see in Section 5, agentivity can be relevant provided that other conditions are satisfied).

The verbs in (6a) can be used as transitive verbs and since as we noted it is by and large transitive verbs for which we find corresponding *-ung*-nouns, an important part of our task is to explain why these verbs do not permit *-ung*-nominalisation. Part of the explanation we offer rests on another assumption following Kratzer (2004, 2005), according to which the transitive verbs in (6a) are built from unergative intransitive verbs by adding structure which includes the argument that gets realised as direct object.

The resulting structure differs, as we will see in detail below, crucially from that of ‘core-transitive’ verbs like those in (1). One piece of evidence for this difference is that non-core-transitives can be extended to resultative constructions, e.g. *den Teller sauber wischen* (‘to wipe the plate clean’); *sich die Finger wund schreiben* (‘to write one’s fingers sore’); *einen Hasen tot schießen* (‘to shoot a hare dead’); *das Jagdrevier leer schießen* (‘to shoot the hunting-ground empty’). Moreover, they can also be used felicitously in conjunctive predicates of the type *er arbeitet und arbeitet* (‘he works and works’); *er schießt und schießt* (‘he shoots and shoots’). Core-transitive verbs do not admit resultative constructions, cf. **den Teller rein säubern* / *den Teller sauber reinigen* (‘to clean the plate clean’); **den Hasen wegtöten* (‘to kill the hare away’); **das Jagdrevier leer töten* (‘to kill the hunting-ground empty’). In addition, *und...und* constructions are somewhat marginal with those verbs: ? *sie tötet und tötet*, etc.

Non-core transitives can sometimes alternate with transitive prefix verbs that permit *-ung*-nominalisation. Examples are the *be*-verb *be-schreiben* (with two quite different meanings: (i) ‘to describe’ and (ii) ‘to cover with writing or symbols’) or the *er*-verb *erschießen* (‘to shoot dead’). We can

observe similar variation in relation to prefix verbs with alternating unergative intransitives that do not have transitive extensions. The verb *arbeiten*, as we already saw, does not have a corresponding *-ung-noun*, but for the corresponding *be-* verb *bearbeiten* we find *Bearbeitung*. It should be noted in this connection that there are also many *be-*verbs with corresponding unergatives that don't allow for *-ung-nominalisation* anymore than the unergatives themselves. In fact, this tends to be the predominant situation. A few examples are given in (7), as pairs consisting of an unergative verb and a corresponding *be-*verb (both lacking a corresponding *-ung-noun*).

- (7) *bellen* ('to bark'), *bebellen* ('to bark at sth. or so.')
- fliegen* ('to fly'), *befliegen* ('to [regularly] cover a certain route by plane'),
- hauen* ('to hit'), *behauen* ('to cover sth. with hits'),
- lachen* ('to laugh'), *belachen* ('to laugh at sth. or so.')
- reisen* ('to travel'), *bereisen* ('to travel in [a country]'),
- tasten* ('to explore by touch'), *betasten* ('to explore sth. by touch')

The difference between *bearbeiten* and the *be-* verbs in (7) indicate that *be-* can do different things to an 'underlying' unergative (or to the root of that unergative). We will argue below that in those cases where *be-* brings about *ung-nominalisability*, the structure of the *be-*verb is very different from that of the verb without *be-*.

This section should have made clear (i) that the problem when *-ung-nominalisation* is possible and when it is not is non-trivial; (ii) that a good deal of this problem ought to be amenable to systematic explanation; it should have given us some idea as to (iii) what properties are likely to be part of such an explanation.

2.3. 'Syntactic' or 'semantic' word structure?

When we started looking for principles to explain when *-ung-nominalisations* are possible and what *-ung-nominals* can mean, we made the assumption that answers could be found by paying careful attention to the aspectual properties of the underlying verbs. This seemed a natural place to look since the semantics of *-ung-nouns*, with event and result state as prominent denotation options, strongly suggested that aspectual structure or event structure held the key. (Moreover, as semanticists we tend to be predisposed towards solutions in terms of 'semantic categories', i.e.

categories that today's semanticists consider as part of their tool kit.) In one sense this hypothesis has been confirmed – aspectual structure *is* essential to whether an *-ung*-noun can be formed and to what it can mean. But there is more to the matter. There are verbs with the same aspectual properties (at least according to the semantic classifications and tests with which we set out to work on the problem), but which nevertheless part company when it comes to *-ung*-nominalisation: one of them has a corresponding *-ung*-noun, the other does not. Soon, it became clear to us that something else must be involved – not only the aspectual properties which we were working with, but some deeper structure, which might account, or partly account, for aspectual properties, but which also articulates distinctions that cannot be recovered from these aspectual properties.

Our first clue as to what it was missing came from Kratzer's analysis of non-core-transitive verbs as verbs that 'enter syntax as intransitives'. Such transitive verbs may even be 'telic' in the sense that their most prominent uses are telic, but nonetheless they are structurally different from the (telic) transitive verbs that have *-ung*-nouns.

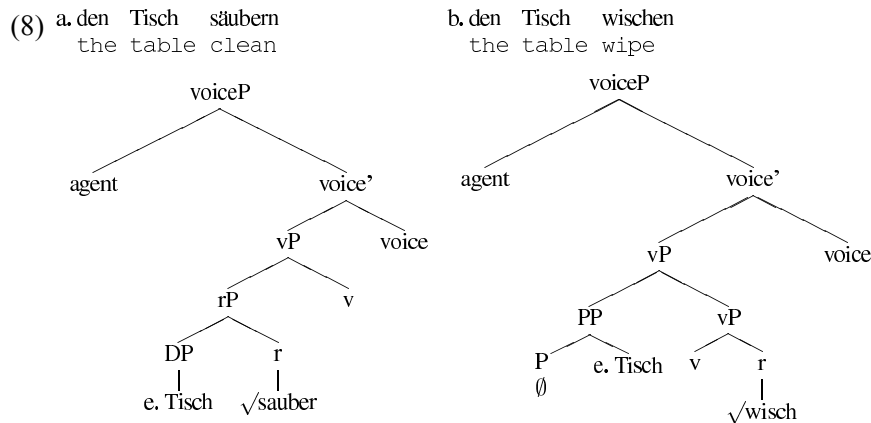
The second clue came from ideas proposed within the framework of DM, in particular the distinction between mono-eventive and bi-eventive verb phrases as it can be found in the work of by Marantz. Bi-eventuality, we realised, can be identified as the licenser of *-ung*-nominalisation. An essential part of this change of perspective is that the distinction between bi- and mono-eventive structures offers a means of explicating Levin's distinction between core and non-core-transitives, cf. Levin (1999). Levin represents these two types of transitive verbs with the help of semantic forms in the spirit of Dowty (1979). Core-transitives have a semantic form as in (i) and non-core-transitive the semantic form in (ii).

- (i) [[x ACT_{<manner>}][CAUSE [BECOME [y <STATE>]]]]
- (ii) [[x ACT_{<manner>}, y]]

In the terms of Marantz, core-transitive verbs are bi-eventive projections of the verbaliser *v*, non-core-transitive verbs are mono-eventive projections of *v*. To be more precise, the semantic representations determined by verbs with a bi-eventive structure are (roughly) like the semantic forms in (i) and the semantic representations determined by verbs with a mono-eventive structure are (roughly) like the semantic form in (ii).

The difference between core- and non-core transitives is neatly demonstrated by the verbs *säubern* (to clean) and *wischen* (to wipe). When these verbs are used with direct object phrases like *einen Tisch* ('a table') the

meanings of the two vPs, if perhaps not strictly identical, are certainly quite close. For instance, when used in simple past tense sentences, both invite the inference that at the end of the described event the table was clean. But nevertheless, in the sense that matters here, *säubern* and *wischen* are very different verbs. *Säubern* is a core-transitive, while *wischen* is non-core-. The difference is shown in the structures (8a,b).



The structure in (8a) is ‘bi-eventive’ in the following sense. The ‘root phrase’ rP has as daughters the DP *einen Tisch* and the root $\sqrt{\text{sauber}}$. Its interpretation is that of a kind of small clause consisting of the saturated predication whose predicate is $\sqrt{\text{sauber}}$ and whose argument is the individual d (some table) denoted by the phrase *einen Tisch*. We take such a predication to describe a state s, and we express the relationship between s and the predication in the form ‘ $\langle s \mid s: \sqrt{\text{sauber}}(d) \rangle$ ’. On the other hand the node v contributes an event e' – the event described by the verbal structure in (8a). The combination of v and rP now takes the form where the state s is interpreted as result state of e', thus e' is the cause of s, something we express with the help of the causal predicate CAUSE. It is the causal relationship ‘e' CAUSE s’ as it results from the interpretation of vP which renders the vP of *säubern* a suitable building site for the corresponding *-ung*-noun *Säuberung*.

No *-ung*-noun can be built from the mono-eventive structure in (8b). The ‘manner’ root $\sqrt{\text{wisch}}$ here acts as a predicate of the event e' contributed by v, with the effect that the interpretation associated with the vP is simply the predication ‘ $\sqrt{\text{wisch}}(e')$ ’. The assumption that the direct object adjunct enters the structure after the formation of vP, as an adjunct to the vP is also

taken from Marantz (2005). (As noted, the same idea is also found in Kratzer (2004).) The silent preposition expresses a relation between the direct object and the event *e'*. This relation can either have a telic or a non-telic character. Either way, no causal relation enters into the structure as part of the *vP* formation. And it is this, we claim, that is responsible for the impossibility of building a corresponding *-ung*-noun.

Since this is the central claim of the paper, we repeat it in the form of an official hypothesis:

Hypothesis 1: Verbs with a bi-eventive structure allow for corresponding *-ung* nouns, verbs with a mono-eventive structure do not.

Note that Hypothesis 1 entails that all the verbs listed under (1)–(5) and prefix verbs like *erschließen*, *beschreiben*, *bearbeiten*, *bekämpfen*, *bemalen* (which have *-ung*-nouns) must have bi-eventive structure and that those listed under (6) and (7) must have mono-eventive structure.

2.4. Syntactic and semantic principles for constructing words from roots

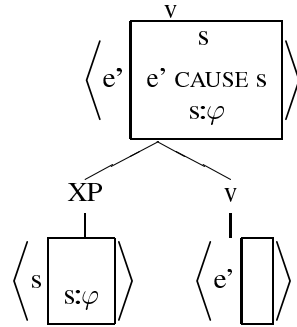
It is the internal structure of a verb that determines whether a corresponding *-ung*-noun can be formed. (8a,b) display the properties of verb structure that are decisive for this question. We will not go into the syntactic principles that convert these structures into grammatical surface strings, with tense and case assignment and either main or subordinate clause word order.⁸ Our focus is on the semantics that such verb structures determine. Crucial in this connection is the semantic difference determined by structures like (8a) and (8b).

3. Syntactic and semantic structure of verbs

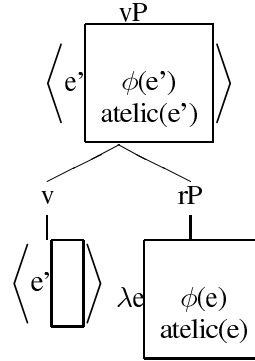
3.1. Some basic structures

We follow the word-syntactic literature in assuming that all verbs have a functional head *v*. *v*'s semantic contribution is to introduce the referential argument *e'* of the verb and of other words derivable from it. As shown in (8a,b), there are two crucially different ways in which *v* can merge with its sister node. These two possibilities are shown in (10).⁹

(10) a.



b.



One possibility, that of (10b), is that *v* selects a root phrase (or root) which denotes an eventuality type. In this case the event type is predicated of the referential argument *e'*. The second possibility, shown in (10a), is for the sister to *v*, which in this case is a maximal projection *XP*, to contribute an entity of its own, which must be construed as standing to *e'* in a certain relation. In all cases relevant in this paper – and as far as we know, in general – the entity described by the sister *XP* is a state and its relation to *e'* that of result state to the event that brings it about.

It is our conviction that these are the two basic structural patterns according to which verbs are built.¹⁰

3.2. Syntactico-semantic constraints on *-ung*-formation

Towards the end of the previous section we stated our hypothesis that bi-eventive verb structures allow for *-ung*-nominalisation and that mono-eventive structures do not. In this section we explore why this should be so. A basic assumption we make and share with existing work on derivational morphology is that *-ung-nouns* are formed by inserting an *-ung*-‘operator’ into a structure that can also be expanded into that of the corresponding verb. Given this assumption the first question we need to settle is *where* in such a verbal structure can *-ung* be inserted (in those cases where it can be asserted at all). To understand and answer this question requires some further background assumptions about the internal structure of verbs. One assumption has already been shown implicitly when we presented the preliminary representations for *säubern* and *wischen* in (8a,b): A verbal structure always involves a *v*-node and its maximal projection *vP*. The second assumption we have taken from Kratzer (1996), according to whom

agentive subjects are introduced at a projection called VoiceP (see also von Stechow 1996; Alexiadou, Anagnostopoulou, and Schäfer 2006). (We leave open the question whether or when there can be other projections between vP and VoiceP.) Given these assumptions we can formulate a preliminary answer about the point at which *-ung* enters into the structure of an *-ung*-noun, it goes as follows: *-ung* is a nominal head that enters above vP and below voiceP. Arguments that *-ung* enters before VoiceP are based on Kratzer's observation of disjoint referent effects which are connected with the (agentive) arguments introduced at the level of Voice. It is at this level that the agent argument enters the structure, and once it has been brought into play, disjoint reference between the agent argument and the theme (or patient) argument becomes an active constraint on interpretation, even in constructions where no agent is explicitly mentioned. On the other hand, if the structure does not contain VoiceP, then no agent argument is represented and no disjoint reference effects involving it and the theme argument can arise.

Illustrations of the presence and absence of the disjoint referent constraint can be found in constructions with past participles in prenominal position, as in (11a,b):

- (11) a. *der angekleidete / angemeldete / geheilte Patient*
 the dressed / registered / cured patient
 b. *der gestern angekleidete / angemeldete / geheilte Patient*
 the yesterday dressed / registered / cured patient
 c. *die gestrige Ankleidung / Anmeldung / Heilung*
 the 'yesterday-ish' dressing / registration / cure
 des Patienten
 of the patient

The participles in (11a) do not carry the implication that the referential argument of the noun (the patient) was dressed / registered / cured by someone else. And if the meaning of the verb forces us to believe that an agent must have been involved, as in the case of *anmelden* (to register), this agent could, for all the grammatical construction tells us, be the referential argument of the noun himself (he himself could have been the one who did the registering). For the examples in (11b) this is not the case. Here, the presence of the adverbial modifier *gestern* (yesterday) forces extra structure on the participle. *Gestern* requires as argument a 'full' event structure, including an agent. This means that the participles in (11b) are true passive participles, which include a voice projection, unlike the participles in (11a).

As is generally the case in passive constructions, the agent is present in the structure even if it isn't mentioned explicitly, so that disjoint reference has a purchase even when no agent phrase is present. Thus *der gestern angekleidete Patient* can only be understood as referring to a patient who was dressed by some other person (for further discussion cf. Kratzer 1995, von Stechow 1996; Roßdeutscher 2000).

It is important to note that there are no disjoint reference effects in (11c), and this is the case in spite of the presence of the adjective *gestrig* (derived from *gestern* and acting as eventuality predicate, to the effect that the eventuality occurred yesterday). For instance, *die gestrige Anmeldung* can refer to an event where the person who was registered on the occasion in question did so himself. This indicates that *-ung*-nouns don't contain a voice projection, not even in cases where we might have expected that the presence of an adjective like *gestrig* would force such an analysis upon the noun, in the same way that the adverb *gestern* does this when it modifies a participle.

This argument only gives us reason to assume that *-ung* operates below voiceP. But how far below? One possibility would be that *-ung* is merged even below the point where *v* gets merged into the structure. This might seem like a natural proposal for *-ung*-nominals which have readings that coincide with corresponding root nominals: For instance, *Wertung* (from *werten* ['to judge', 'to evaluate']) has an entity reading which coincides with the meaning of *Wert* ('value'). Such 'narrow circle' nominals, where the nominaliser operates below *vP*, have been suggested for English in Grimshaw (1990). However, data involving adjectival modification speak against such a view. As reported in Alexiadou (2009), even prenominal adjectives that modify nominals denoting material or abstract objects can be interpreted as predicates of the event described by the underlying verbal construction.

Adjectival modification of *-ung*-nouns is a matter that requires further elaboration than what can be given here. For the time being, we confine ourselves to listing some examples where the adjective must be analysed as a predicate of the event even when the nominal is given an entity-reading. (Such examples are very common, see Roßdeutscher (2010).)

- (12) (i) a. *grobe Schätzung* ('rough estimation')
- b. *grob geschätzter Wert* ('roughly estimated value');
- (ii) a. *fehlerhafte Übersetzung* ('wrong translation')
- b. *fehlerhaft übersetzter Text* ('wrongly translated text')
- (iii) a. *großzügige Bepflanzung* ('generous plantation')

- b. *großzügig bepflanztes Beet*, ('generously planted border');
- (iv) a. *eilige Meldung* ('urgent message')
- b. *eilig gemeldete Nachricht*, ('speedily reported message').

Each of the noun phrase pairs in (12) consists of (a) a phrase whose head is an *-ung*-noun N, modified by an adjective A; (b) a phrase whose head is a root noun whose denotation coincides with the entity reading of N and which is modified by a phrase A'P where A' is the adverbial form of A and P is a past participle derived from the same root as N. The (a) and (b) phrases can be interpreted in ways that render the (a) phrases denotationally equivalent to the (b) phrases. This shows that even when the noun N is interpreted as denoting an entity, the event that is the referential argument of the underlying verb is available as argument for the adjective A. With the corresponding root nouns the event is not denotationally available and has to be made available in some other way, e.g. through addition of the N-related participle P. (For instance, *grober Wert* is not a really acceptable expression; if it should mean anything at all, then it would mean something like *grob geschätzter Wert*, but it cannot really be used to mean that.) This difference between (for instance) *grobe Schätzung* and *grobe Wertung* on the one hand and ??*grober Wert* on the other suggests that the two *-ung*-nominals involve event-like constituents that a root noun like *Wert* does not include. We assume (consistently with standard assumptions in DM and with those structures so far displayed) that this event-like constituent is introduced by the head v. This entails that *Wertung* and *Schätzung* will involve at the very least the maximal projection vP of v.

Before we finalise our hypothesis about the entry point of the *-ung* operator we first turn to the second hypothesis of this section. This hypothesis has already been alluded in much of what we have said, but it is important now to state it in an explicit form. It concerns the admissibility conditions for the inputs to the *-ung* operator – the 'selection restrictions', one might say, which come with this operator. The constraint we assume is that the input structure to the *-ung* operator must contain a condition of the form 'e' CAUSE s'. If and only if this constraint is satisfied can *-ung* be inserted into the structure and an *-ung* noun be constructed.

Given this second hypothesis, we can specify the entry point for *-ung* more precisely than we have so far: in fact, an assumption we have made in Section 2 about the structure of non-core transitives like *wischen* (cf. (8b)) forces us to adopt a more precise hypothesis about the point where *-ung* can enter the structure. Recall that in *einen Tisch wischen* the verb-internal PP is treated as an adjunct to vP, and that we allowed for the possibility that this

adjunction brings result state information (involving a condition of the form ‘e’ CAUSE s’) into play. If *-ung* could be inserted above the higher vP in (8b), then it is hard to see how we could prevent it from having access to this condition. And if there is no way to prevent this, then given our formulation of the second hypothesis, there would be nothing to prevent the formation of *-ung*-nouns like *Wischung*. Thus, to make sure that our theory predicts the impossibility of *-ung* nominalisation in such cases we must assume that *-ung*-always operates *immediately above the lowest vP*.

We are now ready to state our two Hypotheses in their definitive form:

Hypothesis 2: *-ung* must be inserted immediately above a minimal vP node¹¹.

Hypothesis 3: *-ung* requires as input a structure with a semantic representation whose DRS contains a condition of the form ‘e’ CAUSE s’.

Note that Hypothesis 2 and Hypothesis 3 jointly account for Hypothesis 1, according to which bi-eventive structures permit *-ung*-nominalisation and mono-eventive structures do not. Even if verbs with a mono-eventive structure have a telic semantics of which a cause-result-relation is a part, this element will enter into the structure at a point that is not accessible to *-ung*, since it won’t be part of the structure that serves *-ung* as input. The condition is accessible only for bi-eventive structures, where the cause-result-relation is present in the representation of the lower vP-node.

Why should Hypothesis 3 be true? As things stand, we do not know. We do not exclude the possibility that further probing into the properties of *-ung*-nominalisation may point towards an answer to this question; but neither would we be surprised if it turned out that the explanation of when *-ung*-nominalisation is possible cannot be pushed any further.

A similar question can also be raised about Hypothesis 2: Why should this be the correct assumption about where *-ung* can be inserted into the structure? Here we have to distinguish between two sub-questions. The reasons as to why *-ung* should operate between vP and VoiceP are independent of the specific proposals of this paper. Once we accept that *-ung*-nominalisation involves a nominalisation operator that enters into a verbal structure at some point, the arguments we have given indicate vP and VoiceP clearly as outer boundaries between which the insertion point for the operator must be situated. On the other hand, the claim that *-ung* must attach immediately above the lowest vP is a product of our own assumptions about

the structure of non-core transitives. If these assumptions were to be changed – e.g. in that the PP attachment in (8b) involves its own projection level between vP and VoiceP – that might also invite a modification of Hypothesis 2.

In the next section we will explore a number of verbs and *-ung*-nouns in order to see how our Hypotheses fare in the face of individual examples.

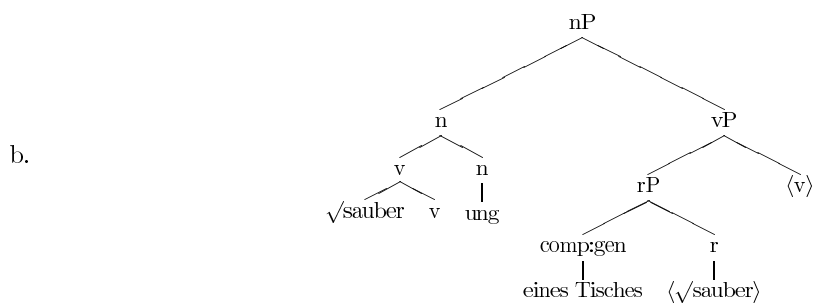
4. More on the construction of verbs from roots

In this section we present the structures of some verb types that permit *-ung*-nominalisation and some that don't permit it. In view of the conclusions from the last section, the relevant difference between the verbs that are *-ung*-nominalisable and those that are not must reside in their structure below vP.

4.1. Verbs constructed from property denoting roots

We start with *säubern*, one of the verbs in (1a) of Section 2. The structure, presented in (13b), is for the phrase *Säuberung eines Tisches*, where the *-ung*-noun derived from *sauber* is the head and the genitive DP *eines Tisches* its theme argument. The structure emerges from two operations of head movement (expressions in angled brackets, e.g. $\langle \sqrt{\text{sauber}} \rangle$ indicate traces).

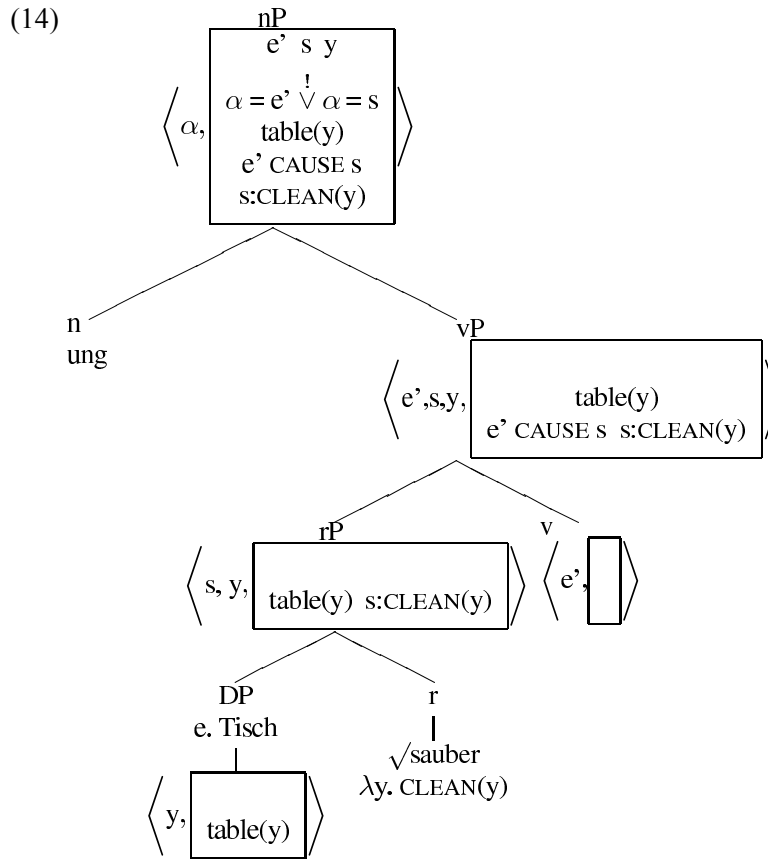
- (13) a. (die) Säuberung eines Tisches
 (the) cleaning of a table



The complement of *r* in (13b) is the argument internal to *rP*, which becomes the internal argument of the verb that can be built from the vP.¹²

The argument phrase *eines Tisches* has genitive case because it fills the internal argument slot of a noun. (We take case assignment to proceed according to widely shared assumptions (e.g. Sternefeld 2007; Marantz 2000). Since this is an issue beyond the focus of this paper we will ignore it in what follows.)

(14) is the semantic representation for (13a) constructed from its syntactic structure in (13b).



The semantic composition presented in (14) goes from bottom to top, with each step indicating how the representation associated with a non-terminal node is built from the representations associated with its daughter-nodes. Note the form of most of these representations: They consist of a DRS preceded by a *store*. A store consists of one or more discourse

referents that occur as arguments in conditions of the DRS following it. These discourse referents await binding (either by means of transfer to some DRS-universe or in some other way). The principles that govern binding in DRT cannot be explained here, and we must refer to other work, cf. Kamp and Reyle (to appear); Kamp, Reyle and van Genabith (to appear).

The semantic representation of vP is constructed in three compositional operations. Each of these is different. The first one, which combines the representations of the root $\sqrt{\text{sauber}}$ and the theme argument *einen Tisch*, is one of argument insertion: The referential argument y of *einen Tisch* is inserted in the argument slot of CLEAN. This operation is much like λ -conversion in systems that use the λ -calculus to specify the semantic values of expressions. In fact, we have adopted λ -abstraction as a way to indicate that the representation beginning with a λ -operator *must* combine with a sister representative via ‘ λ -conversion’, i.e. via insertion of a discourse referent supplied by the sister into the position or positions bound by the λ -operator. The use of λ ’s in the present context leads to structures that have the form of λ -DRSs (cf. Kamp, Reyle and van Genabith (to appear)).¹³

The operation that combines r and DP does more than just argument insertion. It also introduces a new state discourse referent s to represent the state characterised by the stative predication ‘clean(y)’. This reflects the intuitive idea that predicates involving property roots as predicates act as state descriptions. (This is so, we assume, not only for property roots but also for certain others; see Section 4.4. and Section 5.) The rP-representation that results from the combining of r and DP plays the part of a state representation with s as its ‘referential argument’.¹⁴

The next operation, which combines rP and v , is the linchpin in our account of *-ung*-nominalisability. Both sisters here have representations with referential arguments. For rP this is, as we just saw, s , and for v it is the event discourse referent e' . To combine these two representations a relation must be introduced between these two arguments. In this case, it is the relation we express as ‘CAUSE’ that relates e' to s as the causing event and the result state.¹⁵

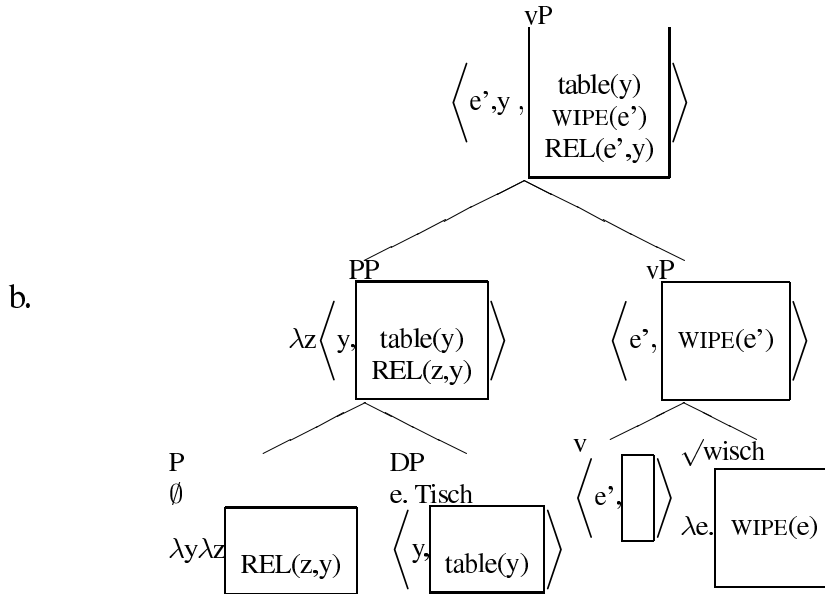
The final operation consists of applying the operator *-ung* to the representation of its sister node. The result of this operation, shown underneath the nP node in (14), reflects the special properties of *-ung* as one of several nominalisation operators that can be found in English and other languages. What is specific in this operation to the particular operator *-ung* and what the operation has in common with those denoted by other nominalisation operators will become clear only as a result of a comparative study of such operators – something we have not yet undertaken.¹⁶

As (14) shows, the nominaliser *-ung* doesn't alter the semantics of the vP as such. The only difference that occurs in the transition from vP to nP concerns the referential argument of the resulting noun or verb. While the referential argument of a verb is always the referential argument e' of the vP from which it is built, for the referential argument of the *-ung*-noun there usually are other options as well. For instance, in the case of *Säuberung*, it can be either e' or the result state s .¹⁷ In (14), this ambiguity of *Säuberung* has been captured by leaving the semantic representation underspecified with regard to the question whether the referential argument α of the noun is e' or s . ($\dot{\vee}$ is an underspecification operator, it is not a normal disjunction as in ' $\alpha=e' \vee \alpha=s$ '). It indicates that whenever an occurrence of the represented word is interpreted, one of the two options must be chosen, cf. Reyle, Roßdeutscher and Kamp (2007).¹⁸

4.2. Non-core-transitives

We noticed that non-core transitives do not have *-ung*-nouns. To see in more detail how this follows from their mono-eventive structure, and how the semantic representations of those verbs differ from property-root based verbs like *säubern* and the *-ung*-nouns (like *Säuberung*) corresponding to them, we present syntax and semantics of the vP-phrase *einen Tisch wischen*.

- (15) a. einen Tisch wischen
a table wipe



The crucial difference between the semantic composition steps in (15) and in (14) is that in (15) no ‘CAUSE’-relation is introduced as part of combining *v* with its sister. The manner root $\sqrt{\text{wisch}}$ denotes a property of events; it combines directly with the event representation provided by *v* and the result is shown under the vP of (15) (cf. ‘direct merge’ in Embick (2004)). The step which combines the representations of *r* and *v* is one of several instances in (15) of the operation of argument insertion. We represent argument insertion as λ -conversion.¹⁹ Note that all λ -s in (15) originate in the semantic representations of its roots ($\sqrt{\text{wisch}}$ and the empty prepositional root that acts as head of the sub-lexical PP). This is a general constraint on the use of λ -s in the interface architecture assumed in this paper.

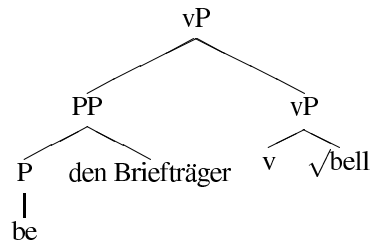
We have specified the semantic contribution of the empty prepositional head as the ‘dummy’-relation ‘REL’. The intention behind this is that the context in which ‘REL’ appears should allow it to be replaced by a relation with genuine semantic content. The details of how this is done – how an interpreter turns REL into a particular relation and what contextual information is used for this purpose – do not concern us here.

4.3. *be*-alternates

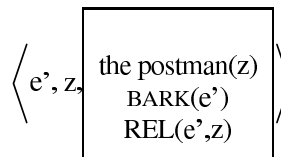
In Section 2 we observed that the verbal prefix *be-* sometimes makes *-ung*-nominalisation possible, but that in other cases it does not: There are mono-eventive verbs *V* such that the verb *be-V* has an *-ung*-noun, but for other such verbs (indeed for most of them) the *be-* verb is no more *-ung*-nominalisable than the verb without *be-*.

Examples of the first sort are *(eine Akte) bearbeiten* ('to deal with [a file]') and *(eine Landschaft) beschreiben* ('to describe a scenery'); examples of the second kind are *(den Briefträger) bebellen* ('to bark [at the postman]') or *(die Komödie) belachen* ('to laugh at [the comedy]'), see (7). In this section we consider cases of the second kind. We assume in these cases that the prefix *be-* expresses a relation between its 'internal argument' (the denotation of the DP *der Briefträger*) and the referential argument *e'* of *vP*. The syntactic structure displayed in (16a) below is quite similar to that in (8b): The *be*-verb *bebellen* shares the internal structure of the simple verb *bellen*. This is the *vP* structure that is typical of unergatives and that is unfit for the construction of *-ung*-nouns. The details of the relation contributed by *be-* have to be filled in on the basis of the meaning of the individual manner root $\sqrt{\text{bell}}$ and the context where it is being used. In this respect the interpretation of (16a) is much like that of (15b). There is a slight difference in that the *be*-constructions based on unergative *vPs* does contribute some meaning of its own – e.g. that the direct object (in this case, the postman) is subjected to some kind of process, and perhaps also that the event *e'* is a purposive action on the part of some agent. Most of the content of such relations must be inferred on the basis of the meaning of the other root (here $\sqrt{\text{bell}}$) and possibly other contextual information. We have indicated this need for inference to supply all or most of the content of the relation by using once more the dummy relation symbol 'REL'.

(16) a.

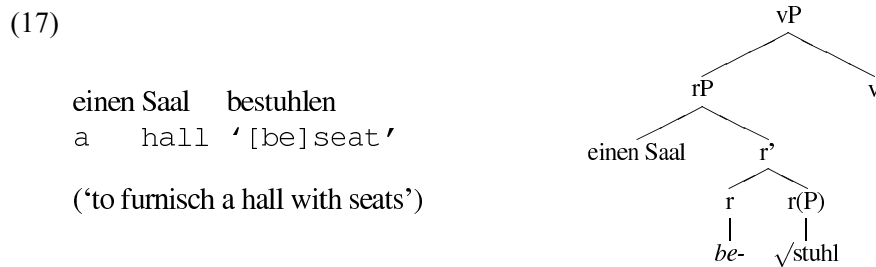


b.



4.4. verbs constructed from ‘nominal’ roots

Many *be*-verbs allow for *-ung*-nominalisation. There is a number of different types of such *be*-verbs. Among them are those built from what appears to be manner roots, but these are, as we already suggested, a minority. One type of *-ung*-nominalisable *be*-verbs that we see as paradigmatic is the one where *be*- combines with a sortal root (see (5) in Section 1.2). A telling example is *bestuhlen*. A vP like *einen Saal bestuhlen* (‘to furnish a hall with chairs/seats’) is to be understood as the bringing about of a state that consists in the holding of a certain relation between the direct object (the hall) and entities of the sort contributed by the root $\sqrt{\text{stuhl}}$. For *bestuhlen* and similar verbs we assume the structure in (17).

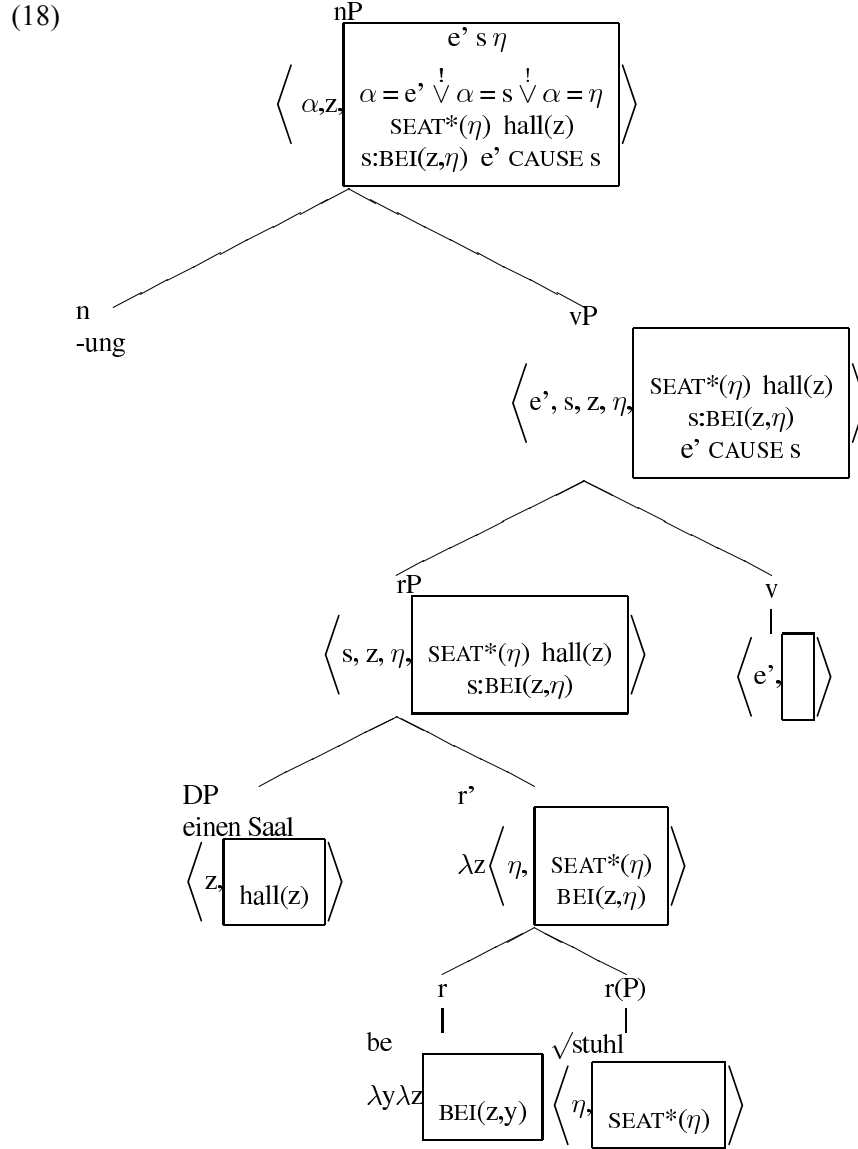


In (17) *be*- does not act as the head of a prepositional phrase in the way it does in (16). The rP of which *be*- is the head has some features in common with the PP-constituent of (16) (and with regular PPs like *bei dem Bismarckturm* in *die Bank bei dem Bismarckturm* (‘the bench near the Bismarck tower’)), but there are also important differences; *be*- in (17) and the rP of which it is the head are subject to rather different structural principles. From a syntactic point of view the rP structure of (17) follows the tradition of Hale and Keyser (2002), particularly regarding the principles of word formation via head movement. (Our node labels differ from those used by Hale and Keyser, but this does not reflect a difference in syntactic assumptions.) The rP of (17) is structured according to the standard assumptions of X-Bar Theory, with a complement to its head *be*- as well as a specifier. Complement and specifier supply the two arguments for the relation that *be*- contributes. In (17), the complement is the root $\sqrt{\text{stuhl}}$ and the specifier is the DP *einen Saal*. The relation *be*- establishes between the denotations of complement and specifier is an instance of the figure-ground schema familiar from the semantics of spatial prepositions. Note however,

that with ordinary spatial prepositions – e.g. the German preposition *bei* (‘at’, ‘near’) – the complement is the ground, while the figure is ‘external’. (Thus, in *die Bank bei dem Bismarckturm* the Bismarck tower is the ground and the bench is the figure.) In (17) it is the complement $\sqrt{\text{stuhl}}$ that provides the figure and the specifier *einen Saal* the ground.

As in the case of *Säuberung* (cf. (14)) the construction of the semantic representation of the rP node involves the introduction of a state discourse referent *s*. For more on the principle behind the introduction of such state discourse referents see page 30.

Combining the semantic representation of the rP in (17) with that of *v* proceeds in the same way as in the case of *Säuberung*: A causal relation is introduced to connect *e'* and *s*. The semantic representation determined by (17) is given in (18).



After what has already been said by way of commentary to earlier computations of semantic representations in this section, there is nothing more to say about (18). However, one point that deserves a comment is the difference between sortal roots and property roots. Property roots are mere

predicates, but sortal roots bring along their own predicanda. However, the entity or entities a sortal root introduces are always quantificationally bound as part of the semantics of the word that is built from this root. (Binding of the entity variable introduced by a sortal root is a case *par excellence* of incorporation.) When building a sortal root based verb *bestuhlen*, this word-internal binding could be carried out as soon as the root entity is inserted into the argument slot of the prepositional relation BEI. However, when constructing the corresponding *-ung* noun, as in (18), it is preferable to delay this binding operation, since the discourse referent must remain available as a possible referential argument of the noun.²⁰ If the possible readings of *Bestuhlung* are captured by the same device we used in our representation for *Säuberung* in (14), then we can bind the discourse referent introduced by the root as part of the operation that is denoted by *-ung* – just as *e*' and *s* are existentially bound as part of this operation. Note that the point at which binding should take place is to some extent under-determined; what matters is only that the binding of a discourse referent does not occur before all operations that make use of it have been performed and yet not so late that the discourse referent is assigned the wrong scope. (Particularly, binding of discourse referents that are introduced by sortal roots must occur at a stage that is early enough to be compatible with their 'incorporation-like' status.)

Related to the incorporation-like status of discourse referents introduced by sortal roots is their number neutrality: they can either represent single individuals or collections of them.²¹ We have adopted the convention of Kamp and Reyle (1993) to use lower case Greek letters for number-neutral discourse referents – here 'η' instead of 'y'.

The \downarrow condition in (18) marks *Bestuhlung* as ambiguous between an event reading, a state reading and an entity reading. For more on the ambiguities of *-ung* nouns, see Section 5.

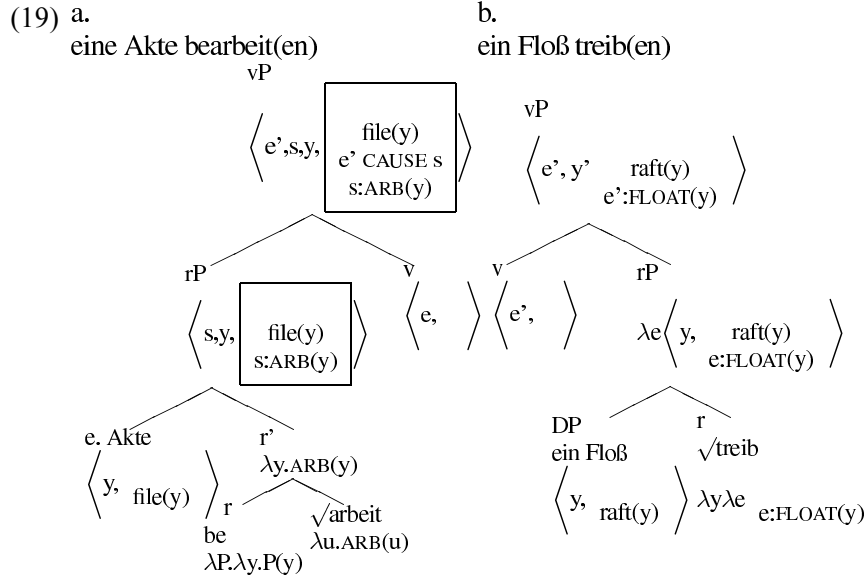
Many of the verbs that have *-ung* nouns are prefix or particle verbs. This is not surprising by itself, for such verbs constitute the greater part of the German verbal vocabulary. However, once we look more closely into the reasons, we see a number of factors that merit our attention. One of these is that many such verbs are not derived from another verb (one without the prefix or particle) by attaching the prefix or particle to it. *Bestuhlen* is a case in point: there is no verb *stuhlen*. Indeed, there is no reason to assume there should be such a verb, given that $\sqrt{\text{stuhl}}$ is a nominal root. A survey of *be*-verbs is illuminating in this regard (Roßdeutscher to appear). Many of the *be*-verbs that have *-ung* nouns are built from nominal roots. But there are also many *be*-verbs for which there are corresponding verbs without *be*-

Often these verbs are unergatives or non-core transitives (and thus without corresponding *-ung* nouns), and in these cases the *be*-verb is usually without an *-ung* noun as well. These facts support the possibility that was mentioned earlier, that when a verb *V* does not permit *-ung* -nominalisation and a corresponding verb *be-V* does, then these verbs may have quite different structures, and their resemblance be only superficial. This, for instance, is what we suggest is the case for *be*-verbs like *bearbeiten*, *beleuchten* and *beenden*. The verbs *arbeiten*, *leuchten* and *enden* do not have *-ung* nouns and also have the other properties that are distinctive of mono-eventive structures. *Bearbeiten*, *beleuchten* or *beenden* on the other hand behave in a way that suggests that they are built from roots that play the part of property roots or sortal roots.²²

We conclude this section by looking at two further structures, for the verbs *bearbeiten* and *treiben*. *Bearbeiten* is an example of the (comparatively small) class of *be*-verbs which have *-ung* nouns, although the corresponding verbs without *be*- do not. More specifically, the noun *Bearbeitung* exists but there is no noun *Arbeitung*. Given the assumptions we have made, this means that the structures of *arbeiten* and *bearbeiten* must be quite different: the structure of *arbeiten* must be mono-eventive and built from a manner root, while the structure of *bearbeiten* must be bi-eventive, with a root that is either a property root or a sortal root.

But if verbs whose meanings are evidently related in some systematic fashion are structured so differently, what can be the connection between them? We propose the following answer. The relation between *arbeiten* and *bearbeiten* – and the same goes for other such pairs of an unergative/non-core transitive verb *V* and an *-ung* nominalisable verb *be-V* – is that the manner root $\sqrt{\text{arbeit}}$ of *arbeiten* can be ‘coerced’ into a root of a different type – for this particular instance, into a property root $\sqrt{\text{arbeit}}$, whose meaning is something like this: it asserts of the theme that it has been subjected to the kind of activity that is described by the manner root from which it is derived by reclassification.

Assuming that such a reinterpretation of $\sqrt{\text{arbeit}}$ is possible and that it can be triggered by the presence of *be*-, we get for *bearbeiten* the structure in (19a):



The syntax and semantics of (19a) differ on the one hand from those of the vP of (14) (the structure for *Säuberung*, a noun that is also built from a property root) and on the other from that of the vP of (18) (the structure of *Bestuhlung*, another -ung-noun derived from a *be*- verb, but built from a sortal root). Since according to our assumptions *bearbeiten* and *Bearbeitung* involve a property root, *be*- cannot function in (19a) in the way it has been assumed to in (18). In (19a) there is only one argument, provided by the DP, and it is this argument that must be inserted into the argument position of the root predicate ' $\lambda u \text{ARBEIT}(u)$ '. *be*- in *bearbeiten* has, as far as we can see, just the function of providing a link between the predicate and its argument (not unlike that of the copula in a copula construction, although the details may differ for the two cases). We have formalised our understanding of the role of *be*- in *bearbeiten* and similar *be*- verbs by assigning it the interpretation ' $\lambda P. \lambda y. P(y)$ '. (This is just the canonical representation of the predication operation within the ' λ -calculus'.)

It should be stressed that P in the semantic representation of *be*- is a variable for properties of *individuals* (as opposed to, in particular, events). This restriction on the possible values of P may be considered as the trigger for the reclassification of $\sqrt{\text{arbeit}}$ as property root. Otherwise *be*- makes no contribution to the semantics of *bearbeiten* and *Bearbeitung*. In such *be*- words its role is purely formal.²³ The structure of *arbeiten*, on the other hand, is the mono-eventive structure found in (8b) (without the PP that

makes *wischen* into a non-core transitive).²⁴

Treiben and other unaccusatives illustrate a different twist to our basic account. The roots of unaccusatives, we assume, express properties of themes. (This is an assumption that we see as consistent with widely accepted intuitions about what distinguishes unaccusatives from unergatives and what renders the subjects of unaccusatives ‘internal’ rather than ‘external’.) But if the roots of unaccusatives denote theme properties, how can we explain that verbs like *treiben* do not have *-ung*-nominals, whereas property root-based verbs like *schwächen* do? The difference, we propose, is that the roots of verbs like *schwächen* are property roots in the strict sense of being predicates of the theme *and nothing else*. In this respect the roots of verbs like *schwächen* differ from those of verbs like *treiben*. The roots of unaccusatives like *treiben* do not denote simple theme properties, but relations between events and their themes. Thus the root of *treiben* is a 2-place predicate, with a slot for the event contributed by *v*. This means that when the semantic representation of the rP of *treiben* is combined with the semantic representation of *v*, the effect is simply argument instantiation of the event argument position in the first by the event discourse referent *e'* introduced by the second, and no ‘CAUSE’ relation gets introduced. This is the hallmark of mono-eventive structures which cannot be developed into the structures of *-ung*- nouns.

Implementing this assumption about the root $\sqrt{\text{treib}}$ of *treiben* in analogy with earlier structures we get for its semantic representation the one shown in (19b). This representation then determines, in the same way as (15b), the composition of the (mono-eventive) semantics of the vP.

The discussion leading up to (19b) enables us to clarify a feature of semantic representation construction which was left without comment when it first made its appearance in structure (8a) for the verb *säubern*. This is the introduction of the result state *s* as part of the rP interpretation in bi-eventive structures. It is the combination of such an rP representation with the event *e'* introduced by *v* which leads to the causal relation between *e'* and *s* and therewith to the bi-eventuality that the present theory identifies as the necessary and sufficient condition for *-ung*-nominalisability. The principle that is responsible for the introduction of *s* in (8a) (and likewise in (14) and (19a)) is as follows: (i) every saturated predication is the characterisation of an eventuality and must be represented as such. A saturated predication can become an eventuality characterisation in one of two ways – either (i) because the eventuality is already a constituent of the given structure, viz. as an argument of the predicate; or, if that is not so, (ii) through introduction as part of the operation that saturates the predicate by filling its last

uninstantiated argument position. Mono-eventive and bi-eventive structures differ in that the former exemplify possibility (i) and the latter possibility (ii).

In this way we also obtain an explanation as to why the unergative-unaccusative distinction is orthogonal to that between verbs that permit and verbs that do not permit *-ung* noun formation: A verb is unergative or unaccusative depending on whether its root predicate has a slot for the theme; a verb allows for the formation of an *-ung-noun* depending on whether its root does not or does have an argument slot for an eventuality that can be instantiated by the eventuality contributed by *v*.

5. The different Readings of *-ung-* nominals

So far we have dealt with only one of the two problems on our agenda: when is *-ung-nominalisation* possible? We have accounted for the possibility of *-ung-nominalisations* in terms of the internal structure we have proposed for different types of verbs; only when these structures have a certain property – a cause-result relation generated by the structure in a certain way – is nominalisation possible. Moreover, when *-ung-nominalisation* is possible, then the resulting *-ung-noun* shares most of its structure with the underlying verb.

Even if this could be seen as an accomplishment in its own right, it would seem less than optimal. One would expect that the internal structures which the theory ascribes to the different *-ung-nouns* could also account for their possible readings. As a matter of fact, however, this appears to be true only up to a point. The structures for *-ung* we have proposed allow us to state a general hypothesis that provides a kind of outer boundary to the set of possible readings an *-ung* noun can have. But *-ung-nouns* differ in what readings they can have, and that appears to be so even for *-ung-* nouns whose structures are indistinguishable when represented as in this paper. This second part of the readings' problem of *-ung-nouns* – Why do certain *-ung-nouns* not have all the readings that our structural hypotheses allow for? – we will not solve. But we will offer some hints of factors that seem to play a role in eliminating readings that our general hypotheses admit.

First the 'outer boundary' principle, which can be stated within the framework we have so far developed. Consider once more the representation in (18) of *Bestuhlung eines Saals*. The store of the *vP* node in (18) contains the discourse referents *e'*, *s*, *η*, *z*. Three of these – *e'*, *s* and *η* – are available as possible referential arguments for *Bestuhlung*. This

illustrates the following general hypothesis about the semantics of *-ung*-nouns.

Hypothesis 4:

- (i) The possible referential arguments for an *-ung*-noun are among the discourse referents in the store of the vP node.
- (ii) From this set the following discourse referents are available:
 - (a) the discourse referent *e'* introduced by *v*;
 - (b) the discourse referent *s* representing the result state of *e'* (and occurring as second argument of the condition '*e'* CAUSE *s*');;
 - (c) the discourse referent (if any) for the entity that is 'created' in the course of *e'* and that is essential to the result state *s*.

We have placed "created" within scare quotes since for many *-ung*-nominalisable verbs the 'creation' of the entity in question has the character of things that already exist being cast into a new form, or of their being assigned a new function. *Bestuhlung* is a good illustration; typically, the 'creation' of the entity that *Bestuhlung* can be used to denote is a seating arrangement (as we have been referring to it) that is made from seats that are brought into the hall and that may already have been in existence for any length of time. But once they have been installed, the seats may be regarded as constituting a new entity – that which makes it possible for an audience to be seated while attending a meeting or a performance.²⁵

According to Hypothesis 4 the discourse referents in the stores of the semantic representations of the vP nodes of *-ung*-nouns set an outer limit to the possible readings these nouns could have. But not every *-ung*-noun admits all of the discourse referents that are available in this sense. In fact, we can distinguish four different 'ambiguity profiles' for *-ung*-nouns, where each 'profile' corresponds to a certain subset of the maximal set {*ev*, *st*, *ent*}, consisting of event, result state and entity. In what follows we will give for each of these profiles one example of an *-ung*-noun whose possible readings coincide with that profile. (Some additional examples will be briefly discussed in connection with Type 4.) Profiles and examples are given in (20).

(20)

verb	noun	profile
1. <i>bestuhlen</i> ('to furnish with seats')	<i>Bestuhlung</i>	{ ev, st, ent }
2. <i>schwächen</i> ('to weaken')	<i>Schwächung</i>	{ ev, st }
3. <i>mischen</i> ('to mix')	<i>Mischung</i>	{ ev, ent }
4. <i>säubern</i> ('to clean')	<i>Säuberung</i>	{ ev }

The discussion of the examples in (20) will show to what extent their ambiguity profiles can be explained within the framework we have developed and where new distinctions or new principles are needed.

Type 1. *Bestuhlen* and *Bestuhlung* are built from a sortal root. Moreover, the entity or entities contributed by the root are (or are recast as) the entity that is 'created' in the course of the describe event. Under these conditions, and only under these, this entity is among the possible referential argument of the *-ung-* noun. We state this principle as a further hypothesis:

Hypothesis 5: When an *-ung-noun* refers to an entity, then it has a sortal root and it refers to the entity contributed by this root. Moreover, this entity must be conceptualisable as resulting from the event described by the corresponding verb.

The entity reading of *Bestuhlung* is clearly distinct from its event reading. One way to see this is to consider examples like those in (21). The event reading is the only reading compatible with the constraints in sentence (21a) and only the entity reading is compatible with the constraints in (21b).

- (21) a. *Die Bestuhlung nahm eine ganze Woche in Anspruch.*
 'The installation of the chairs took a whole week'
 b. *Die Bestuhlung war aus Stahl und rotem Plüsch.*
 'The seating was made of steel and red plush'.

Besides the event and the entity reading *Bestuhlung* also allows for a result state reading. This reading may be less prominent than the other two readings, but there are contexts where it is the only one possible. One such context is (22).

- (22) *Wegen seiner langjährigen Bestuhlung konnte keiner sich erinnern, wie der Saal ausgesehen hatte, als er noch leer war.*
 ‘Because of the fact that it had been filled with seats for so many years, no one could remember what the hall had been like when it was still empty.’

Type 2. *Schwächung*, as in *Schwächung des Organismus* (‘weakening of the organism’) is ambiguous between an event reading and a state reading. The first reading is more prominent in *die plötzliche Schwächung des Organismus* (‘the sudden weakening of the organism’), the second in *die kurzfristige Schwächung des Organismus* (‘the brief weakening of the organism’); here the more prominent reading is that the organism *was* weak, rather than that it *was becoming* weak. *Schwächung* does not have an entity reading. This is what our assumptions predict, given that it is built from a property root rather than a sortal root.²⁶

Type 3. Our example for this type is *Mischung*. We assume that *Mischung* and *mischen* are built from a sortal root $\sqrt{\text{misch}}$ with the meaning ‘mixture’; that is, $\sqrt{\text{misch}}$ denotes what comes about as a result of an event described by the verb *mischen*. (So *mischen* means something like ‘make into a mixture’.) If this assumption is correct, then *Mischung* is like nouns of Type 1 in being built from a sortal root. But what then is the explanation that the state reading is not available in this case? The reason, we conjecture, is this: While both in *Mischung* and in *Bestuhlung* the root can be seen as contributing the entity that is created by the event – or alternatively, as contributing what becomes that entity as a result of the changes that the event produces – the two words differ in the way in which the contribution of the root is related to the contribution made by the argument in the specifier position of the preposition. In *Bestuhlung eines Saales* the ‘location’ argument is the hall and the relation between it and the entity contributed by the root is that the former is provided with the latter (by virtue of the latter being put inside the former). This is a relation between two entities that are unequivocally distinct on any account of identity. The case of *mischen* and *Mischung* is different. Here it is the specifier argument of the (silent) preposition that refers to the ingredients which are mixed in the course of the *mischen* event and thereby turned into the mixture. So the relation between the specifier argument and the contribution by the root $\sqrt{\text{misch}}$ is more like the relation of ‘constitution’ known from philosophical discussions about relative identity (Geach 1967), see also work on the mass-

count distinction within linguistic (Wiggins 1980; Link 1983).

The arguments of such relations can be seen as two stages or two forms of the same thing. For the case at hand this means that the state *s* which is introduced as the meaning of the prepositional root phrase is a result state of a quite different sort than it is in the case of *Bestuhlung*. Such ‘metaphysical’ relations, which hold between different manifestations of the same thing rather than between two things that are distinct by any standards, do not qualify, we conjecture, as possible denotations of *-ung*-nouns.²⁷

Type 4. The *-ung*-nouns of this type are the most problematic. And they show, even more dramatically than those of Type 3, that in order to explain why an *-ung*-noun belongs to the type more is needed than the theory developed in the preceding sections can deliver. The nature of the problem has already become visible in our discussion of *Mischung*: Our theory identifies as the source of *-ung*-nominalisability that a result state relation ‘*e* CAUSE *s*’ is introduced at a level that is visible to *-ung*. This means that a result state discourse referent *s* will be present in the structure of *any* *-ung*-noun. Why then can this discourse referent become a referential argument of the noun only in some cases but not in all?

As we have seen for the case of *Mischung* we need more than the tools developed in Sections 2–4 to find answers to this question. In order that the result state can be a referential argument of the *-ung*-noun it must satisfy further conditions which are not captured by our hypotheses and which for all we know cannot be expressed in the terms we have been using.

The *-ung*-noun we have chosen as an example of Type 4, *Säuberung*, illustrates this point in a different way than *Mischung*. As a noun built from the property root $\sqrt{\text{sauber}}$ it ought to have a state reading as well as an event reading and belong, like *Schwächung*, to the class of Type 2 nouns. But the state reading is not there. (All the tests familiar to us point in this direction. For instance *die kurzfristige Säuberung des Gebäudes* (‘the brief cleaning of the building’) cannot refer to a brief period during which the building was clean.) We conjecture that this difference between *Säuberung* and *Schwächung* has to do with the role of agentivity in the words that can be built from the roots $\sqrt{\text{sauber}}$ and $\sqrt{\text{schwach}}$. In the case of $\sqrt{\text{sauber}}$ it is much harder to separate the result property from the agentive part of the event introduced by *v* than it is for $\sqrt{\text{schwach}}$. This can be seen by comparing the sentences in (23), which invite different paraphrases.

- (23) a. *Der Tisch machte einen gesäuberten Eindruck.*
 ‘The table made a ‘cleaned’ impression.’
 = *der Tisch machte den Eindruck als sei er von jemandem gesäubert worden.*
 ‘The table made the impression of having been cleaned by someone.’
- b. *Der Mann machte einen geschwächten Eindruck.*
 ‘The man made a ‘weakened’ impression.’
 = *Der Mann machte den Eindruck, als sei er geschwächt.*
 ‘The man made the impression as if he was weakened.’
 ≠ *Der Mann machte den Eindruck, als sei er geschwächt worden.*
 ‘The man made the impression as if he had been weakened.’

These sentences suggest that in the case of *schwächen* it is possible to use the participial form to refer to just the result state, detached from the agentivity part, whereas in the case of *säubern* this is not possible.

This is not to say, however, that non-detachability of the agentive dimension is always the reason why an *-ung*-noun is without a state reading. In fact, the explanation we offered for what appears to be lack of a result state reading for *Mischung* was quite a different one.

For yet another case, consider *Beleuchtung*. The verbs *leuchten* and *Beleuchten* are like *arbeiten* and *bearbeiten* in that the *be*-verb has an *-ung*-noun but the verb without *be*- does not. (There is no *Leuchtung*.) As in the case of *bearbeiten* (see Section 4) we assume that the manner root $\sqrt{\text{leucht}}$ of the mono-eventive *leuchten* undergoes reclassification as a property root in the presence of *be*-. As in the case of *bearbeiten* this accounts for the existence of the corresponding *-ung*-nominal, and predicts as possible readings for it the event and the result state reading. But *Beleuchtung* is like *Säuberung* and *Mischung* in that only the event reading is clearly attested. In this case the reason why the state reading is not there (or appears not to be there) has to do with the property that the reclassified root $\sqrt{\text{leucht}}$ attributes to its argument (the theme) and with the time at which this property is attributed to its argument. The property, we take it, is nothing more than that the argument is subjected to the kind of process that is expressed by the underlying manner root $\sqrt{\text{leucht}}$ of *leuchten*. And the time at which the theme is said to have this property is not after, but during the event described by the verb *beleuchten*. Independent evidence for this last claim comes once more from the semantics of the corresponding past participle. Consider the following contrast:

- (24) a. *der beleuchtete Tisch*
 ‘the illuminated table’
 b. *der gesäuberte Tisch*
 ‘the cleaned table’

(24b) conveys that the table *has been* cleaned, (24a) that the table *is being* illuminated. Assuming the root predication that is responsible for the existence of *Beleuchtung* to be like the predication expressed by the participle, in that the predication time coincides with the time of the event *e'* rather than following it, we see why a state reading for *Beleuchtung* should be hard to recognise as a reading distinct from the event reading: Not only does the stative predication temporally coincide with the event, but it also contributes nothing that is not already expressed by the root as characterisation of the event. This, we believe, is the reason why a separate state reading cannot be made out in this case.

As a final example of a Type 4 noun consider *Bearbeitung*. As we just said in connection with *Beleuchtung*, we assumed *Bearbeitung* and *Beleuchtung* to come about in the same way, through reclassification of a manner root as property root and then building the structure that is characteristic of property root based verbs and their -ung-nouns. This might suggest that the explanation as to why *Bearbeitung* has no distinguishable result state reading is the same as for *Beleuchtung*. We do not think, however, that that is right. There is an important difference between *bearbeiten* and *beleuchten* which, like that between *schwächen* and *säubern*, can be brought out by comparing prenominal past participles. Consider the phrases in (25).

- (25) a. *der beleuchtete Tisch*
 ‘the illuminated table’
 b. *die bearbeitete Akte*
 ‘the dealt with file’

As we saw, (25a) (= 24a) describes the table as *being* illuminated. In contrast, (25b) describes the file as *having been* dealt with. In other words, while *beleuchtet* expresses a property of the theme that holds during the time that the illuminating takes place, *bearbeitet* expresses a true result state property which holds after the event described by *bearbeiten*. (In this regard *bearbeitet* is like *gesäubert*). This indicates that the result state reading of *Bearbeitung*, if it exists at all, should be clearly distinguishable from the event reading. As no separate state reading can be made out for *Bearbeitung*

nonetheless, this must mean that the reading isn't there at all, not that it coincides with the event reading, as we suggested for *Beleuchtung*.

We conjecture that the reason why *Bearbeitung* doesn't have a result state reading is that the state *s* that is part of its semantic representation lacks the necessary independent 'contentual substance': all that the condition 's: ARBEIT(y)' tells us about *s* is that *s* results from subjecting *y* to the kind of procedure that is described by *bearbeiten*. Thus *s* is like the 'formal result states' that have been distinguished from 'target states' in the tense and aspect literature (Parsons 1990). Mere formal result states, we conjecture, are not possible as referential arguments of *-ung-* nouns.

Säuberung, *Mischung*, *Beleuchtung* and *Bearbeitung* are just four examples of *-ung* nouns that look like they lack separate state readings. At this point we see no reason why the cases they represent should exhaust the possible reasons for why an *-ung*-noun might lack such a reading. To arrive at a more comprehensive picture of what may be responsible for such readings more work is needed.

A different challenge to Hypothesis 4 comes from nouns like *Änderung*. In Section 2, it was assumed that *Änderung* is built from a property root. For such *-ung*-nouns, Hypothesis 4 implies that they can have an event reading and a state reading, but no entity reading. But it might well be thought that *Änderung* does allow for entity readings, and in fact that the entity reading of *Änderung* is often more prominent than a state reading. This impression is particularly strong in cases where the theme of *Änderung* is a text or other kind of representation. In (26) it seems that the speaker is referring to the content of the changes that her co-author has made in their joint paper, not to the events of his making those changes, nor to the different states that consist in the paper having been subjected to them.

- (26) *Bist du mit den Änderungen einverstanden?*
 'Do you agree to the changes?'

The existence of such entity readings, according to which the *-ung-* noun refers to a modification of a given representation or part thereof, appears to be quite common for nouns derived from verbs that describe representational acts. It appears to be widely true for verbs with such representation-creating meanings that the events they describe can be re-conceptualised as the contents of the representations that the events create. As far as we can see, this re-conceptualisation process is orthogonal to the principles and mechanisms we have tried to track in this paper. But if that is so, then what has been proposed here is only one component of a

comprehensive account of the systematic aspects of the semantics of *-ung*-nominalisation.

6. Conclusion

The central aim of this paper was to explain when *-ung*-nouns can be formed and what an *-ung*-noun can mean in case it can be formed. Our general approach to these questions has been to develop a theory of the internal, root based structure of verbs, building on the works from within Distributed Morphology. New to our knowledge is the way in which morpho-syntactic structures familiar from DM (or structures closely related to those) are given a formal semantics (specified here in the form of semantic representations cast in a version of DRT).

However, in this paper we have only given illustrations of how this syntax-semantics interface works, at the hand of a small number of examples. A more systematic development, in which all interface principles (for us: all DRS construction principles) are spelled out explicitly for a fragment of German is planned. It will contain a substantial sample of German verbs and corresponding *-ung*-nouns. Accounting for the availability and the possible meanings of *-ung*-nouns will be only one among a number of problems that will have to be addressed simultaneously in this undertaking.

The central aim of such a fully explicit fragment description is to come up with satisfactory syntactic and semantic representations of complete sentences. In this paper there was no need to extend the structures we have presented to full sentence structures. But we could have done so if we had wanted to; and, speaking in more general terms, we do not see any greater obstacles in the way of doing this, than to be faced by formal semantics of any denomination.

A topic closely related to the one of this paper is the internal syntax and semantics of German prefix and particle verbs. We have touched on this topic in a few places, particularly, in our discussions of *be*-verbs. But the question when and how prefixes and particles can be the source of *-ung*-nominalisability is a much more general one, in which all prefixes and particles have to be covered. Moreover, this general question is only one of many that have to be answered by a general account of the syntax and semantics of verbal prefixation. In fact, the central question in this domain is similar to the one that we have made an attempt to address in this paper: What prefix- and particle verbs can be formed from the different prefixes

and particles, how do those prefixes and particles combine with other root elements in the structure of those verbs and what does this tell us about the semantics of the resulting complex verbs? What has been proposed here about the structure of certain *be*-verbs is no more than a very small part of a comprehensive answer to this question: there are more types of *be*-verbs than we have considered, *be*- is only one from the set of German verbal prefixes, and nothing has been said here about the much larger class of German particles. Our own investigations of aspects of this so much bigger question are only now moving into higher gear and so far only a few results are generally accessible at this point (Lechler and Roßdeutscher 2009).

Notes

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- 1 See Hamm and Kamp (2009) for an investigation of the mechanisms by means of which occurrences of *Absperrung* are disambiguated in context.
- 2 An anonymous reviewer of this paper has complained about the lack of general mapping principles in the paper. We found it difficult to tell whether these complaints were intended as a criticism of DRT in general, or more specifically of the (cavalier) use that DRT made of it in this particular presentation. As a general criticism we reject it: From the start DRT, has been concerned with giving fully explicit definitions of the syntax-semantics mappings it proposes for particular natural language fragments and to provide a model-theoretic semantics for the representation formalisms ('DRS languages') used. (However, we would agree with one possible objection, viz. that so far DRT has failed to commit itself to a fixed set of principles for translating syntactic structures into DRSs.) If the reviewer meant to complain against the way we proceed in this paper we can understand the criticism: We do not define a 'fragment' in this paper (a fragment of German consisting, as it would have to be in this case) of a substantive part of the German vocabulary, including a range of verbs and corresponding *-ung*-nouns) for which both syntax and a syntax-semantics interface are explicitly defined. To do this would have been quite impossible within the space available for this contribution, and it would have defeated its main purpose: to present the present account of *-ung*-nominalisation in a way that should be accessible to an audience with little previous exposure to DRT,

which would find a strictly formal presentation tough going. But we agree that a systematic formal presentation of the theory should be given – especially since the representations and mapping principles we are appealing to here differ in some respects from explicit formulations of DRT (like those in Kamp and Reyle (1993)) that are readily accessible at the present time. We will address this matter in a paper that is currently under preparation.

- 3 Among the -ung-nouns we have put aside for the time being are those of which we suspect that they have entered the lexicon as technical terms, e.g. *Kochung* (a way of making paper), *Abschreibung* ('amortisation'), *Abtreibung* ('abortion'), *Anhörung* (a session during which the parties to a law suit are being interviewed by a judge). There are also nouns ending on -ung which seem to defy systematic treatment altogether, e.g. *Zeitung* ('newspaper'), *Gattung* ('species'), *Böschung* ('embankment'). These are -ung-nouns for which there does not exist a verb with the same root. Then there are cases where for all we know noun and verb are built from the same root, but where the meaning of the noun appears to bear no systematic relation to the meaning of the verb. Examples are *Währung* ('currency'), *Spannung* ('tension'). And finally there are -ung-nouns which would appear to be counterexamples to the theory we will present. An example is *Meinung*. On the one hand the verb *meinen* should not, according to the theory, permit the derivation of an -ung-noun. On the other hand, *Meinung* does not have an 'event' reading, a reading that is generally possible for the -ung-nouns that are derivable according to our theory.
- 4 As we proceed, it will become gradually clearer that the present theory requires quite detailed assumptions about the properties of roots. Some of these properties have a distinctive 'grammatical' flavour, which makes it odd to classify them as 'encyclopaedic', i.e. as contributing only contingent non-structural information. In fact, some of the properties that we will be assuming for roots may appear to some DM-theorists to be incompatible with a basic conception of DM according to which all that roots do is to contribute no more than purely 'encyclopaedic' information, which has no bearing on what structures can be built from them.
- 5 The verb *mustern* is used with a number of other meanings. The perhaps more salient of these is 'observe' or 'inspect'. These other meanings are meanings of a different (though superficially indistinguishable) verb, with a different internal structure.
- 6 The verb *würfeln* exemplifies another general moral. Besides the meaning just considered this verb also has another meaning, viz. to 'throw dice'. But there is no -ung-noun corresponding to this verb. According to the theory we will present this can only mean that there are two structurally distinct verbs *würfeln*.
- 7 (i) a. *Sie haben um fünf gegessen.*
'They ate at five'.
b. **Ihre Essung fand um fünf statt.*
'Their eating took place at five.'

-
- c. *Sie hat ihre Haferflocken mit Ekel gegessen.*
'She ate her porridge with a sense of disgust.'
 - d. **Die Essung ihrer Haferflocken war ihr ekelhaft.*
'The eating of her porridge was disgusting to her.'

or also

- (ii) a. *Er hat sich nie verziehen, dass er damals geschossen hat.*
'He never forgave himself that he had used his gun at that occasion'
 - b. **Er hat sich seine Schießung damals nie verziehen.*
'He never forgave himself his shooting at that occasion.'
 - c. *Er hatte sogleich einen Hasen geschossen.*
'He had shot a rabbit right away.'
 - d. **Die Schießung eines Hasens erfolgte sogleich.*
'The shooting of a rabbit took place right away'.
- 8 We follow the tradition of Hale and Keyser (2002); Baker (1988); Embick (2004); Embick and Noyer (2001); Embick and Marantz (2008) in assuming that word-formation involves head movement. Larger constituents are built using the operation MERGE as applying to heads and non-heads, with the heads selecting the non-heads. Movement of heads and roots obeys the Head Movement Constraint (HMC), cf. Baker (1988):

(HMC) An X^0 only moves into an Y^0 which properly governs it.

An application of HCM will be shown in (13b), below. For general assumptions in Minimalist Syntax, see Adger (2003). As for case theory we follow Marantz (2000).

- 9 The order in which the daughters of vP are presented in (10a) and (10b) has no theoretical import. In (10a) we have placed XP to the left of v. This is consistent with the fact that in the basic word order of the German clause (found in German subordinate clauses) the arguments of the verb occur to the left of the verb itself. (However, the movement principles we assume would lead to this word order also if in (10a) the order of XP and v had been the reverse.) The order of v and rP in (10b) has been adopted for reasons of consistency with other work (Roßdeutscher to appear).
- 10 This also applies, we believe, to those (fairly exceptional) cases to which we drew attention in Section 2, where a prefix verb has an *-ung*-noun but the verb without the prefix does not. (Examples, we noted on p. 9, are *beschreiben* and *bearbeiten*.) In such cases the pre-fixation involves, we hypothesise, coercion into the bi-eventive pattern, in which the manner root of the prefix-less verb is reinterpreted as a property root or sortal root. Such root re-interpretations are not all that common, however, and as far as we know, they are rarely possible without morphology that forces or supports it.

There is also a handful of eventive roots (roots that denote properties of the event *e'* contributed by *v*) which yield verbs with corresponding *-ung*-nouns.

These roots seem to characterise the event as one that produces a state of a certain kind, bringing the result state relation into play in that way. Among them we find $\sqrt{\text{wirk}}$ (yielding the verb *wirken* ('to produce an effect', 'to exert an influence')); $\sqrt{\text{füg}}$ (*sich*) *fügen* ('to adjust', 'to give in'); $\sqrt{\text{nutz}}$ *nutzen* ('to be of use to sth. or so. '); $\sqrt{\text{schaff}}$ *schaffen* ('to create'). It is noteworthy that these verbs tell us nothing about the manner of the events they describe but only about their effects: that they have an effect of some sort, or have the intended effect, or have an effect of some particular kind.

- 11 By a minimal vP node we mean a vP node that does not dominate another vP node.
- 12 For another view on the relation between the head noun *Säuberung* and the DP *des Tisches* see Solstad (this volume).
- 13 In the semantic representation of $\sqrt{\text{sauber}}$ in (14) the λ -operator is attached to what looks like a formula. But as we will see below (cf. (15)) in general λ -operators operate here on DRSs. Strictly speaking the operandum in the representation of $\sqrt{\text{sauber}}$ in (14) is a DRS, with empty universe and a condition set consisting of the single condition 'CLEAN(y)'.
- 14 We assume that most semantic representations of sentence constituents have referential argument. This is so in particular for nouns and verbs and their projections (NP, DP, VP, TP, CP (and possibly Voice)). The *referential argument* of a head or of a phrase is the entity that the head or phrase is used to describe. For discussion see Kamp and Reyle (to appear).
- 15 The operation that we propose here for the semantics of the v-rP combination is meant as a (first step towards a) formal representation of an intuition that can be found in a number of recent studies to the argument structure and aspectual properties of verbs (cf. e.g. Marantz 2005; Levin 1999; Alexiadou et al. 2006). We know of only one proposal in the literature that spells out fully explicit formal conditions for the introduction of causal relations in the semantics of verbs and phases, viz. Bittner (1999) and subsequent work. We do not know for sure at this point whether Bittner's interface architecture could be used for our purposes. Whether 'CAUSE' is always the relation that is introduced when two representations of referential arguments are combined is something we do not know for sure at this point. In the representations given in this paper no other relations arise.
- 16 It should be emphasised that the composition operations in (14) are only meant as an illustration of the systematic syntax-semantics interface for sub-lexical structure that we are aiming for in the longer run.
- 17 The state reading of *Säuberung* is difficult to obtain. For many other *-ung*-nouns the state reading is easier to get. This is also known from some nouns built from property roots, for instance *Weitung*, *Änderung*, *Besserung*. Why result state

readings for *-ung*-nouns are sometimes more and sometimes less prominent, and in some other cases not available at all is a matter we will address in forthcoming work. See also the discussion in Section 5.

- 18 We have used the Greek letter α in (14) as a way of indicating its neutrality w.r.t. the sortal specification of what it represents. See the comments on the use of η in the discussion of *Bestuhlung* later in this section.
- 19 It should be clear by now, however, that λ -conversion is only one of a number of distinct semantic operations that enter into the semantic representation constructions presented in this paper. We use λ s only as a way of making explicit that representations beginning with a λ *must* be subjected to argument insertion in the first construction step that applies to them.
- 20 That *Bestuhlung* is three-way ambiguous while *Säuberung* only has a two-way ambiguity is discussed in Section 5.
- 21 In the case of *bestuhlen* there is a strong presumption that more than one seat is involved, and thus that the discourse referent introduced by $\sqrt{\text{stuhl}}$ represents a collection of seats, rather than a single one. We are unsure whether this is a general structural property of sortal root based *be*-verbs or whether it is inferred (for *bestuhlen* and many other such *be*-verbs) on the basis of what speakers have learned to see as the prototypical events that instantiate the given verb.
- 22 We note in passing that these observations make plain that prefixes and particles can not generally be treated as operators which transform verbs into other verbs. This assumption, with which we started the investigations that have led to this paper, and that seems to reflect an impression that is abroad more generally, is unfounded and untenable.
- 23 Note well: this is the only place in the present paper where a representation beginning with a λ -operator isn't submitted to argument insertion directly, but first serves itself as argument to a sister representation involving λ -abstraction of a higher type.
- 24 An objection that might be expected to this account of *bearbeiten* and similar verbs is that assuming root reclassification is just an *ad hoc* move to save our central hypothesis which correlates *-ung*- nominalisability with bi-eventuality. We reply that if *arbeiten* is without *-ung*-nominal but *bearbeiten* has one, then *some* kind of reconceptualisation of the pieces that go into the analyses of the these verbs must take place at *some* level; and unless everything we have been saying so far is beside the point, the crucial piece here is the root. The question is just at which level the necessary reconceptualisation of the root takes place (as well as what precise form it takes). Our assumption that it takes the form of reclassifying the root *before* the structure of the *be*-verb is built is of course motivated by our central hypothesis about what renders *-ung* possible. But at this point we do not know of any evidence suggesting that reconceptualisation must be assumed to take a different form, or that it occurs at a level after the structure of *bearbeiten* has already been put in place.
- 25 We leave it as an open question whether Hypothesis 4 covers all cases of

systematically available readings of *-ung*- nouns. One type of reading that has a flavour of systematicity to it is that exemplified by nouns like *Regierung*, *Bedienung*, *Verwaltung*. These can be used to denote the people who are in charge of performing the actions that are described by the corresponding verb. It is our impression that this use of *-ung*- nouns is no longer productive in contemporary German (i.e. that currently German does not have any active general principles that permit the formation of *-ung*-nouns with this type of reading). But if one became persuaded that a principle-based account of these readings is wanted, then a fundamental revision of the account presented here would be necessary. The revision would have to be substantial. For the referential arguments of these readings are agents, and it is part of our account that agents are invisible to the *-ung*-operator.

- 26 To forestall a natural objection at this point, we note that *Säuberung*, the noun discussed earlier as our paradigm of the *-ung*-nouns built from property roots, appears to only have an event reading. Why, one might ask, shouldn't *Säuberung* have a state reading as well? We turn to this question below, in the discussion of Type 4 nouns.
- 27 One reason for this may be that with such result state relations the difference between state reading and entity reading isn't much of a distinction at all. Take *Mischung*. The result state reading in this case is that the entities contributed by the theme stand to the entity that is available as referential argument for *Mischung* in the relation of having *become*. This relation is not easy to distinguish from the coming into existence of the latter entity. So the result state, you might say, is nothing over and above the existence of that entity, of which it is presupposed that it was created in the course of the process represented by the event discourse referent *e'*. Since entity and result state are so hard to separate in this case, it is perhaps not surprising that the latter is not available as separate item in the context of *-ung*-nominalisation.

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